Naval Facilities Engineering Systems Command Southwest
BRAC PMO West, San Diego, California

Final

Record of Decision for Parcel F

Hunters Point Naval Shipyard
San Francisco, California

September 2024

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Table of Contents

List of Attachments

Barajas and Associates, Battelle, Neptune & Company, and Sea Engineering, Inc. 2007. *Technical Memorandum, Hunters Point Shipyard Parcel F, Feasibility Study Data Gaps Investigation. Hunters Point Shipyard, San Francisco, CA*. May 25. (DCN: BAI-5106-0004-0001)

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ECC-Insight, LLC and CDM Smith. 2017. *Final Technical Memorandum – Optimized Remedial Alternative for Parcel F, Hunters Point Naval Shipyard, San Francisco, CA*. September. (DCN: INEC-2004-0014-0004)

List of Figures

List of Tables

Acronyms and Abbreviations

ARAR	applicable or relevant and appropriate requirement
AWA	area-weighted average
BMP	best management practice
BRAC	Base Realignment and Closure
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
COC	chemical of concern
CSM	conceptual site model
DTSC	California Department of Toxic Substances Control
EE/CA	Engineering Evaluation/Cost Analysis
EPA	United States Environmental Protection Agency
ER-M	National Oceanic and Atmospheric Administration's effects range - median
FEMA	Federal Emergency Management Agency
FFA	Federal Facility Agreement
FS	Feasibility Study
FSDGs	Feasibility Study Data Gaps
FYR	Five-Year Review
g/day	grams per day
GSR	green and sustainable remediation
HPNS	Hunters Point Naval Shipyard
IC	institutional control
IR	installation restoration
LUC RD	Land Use Control Remedial Design
µg/kg	micrograms per kilogram
mg/kg	milligrams per kilogram
M	million
MLLW	mean lower low water
MNR	monitored natural recovery

Navy	United States Department of the Navy
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NGVD 29	National Geodetic Vertical Datum of 1929
NPL	National Priorities List
O&M	operation and maintenance
PCB	polychlorinated biphenyl
RG	remediation goal
RAO	remedial action objective
RCRA	Resource Conservation and Recovery Act
ROCs	radionuclides of concern
ROD	Record of Decision
RPD	redox potential discontinuity
§	Section
SLERA	screening level ecological risk assessment
USC	United States Code
Water Board	San Francisco Bay Regional Water Quality Control Board

1.0 Declaration

This Record of Decision (ROD) presents the selected remedy for Parcel F at Hunters Point Naval Shipyard (HPNS) in San Francisco, California. HPNS was placed on the National Priorities List (NPL) in 1989 (United States Environmental Protection Agency [EPA] ID: CA71170090087). The remedy was selected in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, as amended by the Superfund Amendments and Reauthorization Act of 1986 (Title 42 United States Code [USC] Section [§] 9601, et seq.) and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) (Title 40 Code of Federal Regulations [CFR], Part 300). This decision is based on the Administrative Record Index for this site. The Administrative Record Index is included in the electronic version of the ROD as **Attachment 1**[1]. The United States Department of the Navy (Navy), the lead agency for site activities, and EPA, the support agency, jointly selected the remedy for Parcel F. The California Department of Toxic Substances Control (DTSC) and the San Francisco Bay Regional Water Quality Control Board (Water Board), also support agencies, concur on the remedy for Parcel F. The Navy, as the lead federal agency, provides funding under the Base Realignment and Closure (BRAC) program for site cleanups at HPNS. The Federal Facility Agreement (FFA) for HPNS documents how the Navy intends to meet and implement CERCLA in partnership with EPA, DTSC, and the Water Board.

Parcel F is one of six parcels (Parcels A through F) originally designated for environmental restoration. Parcel F is composed of 443 acres of sediments that surround HPNS in San Francisco Bay (**Figure 1**). Investigations conducted at HPNS determined that within Parcel F, only Area III (Point Avisadero), Area IX (Oil Reclamation Area), and Area X (South Basin) contained polychlorinated biphenyl (PCB) concentrations that pose unacceptable risks to human health from exposure through fish consumption, and PCBs, copper, lead, and mercury concentrations that pose potential risk to birds feeding on benthic invertebrates and fishes. This ROD addresses only Parcel F.

[1] **Bold Blue Text** identifies detailed site information available in the Administrative Record and listed in the References Table (**Attachment 2**). This ROD is also available electronically whereby bold blue text serves as a hyperlink to reference information. The excerpts referenced by the hyperlinks are part of the ROD. To the extent inconsistencies may exist between the referenced information attached to the ROD via hyperlinks and the information in the basic ROD itself, the language in the basic ROD controls.

1.1 Selected Remedy

The CERCLA remedial action selected in this ROD is necessary to protect the public health, welfare, and the environment from actual or potential releases of hazardous substances from Parcel F. The selected remedy for Parcel F addresses sediments contaminated with PCBs, copper, lead, and mercury within Areas III, IX, and X. The selected remedy consists of the following actions to address risks posed by contaminated sediments:

Area III

The selected remedy within Area III (Alternative 4/4A) is a combination remedy of focused sediment removal and capping for contaminated sediments that exceed the remediation goals (RGs) for copper, mercury, and PCBs, and institutional controls (ICs). The selection and specifications of capping material will be finalized during design of the cleanup remedy. Removed sediments will be transported for off-site disposal. Final off-site disposal locations, including re-use opportunities, will also be determined during the remedial design.

The Parcel F selected remedy for **Area III**, **Alternative 4/4A** – Focused Removal/ Backfill, Off-Site Disposal, Capping, and ICs, is described as follows:

- **Focused Removal/Backfill/Off-Site Disposal**. Focused sediment removal and backfill for sediments, where chemical of concern (COC) concentrations exceed remedial action objective (RAO) 1 RGs in the nearshore area with water depths less than 5 feet (i.e., sediments too shallow to be capped). Sediments will be removed followed by backfilling with clean sediments to pre-removal elevations. Hence, all sediments with concentrations of total PCBs above 1,240 micrograms per kilogram (µg/kg), copper above 271 milligrams per kilogram (mg/kg), and mercury above 1.87 mg/kg that are too shallow to be capped will be remediated through removal to a maximum depth of 2 feet followed by backfilling.
- **Capping**. Contaminated sediments in water depths greater than 5 feet but less than 30 feet will be capped. An estimated 68,670 square feet of contaminated sediments will be capped with approximately 2 feet of material. The cap will be designed to contain the contaminated sediments and resist erosion and will extend beyond the boundary of contaminated sediments to ensure complete coverage and to allow for a shallow slope along the edge of the cap. The dimensions of the cap and the capping material will be determined during remedial design.

- **Institutional Controls**. ICs will be implemented in Area III (see **Section 2.10.2**) to maintain the integrity of the remedy and until cleanup goals have been achieved to ensure that Site conditions remain protective of human health.

Areas IX and X

The selected remedy within Areas IX and X (Alternative 7) is a combination remedy consisting of *in situ* treatment, removal with backfill, monitored natural recovery (MNR), and ICs. It results in the removal of intertidal sediments to a target depth of 1 foot. Sediments will be cleaned up based on PCB concentration, as follows:

- Intertidal PCB concentration exceeding 1,240 μg/kg = focused removal with backfill
- Subtidal PCB concentration exceeding 12,400 μg/kg = focused removal with backfill
- Subtidal PCB concentration exceeding 1,240 μg/kg but below 12,400 μg/kg = *in situ* treatment
- PCB concentrations between 148[2] μg/kg and less than or equal to 1,240 μg/kg = MNR

The technology assignment framework (i.e., which remedial technology is planned to be employed in which grid location), was modified in this ROD to minimize impacts to the Yosemite Slough remedial action by increasing the removal area in close proximity to Yosemite Slough. This modification achieves a lower overall post-remedial action PCB area-weighted average (AWA) concentration of 193 ug/kg for Area X, thereby reducing the MNR timeframe to achieve RAOs in Area X. This modification is documented in the *Final Technical Memorandum Revision to Total PCB Background Concentration and RAO 3 RG* (ECC-Insight and CDM Smith, 2022), presented in **Attachment 5 (Part 3)**. Future adjustments to the technology assignment framework will be made during remedial design based on pre-remedial action sediment characterization data.

The Parcel F selected remedy for **Areas IX and X, Alternative 7** – Focused Removal/Backfill, *In situ* Treatment, Off-Site Disposal, MNR, and ICs, is described as follows:

- **Focused Removal/Backfill/Off-Site Disposal**. All intertidal sediments (i.e., areas with a surface elevation above 0 feet mean lower low water [MLLW],

[2]If the background PCB concentrations are found to be greater than 148 μg/kg either through long-term monitoring at Areas IX/X, a site-specific background sediment study, an updated sediment trap study, or similar study, the Navy may evaluate a higher background PCB value as part of the FYR pursuant to CERCLA §121 and the NCP.

(National Geodetic Vertical Datum of 1929 [NGVD 29] elevation -2.78 feet) with total PCB concentrations above the RAO 1 PCB cleanup level of 1,240 μg/kg will be remediated through removal to a target depth of 1 foot. Subtidal sediments (i.e., areas with a surface elevation below 0 feet MLLW [NGVD 29 elevation -2.78 feet]) with total PCB concentrations exceeding 12,400 μg/kg (10 times the RAO 1 cleanup level) will be remediated through removal to a target depth of 1 foot. In addition, all sediments with copper concentrations above the RAO 1 copper cleanup level of 271 mg/kg and mercury concentrations above the RAO 1 mercury cleanup level of 1.87 mg/kg will be remediated through removal to a target depth of 1 foot regardless of tidal zone location. Following sediment removal, the areas will be backfilled.

- ***In situ* treatment.** Subtidal sediments with total PCB concentrations exceeding the RAO 1 PCB cleanup level of 1,240 μg/kg, but less than 12,400 μg/kg (10 times the RAO 1 cleanup level), will be treated using carbon-based amendments.
- **MNR.** Surface sediments within Areas IX and X with PCB concentrations below the RAO 1 PCB cleanup level of 1,240 μg/kg will be remediated through MNR.
- **Institutional Controls**. ICs will be implemented in Areas IX and X (see **Section 2.10.2**) to maintain the integrity of the remedy and until cleanup goals have been achieved to ensure that Site conditions remain protective of human health.

Parcel F Site-wide Institutional Controls

ICs will be implemented to require proper management and disposal of any low-level radiological objects that may be encountered in sediments during future site activities. Site-wide ICs will be maintained until RAOs are achieved and all radiological concerns have been addressed.

1.2 Statutory Determinations

The selected remedy is protective of human health and the environment, complies with federal and state statutes and regulations that are applicable or relevant and appropriate to the remedy, and is cost-effective. The selected remedy uses permanent solutions and alternative treatment (or resource recovery) technologies to the maximum extent practicable. It provides the best balance of tradeoffs relative to the five balancing criteria and properly considers the two modifying criteria. The selected remedy satisfies the statutory preference for treatment as a principal element through the treatment of PCB-contaminated sediments within Areas IX and X. Statutory Five-Year Reviews (FYRs) pursuant to CERCLA § 121 and the NCP will be conducted because the remedy will leave contamination in place at Parcel F above concentrations that allow for unlimited use and unrestricted exposure.

1.3 Data Certification Checklist

The following information is included in Section 2 of this ROD. Additional information can be found in the Administrative Record file for this site:

- Site description and history (**Section 2.1**)
- Site characteristics (**Section 2.2**)
- COCs and their concentrations (**Section 2.3**)
- Current and reasonably anticipated future waterway use (**Section 2.4**)
- Baseline risk represented by COCs (**Section 2.5**)
- Basis for Response Action (**Section 2.6**)
- Principal threat wastes (**Section 2.7**)
- RGs established for COCs and the basis for these goals (**Section 2.8**)
- Description and evaluation of remedial alternatives (**Section 2.9**)
- Estimated capital, annual operation and maintenance (O&M), total present worth costs, discount rate, and the number of years over which the remedy cost estimates are projected (**Section 2.9.1**)
- Key factors that led to selecting the remedy, e.g., a description of how the selected remedy provides the best balance of tradeoffs with respect to the balancing and modifying criteria, highlighting criteria key to the decision (**Section 2.10.1**)
- Description of selected remedy (**Section 2.10.2**)
- Expected outcomes of the selected remedy (**Section 2.10.3**)

1.4 Authorizing Signatures

This signature sheet documents the Navy's and EPA's co-selection of the remedy in this ROD. This signature sheet also documents the State of California's (DTSC and Water Board) concurrence with this ROD.

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Base Realignment and Closure Environmental Coordinator
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9/26/2024
Date

Michael Montgomery
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Date

2.0 Decision Summary

2.1 Site Description and History

HPNS is a former naval shipyard located on a peninsula in southeast San Francisco that extends east into San Francisco Bay (**Figure 1**). The land portion of the shipyard is approximately 491 acres. In 1940, the Navy obtained ownership of HPNS for shipbuilding, repair, and maintenance during World War II. After the war, activities shifted to submarine maintenance and repair. The Naval Radiological Defense Laboratory was also located at HPNS. HPNS was deactivated in 1974, and the Navy leased most of the property to Triple A Machine Shop, Inc. between 1976 and 1986. The Navy resumed occupancy of HPNS in 1987, and it was listed on the NPL in 1989. In 1991, HPNS was designated for closure pursuant to the terms of the Defense BRAC Act of 1990, which provides funding for site cleanups. Closure activities at HPNS involve environmental cleanup and making the property available for nondefense use and transfer.

Past shipyard operations left hazardous materials and chemicals on site. These chemicals migrated to San Francisco Bay through groundwater discharge, storm and surface water runoff, and soil erosion, resulting in sediment contamination in some areas of Parcel F. Some releases occurred directly to San Francisco Bay from overwater activities at HPNS.

Parcel F, consisting of 443 acres, was initially subdivided into 11 subareas, Areas I through XI, because of its size and complexity. Early site investigations identified Areas I (India Basin), III (Point Avisadero), VIII (Eastern Wetland), IX (Oil Reclamation), and X (South Basin) for further evaluation (**Figure 1**).

Follow-on investigations conducted by the Navy concluded that PCBs, copper, lead, and mercury are present in sediment at concentrations that pose an unacceptable risk to human health and the environment at Areas III, IX, and X (**Figure 1**). Thus, they were identified as COCs for Parcel F and cleanup actions were evaluated to address these COCs in Areas III, IX, and X. The follow-on investigations concluded that chemical concentrations in sediment at Areas I and VIII do not pose a noncancer hazard to human health or the environment, and that human health cancer risks were below 1×10^{-6} in Area VIII and within the acceptable risk range of 10^{-4} to 10^{-6} in Area I (3×10^{-6}).

Site investigations performed at HPNS Parcel F are presented in **Section 2.3**.

2.2 Site Characteristics

2.2.1 Hydrodynamic Setting

Area III: Point Avisadero is a 3.5-acre peninsula located in the northeastern portion of HPNS. It is bordered on the north and east by San Francisco Bay, on the south by Dry Dock 3, and on the west by the remainder of the HPNS property (**Figure 1**). Point Avisadero is flat with a steep armored riprap bank. The riprap banks extend well below low tide elevation. Area III is an open water area within San Francisco Bay with water depths of up to 70 feet, adjacent to navigation areas within San Francisco. A high-resolution **bathymetric survey** conducted during the Feasibility Study Data Gaps (FSDGs) investigation shows a shelf of sediment approximately minus 5 feet MLLW deep located northwest of the drainage tunnel outfall (Barajas et al., 2007). This shelf and the eastern bank of Point Avisadero both slope steeply to the northeast to a depth of about minus 35 feet MLLW, after which the bottom continues to deepen to minus 80 feet MLLW in the southeast direction. A **sediment dynamics study** conducted in Area III indicated that surface sediment was re-suspended 16 percent of the time during the winter and 4 percent of the time during the summer due to strong tidal currents. Strong tidal currents pass Point Avisadero, flowing southeast during flood tides and north-northwest during ebb tides (except along the northern shoreline, where an eddy current flows to the southeast). The study concluded that the net residual circulation and sediment flux in the area is to the southeast. The distribution of COCs within Area III suggests that any sediments transported to depths greater than minus 65 feet MLLW were transported away from the site. The shelf to the north and west of Point Avisadero is a net depositional environment. Evaluation of vertical COC profiles also suggest that deposition has reduced the concentration of surface sediments (Barajas et al., 2007).

Areas IX and X: Areas IX (Oil Reclamation Area) and X (South Basin) are within a shallow embayment located to the south of HPNS, between HPNS and Candlestick Point, with water depths ranging from 6 inches to less than 2 feet (Battelle et al., 2005) (**Figure 1**). Circulation in South Basin is restricted, and tidal currents are weak. The South Basin is a net depositional environment subject to infrequent resuspension events. The most significant sediment resuspension occurs from storm waves generated from the southeast winds during the winter. Sediment stability analysis predicts that up to 4.2 centimeters of **erosion** may be expected during a winter storm event. Sediment deposition rates within the South Basin were measured using radioisotope data from sediment cores collected within the South Basin. The results of this evaluation determined that the net sediment accumulation rate is approximately 1 centimeter per year based on sediment trap data. Sediment deposition within Areas IX and X represents a combination of shallow sediments within the South Basin and sediment from elsewhere within San Francisco Bay. Based on this measured net deposition rate, an average gross sediment deposition rate of about 5 centimeters per year can be estimated. Due to the low advective currents in South Basin, most of this deposition represents material that is locally re-suspended and deposited while the net deposition rate of about 1 centimeter per year is due to new material entering South Basin from the San Francisco Bay (Barajas et al., 2007). Yosemite Slough enters the South Basin from the west and is characterized as a shallow, tidally influenced channel with no permanent flow. Information available from Yosemite Slough studies indicates that there is negligible movement of sediments from the South Basin to the Yosemite Slough (TIG and Integral, 2022). Planned shoreline remedial measures for Parcel E and Parcel E-2 are in progress and remedial measures are planned for Yosemite Slough. These remedial measures are and will be designed to limit the erosion and transport of contaminated material to Areas IX and X. Parcel F cleanup is being coordinated with the current and planned remedial measures for Parcel E, Parcel E-2, and Yosemite Slough.

Updated Hydrodynamic Model for 100-year Storm Events. A hydrodynamic model is being prepared to support remedial design activities which considers 100-year storm events, sea level rise and extreme tidal events such as king tides. The model is based on a Federal Emergency Management Agency (FEMA) model for San Francisco Bay and considers a 100-year storm event in conjunction with predicted sea level rise, partially and temporally variable water levels, water depths, and currents in response to coastal fluctuations associated with tides, storm surges, and offshore set-down events propagating into San Francisco Bay. In addition, a FEMA wave model will be used to consider spatially and temporally variable wave heights and wave periods in response to local wind conditions within San Francisco Bay. The results of the model will be used to develop specifications for capping, backfill and shoreline protection material that can withstand a 100-year event with consideration of sea level rise.

***Evaluation of Sediment Deposition*.** A semi-quantitative evaluation of sediment bed elevation was performed that compared the sediment bed elevations generated during a September 2003 bathymetric survey presented in the Hydrodynamic Modeling, Wave Analysis and Sedimentation Evaluation for the Yosemite Canal Wetland Restoration Project (Noble Consultants, 2005) and a February 2018 bathymetric survey presented in the Field Operation Report, Sediment Investigation and Bathymetric Survey (Appendix A of ECC-Insight and CDM Smith, 2018). The evaluation showed that 38 to 67 centimeters of sediment has accumulated in the South Basin over the past 15 years representing an average sediment deposition rate of approximately 3.5 centimeters per year within the South Basin. The average deposition rate within the intertidal zone was estimated at 3.4 centimeters per year while the average deposition within the subtidal zone was estimated at 3.5 centimeters per year with the greatest amount of deposition observed near the entrance to the South Basin.

2.2.2 Ecological Setting

Parcel F includes three marine habitats that blend with one another in transition zones: open water aquatic, intertidal wetland, and bay mudflats. Many species of mobile marine animals move among these habitats, either daily with the tides or seasonally. The subsections below describe typical species in the open water aquatic, intertidal wetland, and bay mudflat habitats at Parcel F.

***Open Water Aquatic Habitat*:** According to the Parcel F Feasibility Study (FS) (Barajas and Associates, 2008), the shallow bay habitat of Parcel F is a feeding area for many species of fish, including many with commercial value. The abundance of fish and marine invertebrates in the nearshore shallow waters of Parcel F support a diversity of birds. Marine mammals observed using the bay waters around HPNS include the California sea lion (*Zalophus californianus*) and harbor seal (*Phoca vitulina*). Harbor seals, which are the only marine mammals that are permanent residents in the bay, use rocks or sand flats as resting areas (haul-out sites) (URS Corporation, 2006).

Sediments that underlie the open water can be many feet thick, however only the surface sediments are considered biologically active. The nature and thickness of the biologically active zone was assessed during the FSDGs investigation (Barajas et al., 2007). Results of a literature review indicated that the depth of the biologically active zone in marine sediments averages about 10 centimeters (4 inches) and rarely exceeds 30 centimeters (12 inches). The boundary between oxidized and reduced sediments is called the redox potential discontinuity (RPD) and is an indicator of the approximate depth of active bioturbation and porewater exchange caused by bioturbation. Below the RPD, a mid-depth zone is characterized by decreasing bioturbation with increasing depth. Observations of biota in sediment cores collected during the Parcel F Validation Study (Battelle et al., 2005) and the Sedflume cores collected in 2003 are consistent with this pattern (Barajas et al., 2007). A well-mixed oxidized zone from 2 to 10 centimeters (1 to 4 inches) thick was reported. Polychaetes and burrows were observed to depths of 20 to 30 centimeters (8 to 12 inches), although at lower densities than in the surficial layer. Sediment profile images obtained at 20 stations in the South Basin demonstrated that the mean apparent depth of the RPD was 2 to 10 centimeters (1 to 4 inches). In addition, feeding voids were observed to depths up to 15 centimeters (6 inches), which possibly indicated the particle mixing depth by head-down feeders such as polychaetes and the depth of the biologically active zone (Germano & Associates, Inc., 2004).

Intertidal Wetlands and Bay Mudflats Habitat: As shown on **Figure 1**, approximately three acres of intertidal wetlands and bay mudflats are located along the shoreline of the South Basin. Vegetation observed in the tidal wetlands includes salt-loving plant species typically associated with tidal salt or non-tidal salt marshes. The areas of shoreline that are riprapped, support species that attach to or use hard substrate for shelter, including crabs, mussels, and barnacles. The soft bay mud substrate, associated with intertidal and mudflat habitat, provides habitat for many benthic invertebrates, including worms (oligochaetes and polychaetes), crustaceans (e.g., crabs, shrimp, or barnacles), insects, gastropods (e.g., snails), and bivalves (e.g., clams). The intertidal mudflats in the South Basin are exposed at low tide, making benthic invertebrate prey available to a variety of foraging birds. The shallow bay habitat of Parcel F is a feeding area for dozens of species of fish, many with commercial or recreational value, including the Pacific herring, northern anchovy, lingcod, starry flounder, jacksmelt, and several surf perches as well as at least 40 other species of fish, crabs, and shrimp.

2.3 Previous Investigations and Removal Actions

2.3.1 Previous Investigations

Since 1991, numerous investigations have taken place at Parcel F. Key investigations include two ecological risk assessments conducted between 1991 and 1996, the 1998 FS, the 2005 validation study, the 2002 shoreline study, the 2007 FSDGs investigation, and a series of radiological investigations conducted between 2009 and 2013 (**Table 1**). The studies describe the nature and extent of contamination, risk to human health and the environment, and cleanup options. The studies and evaluations are included in the following documents and are in the HPNS Administrative Record (**Attachment 1**):

- The 1991 environmental sampling and analysis plan (Aqua Terra Technologies, 1991) and the 1994 Phase 1A and 1996 Phase 1B ecological risk assessments (PRC, 1994 and 1996) evaluated data to identify contaminants present in sediment and general areas of contamination, described the conceptual site model (CSM), chemical migration routes and exposure pathways, and provided an initial assessment of ecological risk. These investigations fulfilled the site inspection phase of CERCLA.
- The 2005 validation study report (Battelle et al., 2005) and 2007 FSDGs investigation (Battelle et al., 2007) further delineated and refined the extent of chemical release, evaluated toxicity, and assessed human and ecological risk. These studies fulfilled the remedial investigation phase of CERCLA.
- The 2008 FS (Barajas and Associates, 2008) proposed RAOs and evaluated cleanup alternatives and their associated costs. The 2017 FS Addendum (KCH,

2017a) updated the nature and extent of contamination and risk to human health and the environment based on additional radiological data.

- Phase 1, 2a, and 2b Radiological Investigations for Parcel F consisted of radiological data gap investigations conducted between 2009 and 2011 (Battelle and Sea Engineering, 2013; ITSI Gilbane and SAIC, 2013). The investigations included the advancement of over 300 sediment cores for radiological, total PCB and physical analyses (KCH, 2017a).
- Final Sediment Investigation Beneath Former Parcels B and C Pier and Wharf Structures and Bathymetric Survey of Parcel F (ECC-Insight and CDM Smith, 2018). Field activities included collection of grab surface sediment samples within the footprint of six separate former Parcels B and C pier and wharf structures (Pier B, Pier C, Berth 61, Berth 64, the wooden Quay Wall, and Wharf #2) and a bathymetric survey.

A summary of key documents and investigations performed for HPNS Parcel F is in **Table 1.** Sampling locations are shown on **Figure 2** (Area III) and **Figure 3** (Areas IX and X), respectively.

2.3.2 Nature and Extent of Contamination

Investigations conducted within Parcel F concluded that the highest chemical concentrations detected in Parcel F sediments are present in Areas III and X. The Parcel F Validation Study Report (Battelle et al., 2005) concluded that the COCs detected within Area III (copper, lead, mercury, and PCBs) were most likely derived from episodic discharges associated with historical ship painting and maintenance activities that were carried out in the adjacent dry docks. As noted in the Parcel F FS (Barajas and Associates, 2008), the horizontal and vertical **distribution of chemicals** in Area III sediments is localized and discontinuous rather than exhibiting a gradient away from a well-defined source. Within Areas IX and X, the COCs were determined to be PCBs, copper, mercury, and lead. The highest concentrations of these chemicals were detected along the eastern shoreline of Area X and decreased with increasing distance from the shoreline.

Within Area IX, concentrations of mercury in surface sediment exceeded the San Francisco Bay ambient threshold level of 0.43 mg/kg (100% fines) but did not exceed the National Oceanic and Atmospheric Administration's effects range – median (ER-M) value of 0.71 mg/kg. PCB concentrations exceeded the ER-M value in surface sediment samples collected from Area IX during both the validation study and the FSDGs investigation (Battelle et al., 2007). Despite the generally low PCB and mercury sediment concentrations within Area IX, the Navy and regulatory agencies agreed to include a portion of the northern shoreline within Area IX with the evaluation of Area X.

The location(s) of lead concentrations exceeding the ER-M are sample PA-47 in Area III and samples TZSA-03 and SB-01 in Areas IX and X (Barajas and Associates, 2008).

The distribution of PCB contamination presented in the Parcel F FSDGs investigation technical memorandum (Barajas et al., 2007), shows that PCB contamination within Areas IX and X is highest adjacent to the Parcel E-2 landfill and near the entrance to Yosemite Slough. Evaluation of the vertical extent of contamination indicates that PCB concentrations are higher in subsurface sediments than surface sediments with maximum concentrations present 6 inches to 2 feet below mudline. The highest levels of PCB contamination were detected near the mouth of Yosemite Slough at a depth of approximately 50 centimeters below mudline. The highest levels of metals were detected along the eastern shore of Area X and near the mouth of Yosemite Slough and generally co-occur with PCBs. A summary of COC concentrations in each of the Parcel F remediation areas is included in **Table 2** based on the data used to evaluate site risks as presented in the FS Addendum (KCH, 2017a).

A series of investigations were conducted between 2009 and 2013 to **characterize radionuclides of concern (ROCs)** at Parcel F. These investigations concluded that concentrations of ROCs in sediment at Parcel F were equal to or less than background and that there was no evidence of bioaccumulation of ROCs in clam tissue at Parcel F. Therefore, there is no unacceptable risk to human health and the environment due to the presence of ROCs.

The Navy did not recover any radioluminescent items such as dials, gauges, or deck markers from Parcel F sediments during the radiological characterization investigations mentioned above. However, based on the CSM for HPNS activities, which include the potential for inadvertent disposal of radioluminescent items, the potential remains for these radioluminescent items to be present in Parcel F sediments where ships docked during HPNS operations. Therefore, the Navy decided that it is appropriate to place ICs on Parcel F sediments for the management of low-level radiological objects.

2.3.3 Sources of Contamination and Removal Areas

Investigations at HPNS identified the **sources of COCs** to Parcel F sediments (**Figures 2** and **3**). Key sources of COCs include:

- **Area III**: Stormwater discharge, a drainage tunnel that was used to rapidly drain water from Dry Docks 2 and 3, surface runoff, and groundwater discharge.

- **Area IX**: Parcel E Shoreline debris, a former small arms firing range, and historical oil reclamation ponds installation restoration (IR)-03.
- **Area X**: Parcel E-2 landfill and Yosemite Slough were source of COCs and are described as follows:
  - *Parcel E-2 landfill*: Parcel E-2 landfill was used for the disposal of a variety of industrial debris and waste including transformers and electrical equipment, waste oils, sandblast grit and other waste materials; former drum storage areas; and shoreline debris including metallic waste, kiln bricks, and sandblast grit.
  - *Yosemite Slough*: Yosemite Slough enters the South Basin (Area X) from the west and was identified as one of the sources of PCBs in the South Basin (**Figure 1**; Barajas et al., 2007). Sources of contamination to Yosemite Slough include combined sewer overflow discharges, non-native fill material placed along the Yosemite Slough banks, potential undocumented commercial and industrial discharges, urban runoff of storm water, groundwater transport, regular flooding of both Armstrong and Griffith pump stations, and release of contamination from materials placed during filling or redevelopment activities. Chemicals of potential concern detected in sediment samples within Yosemite Slough include PCBs, polycyclic aromatic hydrocarbons, pesticides, and metals.

Since 1994, a series of removal actions have been performed at the HPNS site to control sources of contamination to Parcel F sediments. Additional information on the Parcel E and E-2 remedial design is included in CES (2018) and ERRG (2014), respectively. The Fourth FYR summarizes the latest phases of remedial actions in these areas (Innovex-ERRG, 2019). In addition, the Navy prepares fact sheets with updates on the multiple phases of remedial action at Parcels E and E-2 (Navy, 2019a, b, c, 2020). Specific actions conducted by the Navy include:

- 1994: A sheet pile wall was installed and riprap was placed along the Parcel E-2 shoreline to prevent further migration of COCs to Area X.
- 1996: A sheet pile wall was installed along the IR-03 shoreline to prevent the migration of oily waste and COCs to Areas VIII and IX.
- 2000: A cap was placed over the Parcel E-2 landfill to prevent infiltration of surface water further minimizing the potential for ongoing COC migration to Area X.
- 2004: Debris such as tires, kiln bricks, and concrete blocks were removed from the Parcel E-2 shoreline.

- 2006: Metal debris, slag, and burn waste were removed from Parcel E-2 along the northwest shoreline of the South Basin.
- 2007: Approximately 44,500 cubic yards of soil and sediment containing PCBs and 110 buried drums were removed from a PCB hotspot within Parcel E along the east shoreline of the South Basin.
- 2011: Approximately 40,000 cubic yards of soil were removed from an onshore PCB hotspot within Parcel E-2 along with lead contamination from an area where batteries were disposed.
- 2015: A nearshore slurry wall was installed along the Parcel E-2 shoreline to prevent groundwater contamination from migrating from the landfill (Gilbane Federal, 2018).
- 2016-2021: Phase II Parcel E-2 remedial action, consisting of installation of the shoreline revetment, site grading and consolidation of excavated soil, sediment, and debris, and upland slurry wall installation, was implemented (Aptim, 2021).

Additional remedial actions are also planned at HPNS Parcels E and E-2 to control sources of contamination to Parcel F sediments, particularly to Areas IX/X (Navy 2012, 2013; Innovex-ERRG, 2019). The Parcel E and E-2 remedies are further described in the Final Parcel E and E-2 RODs (Navy 2012, 2013). These additional actions include the following phases of remedial action at Parcels E and E-2, to be completed by fiscal year 2026, in coordination with the anticipated remedial action for Parcel F:

- Phases III and IV remedial action for Parcel E-2: installation of a soil cover with multiple protective liners, landfill gas extraction and treatment system, and new tidal and freshwater wetlands (ERRG, 2014).
- Phase I remedial action for Parcel E: excavation and disposal of approximately 65,000 cubic yards of contaminated soil, closure of 2,700 linear feet of inactive steam lines and 3,100 linear feet of underground fuel lines, construction and operation of a soil vapor extraction system, and treatment of VOC contamination in groundwater at inland plumes using *in situ* biological nutrients and zero-valent iron (Innovex-ERRG, 2019; Navy, 2019a).
- Phase II remedial action for Parcel E: excavation of contaminated shoreline sediment from IR-03, implementation of *in situ* stabilization within the non-aqueous phase liquid of IR-03, construction of a subsurface groundwater containment slurry wall, and armored revetment shoreline protection, and ICs (Navy, 2019c).
- Phase III remedial action for Parcel E: excavate and dispose off-site 2,000 cubic yards of contaminated shoreline soil and sediment, installation of a nearshore slurry wall and shoreline protection at IR-02 northwest (Navy, 2019b).
- Phase IV remedial action for Parcel E: radiological survey and durable cover.

An Engineering Evaluation/Cost Analysis (EE/CA) was conducted by EPA in 2013 (Ecology and Environment, 2013) for Yosemite Slough. Based on the results of the EE/CA (Ecology and Environment, 2013), EPA issued an Action Memorandum identifying a combination of dredging, capping, enhanced natural recovery and MNR as the remedy in 2014 (EPA, 2014). Subsequently, a Technical Memorandum was developed by the EPA to incorporate additional data gathered through pre-remedial design investigations and a feasibility evaluation for implementing a new remedial goal for Yosemite Slough, consistent with a calculated nearshore PCB ambient concentration of 148 µg/kg (EA EST and EPA, 2021). The remedy for the Yosemite Slough site is being coordinated with the remedial action for Parcel F.

The source control measures for Area III are complete as documented by the remedial action completion reports for Parcels B-1 (ERRG, 2017) and B-2 (ERRG, 2018) and consisted of soil excavation and off-site disposal, durable covers, soil vapor extraction, groundwater treatment, decontamination of building sites, excavation of radiologically impacted areas, excavation of storm drain and sanitary sewer lines, and disposing of contaminated excavated soil at an off-site low-level radiological waste facility.

2.4 Current and Potential Future Site Uses

The land portion of HPNS is a former industrial use area that is targeted for a range of uses including industrial, commercial, residential, active and passive recreation, plazas and promenades, and wetlands restoration. Parcel F sediments include both shallow and open water habitat. Current and potential future waterway uses within the South Basin are primarily recreational while providing shallow water, intertidal and mudflat habitat. Current and potential future waterway uses along the eastern and northern shorelines include navigation uses and open water habitat.

2.5 Summary of Site Risks

Risk is the likelihood or probability that a hazardous chemical, when released to the environment, will cause negative health effects (such as cancer or other illness) to exposed humans and wildlife. Parcel F currently provides open water and intertidal habitat. The adjacent shoreline likely will be redeveloped as open space for a park or similar use. People could potentially use this area for fishing and collecting shellfish for food. No other potential uses have been identified.

Based on the CSM, human health and ecological risk assessments were conducted to estimate risks associated with exposure to contaminants in sediment at Parcel F. Exposure was assessed for current and potential future uses of the area after redevelopment.

2.5.1 Conceptual Site Model

The CSM is a basic description of how contaminants enter the environment, how they are transported, and what routes of exposure to organisms and humans are present. It also provides a framework for assessing risks from contaminants, developing cleanup strategies, determining source control requirements, and methods to address unacceptable risks. **Figure 4** shows the CSM for current and future receptors at Parcel F Areas III, IX, and X.

The natural processes that can disturb sediment and bring contaminants to the surface where human and animal receptors may be exposed are wave action, strong currents, and burrowing activity of benthic organisms. Current potential human receptors at the site include individuals consuming shellfish and sportfish and individuals incidentally exposed to sediment during harvesting and cleaning of shellfish. Ecological receptors include birds feeding on aquatic organisms living within the sediment, including benthic invertebrates (such as clams) and fishes. The surf scoter (bird) was selected as a representative ecological receptor that forages within Area III and Areas IX and X for food. Foraging depths for the surf scoter are limited to water less than 30 feet in depth.

2.5.2 Human Health Risk Assessment

In the **human health risk assessment**, the Navy considered the ways humans might be exposed to COCs, the concentrations of COCs, and the amount of current and future exposure to the COCs. Risk is estimated based on conservative assumptions, which tend to overestimate risk to ensure that cleanup goals are protective of human health. The human health risk assessment considered both cancer risk (for contaminants that cause cancer) and noncancer risk (for contaminants that do not cause cancer but are harmful to humans in other ways).

The estimated risk to human health is summarized in **Table 3**. The Navy calculated the potential cancer and noncancer risk to adults from eating fish and shellfish and direct contact with sediment during shellfish collection. Risks were estimated based on sediment, shellfish, and fish tissue data collected within Parcel F and considered the fraction of fish and shellfish collected from the HPNS site. The results of the human health risk assessment indicate that excess lifetime cancer risks due to direct contact with sediment and through fish and shellfish consumption were within the EPA acceptable risk range of a 1 in 10,000 (1×10^{-4}) chance to a 1 in 1,000,000 (1×10^{-6}) chance to develop cancer during one’s lifetime.

The hazard quotient is a measure of noncancer health effects and is calculated as the potential exposure divided by the reference value set by regulatory agencies. A hazard quotient value of 1 or less is considered an acceptable exposure level. For the fish consumption exposure pathway, the hazard quotient exceeds 1 for total PCBs, which indicates that adverse noncancer human health effects are possible.

2.5.3 Ecological Risk Assessment

In the **ecological risk assessment**, the Navy concluded that contaminated sediment in Parcel F poses a potential threat to wildlife. Unacceptable risks were identified for birds, such as the surf scoter, feeding on organisms such as clams, snails, worms, or insects. The surf scoter, a diving duck, was chosen as a representative species in evaluating ecological risk at Area III for the following reasons:

- The scoter is present in large numbers from late fall through winter at HPNS.
- The scoter is a benthic-feeding bird that forages primarily on mollusks. As such, it is exposed directly to contaminated sediment.
- The scoter can feed in the intertidal zone during high tide and forages in the subtidal zone to depths up to 30 feet. Therefore, it represents bird species potentially exposed to both intertidal and subtidal habitats. Many other species are only appropriate for one habitat or the other, or primarily consume surface dwelling fish, which are not directly exposed to contaminated sediment:
  - Brown pelicans, cormorants and terns can forage in water depths of 150 feet but typically eat surface-schooling fish such as mackerel, sardines, anchovy, and smelt
  - Diving ducks that eat fish, such as mergansers, feed primarily in shallow water less than 20 feet deep
  - Wading birds such as great blue herons forage only in shallow water
  - Gulls cannot dive and feed only on the surface

Risks to the surf scoter are summarized in **Table 4**. In Area III, copper and mercury were identified as the primary risk drivers, and PCBs were the primary risk drivers in Areas IX and X. Lead was identified as a potential but unquantifiable contributor to risk because of the uncertainty associated with both the bioavailability and toxicity of lead.

2.6 Basis for Response Action

The response actions selected in this ROD are necessary to protect the public health, welfare, or the environment from actual or potential releases of hazardous substances into the environment. The Navy, in partnership with EPA, DTSC, and the Water Board, considered all pertinent factors in accordance with CERCLA and NCP remedy selection criteria and determined that remedial action is necessary to clean up sediment at Parcel F. This determination was made because:

- Based on the baseline human health risk assessment results, noncancer hazards greater than 1 were identified at Parcel F.
- Based on the baseline ecological risk assessment results, chemical concentrations in sediment in Parcel F pose a potential threat to wildlife.

2.7 Principal Threat Waste

According to EPA's "A Guide to Principal Threat and Low Level Threat Wastes" (U.S. EPA 1991b), principal threat wastes are those source materials considered to be highly toxic or highly mobile that generally cannot be reliably contained or would present a significant risk to human health or the environment should exposure occur. Based on the results of the risk assessments and the lack of source material, principal threat waste was not identified in Parcel F.

2.8 Remedial Action Objectives

The Navy developed **RAOs** as the first step in identifying and assessing options for the cleanup strategy (cleanup alternatives). Consistent with CERCLA guidance, RAOs consist of specific cleanup goals for protecting human health and the environment. Each RAO specifies: COCs, exposure routes and receptors, and goal(s) for the cleanup action that ensures protectiveness. These cleanup goals are known as the RGs and are presented in **Table 5**. RAOs include both a chemical level and an exposure route because a protective cleanup can be achieved by reducing either exposure or chemical levels. Ultimately, the success of a cleanup action is measured by its ability to meet the respective RAOs.

The three RAOs for Parcel F Area III and Areas IX and X are focused on exposure from consumption of fish and shellfish by humans and wildlife:

- **RAO 1**. Reduce the risk of benthic feeding and fish-eating birds, including surf scoters, to acceptable levels from exposure to copper, lead, mercury, and total PCBs through eating of contaminated prey and incidental ingestion of sediment.
- **RAO 2**. Limit or reduce the potential risk to human health from eating shellfish from Parcel F.
- **RAO 3**. Limit or reduce the potential biomagnification of total PCBs at higher trophic levels in the food chain to reduce the potential risk to human health from eating sport fish.

To develop RGs, the Navy considered **background** levels of COCs in San Francisco Bay. Background levels consist of:

- Naturally occurring chemical substances derived or originating from natural processes in the environment, exclusive of human activities or sources.
- Ambient chemical substances that are representative of the area surrounding a site and not attributable to a single identifiable source.

Under CERCLA, RGs are not set at concentrations below natural or ambient background levels. Background concentrations for copper, lead, and mercury were estimated at 68.1, 43.2, and 0.43 mg/kg, respectively. These values are below the RGs for copper and mercury established in the 2008 FS (Barajas and Associates, 2008).

At the time of the FS (2008), Proposed Plan (2018), and consideration of public comments for Parcel F, the PCB background value was estimated at 200 µg/kg, which was selected to represent the upper end of nearshore ambient sediment total PCB concentrations in San Francisco Bay (Water Board, 2003). In March 2019, the Water Board proposed a revision of the total PCB background concentration from 200 to 148 µg/kg, which is based on a non-parametric 95th percentile of the 2015 San Francisco Estuary Institute Regional Monitoring Program ambient concentration dataset after removing data from Marin County and an identified high sample result in the vicinity of known impacted properties. The Navy agreed to evaluate this proposed revision to the total PCB background concentration and its potential impact on the Parcel F remedy. EPA also agreed to evaluate the same revision to the total PCB background concentration (i.e., 148 µg/kg) for the Yosemite Slough remediation that EPA is performing separately, and is documented in a technical memorandum (EA EST and EPA, 2021).

The Navy also prepared a technical memorandum to document the impacts of the revision to the PCB background concentration on the Parcel F remedy (ECC-Insight and CDM Smith, 2022). The Navy's technical memorandum documenting the impact of this change to the PCB background concentration (which is the basis of RAO 3) for Parcel F is included as part of **Attachment 5 (Part 3), Responses to Comments**. The revised PCB background concentration of 148 µg/kg is incorporated throughout this ROD.

Site specific cleanup levels were established for each RAO. A discussion of RGs for each RAO is summarized below:

- **RAO 1**: RGs for copper, mercury, and total PCBs in sediment were developed using the data from collocated sediment and laboratory-exposed *Macoma nasuta* tissue concentrations in a food chain model based on risk to the surf scoter and will be applied on a not-to-exceed basis. RGs were developed for copper, mercury, and total PCBs based on a site use factor of 0.5, meaning that the surf scoter is obtaining half of its food intake from these areas. A RG was not developed for lead due to uncertainty associated with the bioavailability and toxicity of lead.

- **RAO 2**: Potential human health risks from shellfish consumption and direct contact with sediment during shellfish collection were evaluated using *Macoma nasuta* tissue data from the laboratory bioaccumulation test to develop the second RAO. Future residents were assumed to harvest and consume shellfish from the intertidal areas of Parcel F and be incidentally exposed to sediment during harvesting. The RAO 2 RG was evaluated during the FS using the assumption of a shellfish consumption rate of 2.13 grams per day (g/day), and an assumption that 10 percent of the clams ingested are obtained from Parcel F. **RAO 2** will be applied as AWA. This is not the final RG since the RAO 3 background level is 148 μg/kg.
- **RAO 3:** Although the human health risk assessment determined that the fish consumption exposure pathway poses unacceptable risks, numerical sediment RGs were not developed for RAO 3 as part of the FS due to uncertainties associated with the fish consumption pathway (Barajas and Associates, 2008). Key uncertainties include uncertainty in the tissue-sediment relationship and the difficulty in linking tissue concentrations in larger sport fish with large home ranges to site-specific sediment concentrations. Despite these uncertainties, a range of RGs for PCBs was developed in the 2017 Optimization Technical Memorandum based on a fish consumption rate of 48 g/day, derived from literature-based and site-specific biota sediment accumulation factors (ECC-Insight and CDM Smith, 2017). These RGs ranged between 28 and 95 μg/kg based on a 1 x 10^{-4} cancer risk and between 3.2 and 11 μg/kg based on a hazard quotient of 1 (ECC-Insight and CDM Smith, 2017). This range of RGs is below 148 μg/kg, which represents ambient sediment total PCB concentrations in San Francisco Bay (ECC-Insight and CDM Smith, 2022; **Attachment 5 [Part 3]**). As a result, an RG of 148 μg/kg was selected for PCBs and will be applied as an AWA.

AWAs will be calculated using surface sediment concentrations according to the following formula:

AWA = ∑Ci x Ai/∑Ai

Where C = the concentration of the chemical and A = the area associated with that concentration.

Areas will be assigned to each chemical concentration using Thiessen polygons or similar geo-spatial technique.

A summary of the RAO specific cleanup levels is presented in **Table 5**. All RAOs are applicable for each alternative evaluated, as well as for the entire remedial footprint for Area III (per **Table 6**) and Areas IX and X (per **Table 7)**.

As noted above, a RG for lead was not developed due to uncertainty associated with bioavailability and toxicity of lead. Lead is collocated with PCBs in sediment, so achieving the cleanup goals for PCBs is expected to address any risks associated with lead. Within Area III, few sediment samples had PCB concentrations above the not-to-exceed cleanup level (RAO 1 RG), and only one surface sediment sample located in greater than a 30-foot water depth exceeded the ER-M value for lead, while concentrations of mercury and copper above the RAO 1 RGs are more widespread. Within Area IX/X, PCBs are the primary risk drivers, while mercury and copper concentrations do not exceed sediment RGs. The two detections of elevated lead that exceed the ER-M are limited to the intertidal sediments in Area IX/X, which also contain elevated concentrations of PCBs and are slated for removal.

2.9 Description and Evaluation of Remedial Alternatives

The Navy screened a range of general response actions and remedial technologies and used the retained technologies to develop alternatives in the 2008 FS (Barajas and Associates, 2008) to address contamination at Parcel F. In developing the remedial alternatives, the Navy evaluated site conditions and used experience and engineering judgment to formulate process options into the most plausible site-specific response actions. Remedial alternatives were developed for contaminated sediments within Areas III, IX, and X.

In addition to the remedial alternatives evaluated in the 2008 FS, the Navy developed Remedial Alternative 7 for Areas IX and X in the 2017 Optimization Technical Memorandum to take advantage of advances in the use of *in situ* treatment to remediate PCB-contaminated sediment and minimize the volume of material requiring removal, management, and disposal (ECC-Insight and CDM Smith, 2017).

At the time the remedial alternatives were developed and presented in the Proposed Plan, the identified PCB background value was 200 µg/kg. In the 2022 Technical Memorandum (ECC-Insight and CDM Smith, 2022; **Attachment 5 [Part 3]**), the Navy assessed impacts of the revised PCB background value (148 µg/kg) on the preferred remedy conveyed in the Proposed Plan. The revised PCB background value does not influence the Area III preferred remedy. Adopting the revised PCB background value of 148 µg/kg does not alter the screening of general response actions and remedial technologies that was performed in the 2008 FS (Barajas and Associates, 2008), nor optimized in the 2017 Optimization Technical Memorandum (ECC Insight and CDM Smith, 2017). In the 2022 Technical Memorandum (ECC-Insight and CDM Smith, 2022; **Attachment 5 [Part 3]**), the technology assignment framework (i.e., which remedial technology is planned to be employed in which grid location) was modified to minimize impacts to the Yosemite Slough remedial action by increasing the removal area in close proximity to Yosemite Slough. This modification achieves a lower overall post-remedial action PCB AWA concentration of 193 ug/kg for Area X, thereby reducing the MNR timeframe to achieve RAOs in Area X.

Section 2.9.1 describes the Parcel F remedial alternatives, and **Sections 2.9.4** and **2.9.5** present the results of the Navy's comparative analysis for Area III and Areas IX and X, respectively, in accordance with the NCP criteria. A detailed description of the selected remedy for each Area is provided in **Section 2.10.2.**

2.9.1 Summary of Remedial Alternatives

Remedial alternatives to clean up contaminated sediments evaluated in the 2008 FS ranged from no action to complete removal with off-site disposal of contaminated sediment (Barajas and Associates, 2008). Remedial Alternative 7 for Areas IX and X, incorporating *in situ* treatment, was developed in the 2017 Optimization Technical Memorandum (ECC-Insight and CDM Smith, 2017) and updated in 2022 ECC-Insight and CDM Smith, 2022; **Attachment 5 [Part 3]**).

The Navy's remedial strategy is to remediate Parcel F sediments using a combination of technologies. This remediation, in conjunction with previously implemented source control measures and ICs, will reduce risks to human health and the environment to acceptable levels. This is expected to be a final action for Parcel F sediments at HPNS.

Excavation/dredging of contaminated sediment is included in each of the remedial alternatives for Area III because strong tidal currents prevent application of *in situ* treatment and MNR, which are better for low-energy environments like Areas IX and X. The six alternatives evaluated for Area III are shown in **Table 6** and the nine alternatives evaluated for Areas IX and X are shown in **Table 7**. The capital costs, O&M costs and total present value cost for each alternative are presented in **Table 8.**

The primary components of the remedial alternatives considered for Parcel F are described below:

Removal with Backfill. This technology includes the removal of contaminated sediments through dredging or excavation to reduce total contaminant concentrations. Removed sediments would be transported to a barge or on-site processing facility for dewatering and transported for disposal. The primary disposal option considered is disposal at a permitted off-site disposal facility. However, potential re-use opportunities would also be considered during remedial design. Following removal of contaminated sediments, backfill would be placed to achieve pre-removal sediment elevations. The removal depth would be determined during remedial design based on the results of pre-remedial action characterization and other information.

Capping. This technology includes the containment of contaminated sediments through placement of sand or AquaBlok® (or equivalent capping material) with armor stone to limit erosion. Capping acts to eliminate the exposure pathways to contaminated sediments. AquaBlok® or equivalent capping material consists of composite-aggregates composed of a central core, clay or clay-size materials, and polymer. Capping is limited to Area III.

***In situ* Treatment**. *In situ* treatment includes the addition of carbon-based amendments to contaminated sediments in order to reduce the bioavailability of total PCB concentrations in sediments. *In situ* treatment is not applicable in Area III due to the high currents offshore of Point Avisadero. *In situ* treatment is also not considered effective for intertidal sediments within Areas IX/X due to the potential for wave-induced erosion and the presence of elevated levels of lead and copper. *In situ* treatment is considered a viable remedial technology for subtidal sediments contaminated with PCBs within Areas IX and X. A **pilot study** was conducted at HPNS Parcel F Area X (South Basin) that evaluated the effectiveness of two commercially available activated carbon-based products, SediMite™ and AquaGate®, to reduce PCB bioavailability (KCH, 2018). The **pilot study** demonstrated that activated carbon amendments:

- Can be accurately and efficiently placed in the South Basin area of Parcel F.
- Remain in place for at least 26 months post-placement.
- Are effective at reducing PCB exposure to marine organisms. Bioavailability of PCBs, as measured by pore water (water in between sediment particles) and clam tissue concentrations, was reduced by up to 91 and 90 percent, respectively.
- Do not result in any long-term negative impacts to the local benthic community.

MNR. MNR includes monitoring the natural recovery process to achieve compliance with the RAOs at HPNS Parcel F. Natural recovery processes at HPNS Parcel F primarily involve natural sedimentation that would create a cleaner layer of surface sediments, by burying more contaminated sediments over time. MNR would be applied to sediments below the RAO 1 RGs. MNR would not be applied to Area III due to high currents offshore of Point Avisadero.

Institutional Controls. ICs are legal and administrative mechanisms used to implement land use and access restrictions. ICs limit the exposure of future landowner(s) or user(s) of the property to hazardous substances present on the property; maintain the integrity of the remedy until remediation is complete and RAOs have been achieved; and ensure containment of hazardous substances in vapors, soils, sediments, or contaminated groundwater remaining on the property after remedial actions have been taken. ICs are not effective for ecological receptors. ICs that would be applied at HPNS Parcel F include land and waterway use restrictions and their effectiveness would be supported by FYR inspections and reporting requirements (see **Section 2.10.2**).

2.9.2 Evaluation Criteria

The Navy evaluated the remedial alternatives based on the nine criteria specified by federal regulations in the NCP:

- **Two threshold criteria** – Overall protection of human health and the environment and compliance with applicable or relevant and appropriate requirements (ARARs)
- **Five balancing criteria** – Long-term effectiveness and permanence; reduction of toxicity, mobility, or volume through treatment; short-term effectiveness; implementability; and cost
- **Two modifying criteria** – State and community acceptance

These criteria are summarized on **Figure 5**.

CERCLA requires selected remedies to be cost effective, use permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable, and satisfy a preference for treatment that reduces toxicity, mobility, or volume as a principal element. In addition, the environmental footprint, climate change impacts, and community impacts were compared for each alternative. Both short-term and long-term effectiveness and permanence criteria were considered to maximize long-term durability and maintainability of the remedy.

Under CERCLA, the proposed cleanup must achieve the threshold criteria of overall protection of human health and the environment and compliance with ARARs (**Attachment 4**). Alternatives are evaluated against threshold criteria on a “yes/no” basis.

2.9.3 Comparative Evaluation of Alternatives

A comparative analysis of alternatives with respect to the nine evaluation criteria is summarized for Area III (**Section 2.9.4**) and Areas IX and X (**Section 2.9.5**). **Figures 6** and **7** present a relative ranking for each of the remedial alternatives for Area III and Areas IX and X, respectively.

2.9.4 Area III

Overall Protection of Human Health and the Environment

Alternative 1 (no action) would not provide additional protection of human health or the environment at Parcel F. All the remaining alternatives meet the threshold criterion of overall protection of human health and the environment.

Alternatives 3 and 3A would provide overall protectiveness because contaminated sediments would be removed in the nearshore areas and backfilled with clean sediments minimizing residual contamination. The placement of a cap would provide a protective barrier between the sediment bed and ecological receptors (i.e., the surf scoter) in the offshore areas. Although contaminated sediments would remain isolated under the cap, the residual risk would be controlled by implementing ICs.

Alternatives 4 and 4A would provide protection to human health and the environment because sediments in the nearshore areas would be removed and backfilled with clean sediments; however, under these alternatives only sediment areas located in water approximately 30 feet deep or less would be capped. Limiting the capping to these shallower areas would protect piscivorous-eating birds represented by the surf scoter while also reducing the negative short-term effects on the environment during construction and limiting the disruption to habitat from placing the cap over such large areas. Similarly, Alternative 2 would provide protection to human health and the environment by combining capping and nearshore removal. Although contaminated sediments would remain isolated under the cap, the residual risk would be controlled by implementing ICs.

Compliance with Applicable or Relevant and Appropriate Requirements

All alternatives would comply with the chemical-, action-, and location-specific ARARs, except for the no-action alternative. The requirement to meet ARARs is not triggered by the no-action alternative (U.S. EPA, 1991a) (**Attachment 4**).

Long-Term Effectiveness

Alternative 1 (no action) would not meet the criterion for long-term effectiveness because the effectiveness of natural recovery processes would not be verified.

Alternatives 4 and 4A were rated as moderate for long-term effectiveness because nearshore contamination would be removed and backfilled with clean sediments, in the area posing the greatest risk to piscivorous-eating birds such as the surf scoter. Under Alternatives 4 and 4A, areas further offshore would be capped, thereby effectively isolating the contamination from ecological receptors. Alternatives 3 and 3A rated slightly higher (moderate to high) because a larger area would be capped, including areas with water depths approaching greater than 60 feet deep. Alternative 2 rated lower (moderate to low) because of the uncertainty of effectively removing the residual sediment contamination. This uncertainty is driven by the unfavorable site conditions found in Area III for dredging, including the steep bathymetric gradient, high currents, and greater water depths. As a result, the long-term effectiveness is less certain.

Reduction of Toxicity, Mobility, or Volume through Treatment

None of the alternatives would result in a reduction of the toxicity, mobility, or volume of contamination through treatment; therefore, all the alternatives are rated as low with respect to this criterion.

Short-Term Effectiveness

Under Alternative 1, no remedial action would take place; therefore, there are no short-term risks to the community, the environment, or construction workers. However, sediment contamination would not be addressed and the time for natural recovery processes to take place is uncertain. Therefore, overall the short-term effectiveness of Alternative 1 is rated as low. RAOs would not be achieved in a reasonable timeframe (greater than 30 years).

Alternative 2 was rated as moderate to low for short-term effectiveness. The short-term risks to the community and site workers would be the greatest for this alternative because it includes the greatest amount of sediment removal and thus the greatest effect because workers would be handling sediment (transport to the barge or pier, dewatering, and truck transportation off site). Risks to on-site construction workers would be short term and addressed through the health and safety plan to be prepared prior to start of construction activities. Short-term negative risks to the environment include increased contamination to the water, increased tissue contamination in resident biota, and increased surface sediment contamination, although this will be partly minimized by the backfill of clean sediments. Construction controls would be more difficult to implement in the offshore areas where the dredging operation would take place at deeper water depths. Alternative 2 will also take the longest time to implement. RAOs would be achieved immediately after implementation of the remedy (0 years).

Alternatives 3 and 3A were rated moderate for short-term effectiveness. The short-term negative effects cause by dredging would be less than those for Alternative 2 because a smaller area would be dredged, and the dredging would only take place close to the shoreline with shallow water depths. The dredging operations could be conducted from the shoreline. The effects on the community and environment during the capping operation would be temporary and include similar risks to on-site construction workers as Alternative 2. Fewer effects would occur from sediment handling operations because less sediments would be removed. Alternatives 3 and 3A will take less time to implement than Alternative 2. RAOs would be achieved in water depths less than 30 feet immediately after implementation of the remedy (0 years).

Alternatives 4 and 4A are rated slightly higher than Alternatives 3 and 3A for short-term effectiveness because less area would be capped. Under this alternative, there are fewer short-term effects to the community and the environment because a smaller volume of capping material would be transported to the site than under Alternatives 3 and 3A and fewer effects to the aquatic environment would occur from construction activities. Alternatives 4 and 4A will take the least time to implement. RAOs would be achieved in water depths less than 30 feet immediately after implementation of the remedy (0 years).

A green and sustainable remediation (GSR) evaluation was conducted to identify the difference among the environmental footprint, climate change impacts, and community impacts associated with each proposed remedy. Community impacts were evaluated qualitatively by assessing the potential detrimental and beneficial impacts of remedy implementation. Findings from the GSR evaluation were considered under the short-term effectiveness criterion as follows.

- The no-action alternative (Alternative 1) would moderately meet sustainability criteria because the environment and surrounding community would not be disturbed due to limited site activities, yet contamination would remain in place and would not be addressed.
- The sustainability evaluation considered metrics for consumables, equipment use/miscellaneous, and residual handling for each remedial alternative and community disturbance such as truck hauling traffic and the estimated global monetized impacts, including climate change and human health due to chemical emissions.

- Overall, Alternative 2 is ranked the lowest for sustainability attributes due to the larger remedial footprint and the larger volume of sediments targeted for removal. Alternatives 3/3A and 4/4A have a lower overall environmental footprint in comparison due to the smaller sediment removal footprint.
- Alternatives 3/4 and 3A/4A include amendment application using an armored cap and impermeable materials such as AquaBlok®, respectively. The armored cap has a larger footprint than the amended cap, thus Alternatives 3A and 4A have a lower footprint than Alternatives 3 and 4. In addition, Alternatives 4/4A have an overall smaller footprint than Alternatives 3/3A due to the smaller capping footprint.

Implementability

Alternative 1 would be the easiest to implement because no action would be taken.

All the alternatives would be implementable considering the maturity of the technologies involved. Dredging and capping equipment and contractors would be readily available for all the alternatives. However, the site conditions in Area III are not favorable for dredging or capping in portions of the area that have steep bathymetric gradients, deep water, and high currents. Therefore, Alternatives 2, 3, and 3A were given a similar rating of moderate. Alternatives 4 and 4A were rated moderate to high since dredging would only occur in the nearshore areas and capping would only be performed in areas with water depths of approximately 30 feet or less.

Cost

Alternative 1 is the lowest cost. The costs for Alternative 4/4A are the next lowest due to the smaller remedial footprint. Alternatives 2 and 3/3A are the costliest. Based on the comparative analysis, Alternatives 4 and 4A offer significant advantages over the other alternatives because they are the most effective in the short-term, they are the easiest alternatives to implement, and they cost significantly less than Alternatives 2, 3, and 3A. Cost estimates for Area III alternatives include post-remedial action monitoring, data evaluation and reporting.

State Acceptance

State involvement has been solicited throughout the CERCLA process. The State of California concurs with the Navy's selected remedy.

Community Acceptance

Community acceptance is evaluated based on comments received from the public during the public comment period for the Proposed Plan. The Proposed Plan, which identified Alternative 4/4A for Area III as the preferred remedial alternative, was presented to the community and discussed during a public meeting on April 11, 2018. Comments were gathered during the public comment period from April 7, 2018 through May 7, 2018. **Attachment 3**, the responsiveness summary, of this ROD addresses the public's comments about the selected remedial alternatives for Area III.

2.9.5 Areas IX and X

Overall Protection of Human Health and the Environment

Alternative 1 (no action) would not provide additional protection of human health or the environment at Parcel F. All the remaining alternatives meet the threshold criterion of overall protection of human health and the environment.

Alternative 2 would protect human health and the environment by removing contaminated sediments and backfilling with clean sediments. Alternative 4 (MNR) would provide protection to human health and the environment, but may take a longer time to achieve the RAOs than the other alternatives. Alternative 3 would provide overall protectiveness by reducing the bioavailability of chemicals, and thus reducing the overall risk to humans and ecological receptors. Alternatives 5, 5A, 6, and 6A would provide overall protectiveness because contaminated sediments would be removed in the nearshore areas where contaminated sediments pose the greatest risk to humans and ecological receptors, with MNR being implemented in deeper, less contaminated areas. Alternative 7 combines removal, *in situ* treatment, and MNR to provide an equivalent level of protectiveness as Alternatives 2, 3, 5/5a and 6/6a. Alternative 7 would also minimize the potential for off-site (e.g., Yosemite Slough) impacts from HPNS contamination and actions by employing removal nearest Yosemite Slough and a faster RAO attainment elsewhere in Area X.

Compliance with Applicable or Relevant and Appropriate Requirements

All alternatives would comply with the chemical-, action-, and location-specific ARARs, except for the no-action alternative. The requirement to meet ARARs is not triggered by the no-action alternative (U.S. EPA, 1991a) (**Attachment 4**).

Long-Term Effectiveness

Alternative 1 (no action) would not meet the criterion for long-term effectiveness because the effectiveness of natural recovery processes would not be verified.

Alternative 2 is rated moderate for long-term effectiveness. This alternative would result in the greatest removal of contaminated sediments; however, there is more potential for residual surface contamination and resuspension because a greater area is proposed for dredging under this alternative, resulting in a greater potential for leakage from the dredge bucket spreading contamination into adjacent areas. This is especially true considering the debris in the South Basin that could cause dredge buckets to not close completely and leak or otherwise suspend contaminated sediments. That said, the residual contamination would likely be minimized by the backfilling component of this alternative using coffer dams.

Alternative 4 provides moderate to low long-term effectiveness. Under Alternative 4, the long-term effectiveness of MNR depends on the enforcement of ICs to avoid disruption of sediments, particularly in the nearshore areas. The long-term effectiveness of MNR in shallower areas is less certain due to wave induced erosion, so this alternative is rated lower than the full removal alternative (Alternative 2). MNR would provide long-term effectiveness in deeper areas because sedimentation studies and modeling results have shown that sedimentation will continue, effectively capping the sediments in place.

For *in situ* treatment (Alternative 3 and Alternative 7), results of the **pilot study** for *in situ* treatment (KCH, 2018) showed significant reductions (89 to 91 percent) in porewater concentration within the upper 6 centimeters of the sediment bed 26 months following placement of activated carbon when compared to baseline conditions; these reductions are permanent, indicating long-term effectiveness of *in situ* treatment.

Alternatives 5, 5A, 6, and 6A that combine nearshore removal with MNR would meet the criterion of long-term effectiveness and are rated as highly effective. Alternative 7 would provide the greatest long-term effectiveness since it would limit resuspension by only targeting intertidal areas for removal (where debris could be visually identified so to not impede removal) and address subtidal contamination with *in situ* treatment and MNR.

Reduction of Toxicity, Mobility, or Volume through Treatment

Alternative 3 and Alternative 7 would reduce the toxicity and the mobility of contamination through treatment and are rated the highest among the alternatives. Alternatives (5A and 6A) that include the incorporation of carbon treated backfill are rated slightly lower as moderately effective. Under Alternatives 1, 2, 4, 5, and 6 there would be no reduction of the toxicity, mobility, or volume of contamination through treatment on site, and thus none of these alternatives meet the criterion.

Short-Term Effectiveness

The no-action alternative (Alternative 1) would moderately meet the criterion because the environment and surrounding community would not be disturbed, yet contamination would remain in place and would not be addressed. RAOs would not be achieved in a reasonable time frame (greater than 30 years).

Alternative 2 is ranked moderate to low for short-term effectiveness because the volume of sediment handling would be larger than under the other alternatives and construction controls would be more difficult and take a longer time to implement. In addition, short-term negative effects to the aquatic environment would be greatest for Alternative 2 because it would result in the greatest disruption of the sediment bed (i.e., greatest surface area) and greatest destruction of the benthic community. In turn, short-term effects to the aquatic environment overall would be greater than alternatives affecting less area of benthic community. These short-term effects are offset by the reduction in mass of PCBs thereby resulting in a moderate to low short-term effectiveness rating. RAOs would be achieved immediately after implementation of the remedy (0 years).

Alternative 3 (*in situ* treatment) received a slightly higher rating because the construction effects to the community and construction workers are less than for the full removal option, short-term negative effects to the benthic community are fewer, and the remedy would take a shorter time to construct. RAOs are estimated to be achieved in approximately 14 years after implementation of the remedy from SEDCAM modeling (ECC-Insight and CDM Smith, 2017).

Alternative 4 (MNR) is rated moderate for short-term effectiveness because the time for MNR to meet the RAOs is the longest, resulting in the greatest short-term risk. RAOs would not be achieved in a reasonable time frame (greater than 30 years). The rating is partly offset by the fact that MNR would pose the least short-term effect to the community and construction workers because no active dredging would occur.

Alternative 7 and Alternative 6/6A best meet the criterion for short-term effectiveness, with Alternative 5/5A rated slightly lower. Under Alternatives 5/5A and 6/6A, RAOs are estimated to be achieved in approximately 20 years. Under Alternative 7, RAOs are estimated to be achieved in approximately 13 years (8 years for Area X, and 13 years for Area IX), as estimated from SEDCAM modeling (ECC-Insight and CDM Smith, 2017; ECC-Insight and CDM Smith, 2022; **Attachment 5 [Part 3]**). Under these alternatives, there would be less risk to workers and the community than under the remaining alternatives because a much smaller volume of sediments would require handling and transportation. These alternatives also would result in less effects to the aquatic environment than under Alternative 2 (full removal) because construction controls would be easier to implement, and the remedy would take a shorter time to construct. Finally, the addition of mixing clean backfill with activated carbon may further reduce the possibility for residual contamination. Alternatives 5 and 6 would only use clean sediments as backfill and therefore were rated slightly lower than those that incorporated the addition of activated carbon.

Regarding time frames for meeting RAOs, Alternative 4 (MNR at greater than 30 years) would take the longest of the alternatives because remediation would rely solely on natural processes. Alternatives 5/5A and 6/6A are expected to meet RAOs within a roughly similar time frame (20 years) because treatment or removal would be conducted on a similar spatial scale. RAOs would be met in approximately 13 years (8 years for Area X and 13 years for Area IX) for Alternative 7 (ECC-Insight and CDM Smith, 2022; **Attachment 5 [Part 3]**). The 2022 Technical Memorandum (**Attachment 5 [Part 3]**), also presents the sensitivity analysis (Attachment 1 within the Technical Memorandum), to show how MNR timeframes could be affected, and possibly shortened, by key site conditions that influence MNR projections. Alternative 3, full *in situ* treatment, would be the next longest, at 14 years, with uncertainty surrounding the effective emplacement of amendment in the higher energy intertidal zone. RAOs would be met immediately post-construction for Alternative 2.

A GSR evaluation was conducted to identify the difference among the environmental footprint, climate change impacts, and community impacts associated with each proposed remedy. Community impacts were evaluated qualitatively by assessing the potential detrimental and beneficial impacts of remedy implementation. Findings from the GSR evaluation were considered under the short-term effectiveness criterion as follows:

- The no-action alternative (Alternative 1) would moderately meet sustainability criteria because the environment and surrounding community would not be disturbed due to limited site activities, yet contamination would remain in place and would not be addressed.
- Alternative 2 is ranked the lowest for sustainability attributes because the volume of excavated sediments sent for off-site disposal results in the largest environmental footprint, associated global monetized impacts, and community disturbance. Alternatives (5, 5A, 6, and 6A) that combine nearshore removal with MNR are ranked low-moderate because the associated sustainability impacts are only slightly improved from Alternative 2 by reducing the volume of excavated sediments.
- Alternative 3 (*in situ* treatment) and Alternative 4 (MNR) are rated moderate for sustainability attributes because these alternatives result in a relatively small environmental footprint, associated global monetized impacts, and community disturbance. However, the sustainable outcome of remedy implementation may not result in successful risk management. The performance of *in situ* treatment of

intertidal sediments under Alternative 3 will likely be impacted by wave action and hinder long-term effectiveness and permanence. The time frame to implement MNR under Alternative 4 is the longest, resulting in the greatest short-term risk.

- Alternative 7 is ranked high as a sustainable risk management strategy because it results in a relatively small environmental footprint and limited community disturbance from truck hauling traffic while overcoming challenges to long-term effectiveness and permanence proposed by Alternatives 3 and 4. The estimated global monetized impacts, including from climate change and human health due to chemical emissions, for Alternative 7 is about 75 percent lower than Alternative 2, 43 to 63 percent lower than Alternatives 5/5A and 6/6A, and a negligible percentage below Alternative 3.

Implementability

In general, the difficulty of implementing a removal alternative increases with the volume of sediments removed. This is due to many constructability factors, including:

- Identifying and removing debris that may impede the removal
- Potential for mobilizing contaminated sediments during removal
- Control of turbidity and resuspension of sediments and release of COCs from the sediment bed
- Management of transfer and off-site disposal of contaminated material
- Equipment decontamination

Alternative 2 would be the most difficult to implement of all the alternatives because it would generate the largest volume of sediments for removal and off-site disposal. Next would be Alternatives 5/5A and 6/6a because these alternatives similarly would generate a large volume of sediments for disposal. Additionally, successful operations of coffer dams to dewater the areas could prove difficult considering the large area and large volumes of water that would need to be pumped.

As considered in the 2008 FS with coffer dams and mechanical mixing of amendment, Alternative 3 would be the next most difficult to implement. Alternative 7 is implementable and is considered easier to implement than Alternatives 2, 3, 5/5A, or 6/6A because the removal volume is lower; removal would be limited predominantly to intertidal zones where debris could be visually identified, and coffer dams and associated dewatering would not be necessary for either removal or *in situ* treatment. A critical difference in implementability between Alternative 3 and Alternative 7 is in the intertidal zone: the energy from wave action in this zone could disrupt the ability to widely and uniformly distribute amendment for *in situ* treatment and could erode it over time for Alternative 3. Erosion of the treatment material would not be a concern in the more quiescent subtidal zone for Alternative 7. Thus, Alternative 7 is considered more implementable than Alternative 3 with respect to *in situ* treatment.

The no-action alternative (Alternative 1) would be the easiest to implement because no action would be involved. MNR (Alternative 4) is rated slightly lower because the primary component of monitoring sediment recovery is easy to implement.

Cost

Alternative 1 is the lowest cost. The costs for Alternative 4 are the next lowest because of the inclusion of MNR. Alternative 3 is the next costliest, followed by Alternatives 5, 6, 7, 5A, and 6A. Alternative 2 is the costliest of the alternatives.

Based on the comparative analysis, Alternatives 5, 6, and 7 cost less than alternatives that include a larger volume of removal (Alternatives 2, 5A, and 6A). Alternatives that rely exclusively on MNR (Alternative 4) and *in situ* treatment (Alternative 3) are the least costly and easiest to implement.

Cost estimates for Areas IX and X alternatives include post-remedial action monitoring, data evaluation and reporting.

State Acceptance

State involvement has been solicited throughout the CERCLA process. The State of California concurs with the Navy's selected remedy.

Community Acceptance

Community acceptance is evaluated based on comments received from the public during the public comment period for the Proposed Plan. The Proposed Plan, which identified Alternative 7 for Areas IX and X as the preferred remedial alternative, was presented to the community and discussed during a public meeting on April 11, 2018. Comments also were gathered during the public comment period from April 7, 2018 through May 7, 2018. **Attachment 3**, the responsiveness summary, of this ROD addresses the public's comments about the selected remedial alternatives for Parcel F sediments. **Attachment 5 (Part 3)** presents the evaluation of the change to the PCB ambient concentration from 200 to 148 μg/kg proposed by the Water Board. This evaluation of Alternative 7 also includes a minor revision of the spatial distribution of the Alternative 7 remediation technologies (i.e., removal/backfill versus *in situ* treatment) to minimize impacts to the Yosemite Slough remedial action by increasing the removal area adjacent to Yosemite Slough, thereby achieving a lower post-remedial action PCB AWA concentration of 193 ug/kg for Area X.

2.10 Selected Remedy

2.10.1 Rationale for the Selected Remedy

The Navy, in consultation with EPA, DTSC, and the Water Board, selected the following remedies for Parcel F sediments:

- **Area III – Alternatives 4/4A** – Focused Removal/Backfill, Off-Site Disposal, Capping, and ICs to maintain the integrity of the remedy
- **Areas IX and X – Alternative 7** – Focused Removal/Backfill, *In situ* Treatment, Off-Site Disposal, MNR, and ICs to maintain the integrity of the remedy
- **Parcel F Site-wide ICs** – ICs will be implemented to require proper management of low-level radiological objects that may be encountered in sediments during future site activities.

The remedies were selected based on an evaluation of the remedial alternatives, as described in **Section 2.9**, relative to the nine evaluation criteria. The selected remedies comply with the two threshold criteria and provide the best balance of tradeoffs with respect to the five balancing criteria. The Navy's evaluation of the two modifying criteria did not warrant changes to the preferred alternatives published in the Proposed Plan. However, following the Proposed Plan public comment period and development of the draft and draft final ROD, a revised PCB background value was evaluated in response to a comment from the Water Board. The impact of the revised PCB background value is described in the technical memorandum (ECC-Insight and CDM Smith, 2022) included as part of **Attachment 5 (Part 3)**. EPA and the State of California, through DTSC and the Water Board, and segments of the community support Alternatives 4/4A for Area III and Alternative 7 for Areas IX and X as proposed.

The Navy has reviewed public input and consulted with the State and support agencies regarding the most appropriate remedy decision for Parcel F. During the course of finalizing the ROD for Parcel F, revisions were made to the PCB background concentration from 200 µg/kg to 148 µg/kg based on stakeholder feedback solicited consistent with NCP 300.430, which lengthens MNR recovery projections. The selected remedy for Areas IX/X yields an MNR time period for Area X that is the same as was documented in the Proposed Plan (8 years), but now includes a longer recovery time period for Area IX (13 years versus 5 years documented in the Proposed Plan). A range of uncertainty in the recovery timeframes based on sensitivity analyses (Attachment 1 within the Technical Memorandum), has also been evaluated for these projections, which is included in **Attachment 5 (Part 3)** (ECC-Insight and CDM Smith, 2022).

Per NCP 300.430(e)(1) required process steps, the costs were updated for Alternative 7, which includes a MNR component (long-term monitoring and O&M) affected by the change in the PCB background value, and are presented in **Attachment 5 (Part 3)**. The updated overall costs (net present value) for Alternative 7 presented in **Attachment 5 (Part 3),** are approximately 1.3% higher than the costs presented in the Proposed Plan. The 1.3% increase in overall costs to Alternative 7 as a result of changing the total PCB background concentration to 148 µg/kg does not represent a substantive change that would alter the outcome of the FS comparative alternative analysis. The updated costs for the selected remedy remain proportional to its overall effectiveness per NCP 300.430(f)(1)(ii)(D). Costs were not updated for alternatives not selected as there would be a similar impact to the evaluation of cost as a criterion for all alternatives with MNR as a component that would not impact the overall remedy selection. The Navy, as lead regulatory agency, has selected Alternative 7 for Areas IX and X and Alternative 4/4A for Area III per NCP 300.515(e). The change in the total PCB background concentration does not affect the selected remedy for Area III, as Alternative 4/4A does not have a MNR component.

The selected remedies are cost-effective remedies that will achieve long-term protection of human health and the environment within a reasonable time frame while minimizing short-term impacts to site workers, the community, and the environment. The selected remedies will effectively reduce site risks by removing significant amounts of COCs, safely containing or treating sediments and relying on natural recovery processes (e.g., deposition of cleaner material) while implementing a sustainable remedy that minimizes the environmental footprint, likelihood of accident or risk/injury per hour during implementation, and socioeconomic and community impacts. ICs will be used to limit exposure by humans and protect the remedy by limiting disturbance. In addition, the selected remedies will be subject to statutory reviews every 5 years, pursuant to CERCLA, to ensure that they remain protective of human health and the environment. The selected remedies include monitoring and maintenance that would be performed, as long as necessary, to protect human health and the environment. Best management practices (BMPs) and remedial approach refinements during design will be implemented to maximize the sustainable outcome of the selected remedy for Areas III, IX, and X.

The Navy will, to the maximum extent practicable, ensure that the selected remedy for Areas IX and X and the Yosemite Slough site will be compatible with respect to timing and constructability to ensure that the cleanups are compatible and to minimize any potential for recontamination of either area.

2.10.2 Description of Selected Remedy

Cleanup activities will be designed to minimize adverse impacts to aquatic habitat and resources through the use of best management practices, equipment selection, and material selection.

Area III

The selected remedy for Area III is a combination remedy of focused sediment removal and backfill and capping for contaminated sediments that meet or exceed the RAO 1 RGs for copper, mercury, PCBs, and ICs (**Figures 8** and **10**). Characterization will be required prior to remedy construction for the purpose of refining the remedial footprint including incorporating the recommendations for refining the remedial action footprint around Wharf #2 (ECC-Insight and CDM Smith, 2018), establishing dredge volumes, assessing geotechnical characteristics and managing and disposing of contaminated sediments and any water generated during construction. The characterization activities will be performed by the remedial action contractor prior to construction at Area III, including in the vicinity of Wharf #2. The selection and specifications of backfill and capping material will be finalized during design of the cleanup remedy.

Cleanup is not required where COC concentrations do not exceed RAO 1 RGs. Contaminated sediments exceeding the RAO 1 RGs in the nearshore area too shallow to be capped (i.e., water depths less than 5 feet MLLW) will be removed followed by backfilling with clean sediments to pre-removal elevations. The sediment removal will target contamination above the site-specific RGs in the focused removal area to a maximum depth of 2 feet because backfilling would occur. The removal depths selected are based on analytical data for copper, mercury, and PCBs from the core samples collected during the 2003 FSDGs investigation (Barajas et al., 2007). The estimated removal volume is 1,790 cubic yards. Removal of sediments is expected to occur using an environmental clamshell bucket although the selection of dredging equipment will be finalized during remedial design or as part of the remedial action work plan. Because of the relatively small volume of sediments to be removed, dredging is expected to be completed in 2 to 3 days. Excavated sediments will be dewatered prior to transport for off-site disposal. Water generated during the dewatering process will be discharged into San Francisco Bay or the sanitary sewer. Water will be treated as necessary prior to discharge to meet required regulatory discharge limits. Final off-site disposal locations, including re-use opportunities, will be determined during the remedial design. Potential re-use opportunities include placement at beneficial re-use sites within the San

Francisco Bay such as Cullinan Ranch, Suisun Marsh, Montezuma Wetland, and Winter Island and the use of sediments as fill material to support California Department of Transportation infrastructure projects.

Beyond the nearshore area, contaminated sediments exceeding the RAO 1 RGs in water depths greater than 5 feet but less than 30 feet MLLW will be capped. An estimated 68,670 square feet of contaminated sediments will be capped with approximately 2 feet of material. The cap will either be an armored sand cap with a carbon amendment or an AquaBlok® cap that forms a low permeability layer to restrict groundwater-surface water interaction. The cap will be designed to contain the contaminated sediments and resist erosion and will extend beyond the boundary of contaminated sediments to ensure complete coverage and to allow for a shallow slope along the edge of the cap. Capping materials that aid active benthic organism recolonization will be preferred. The dimensions of the cap and the capping material will be determined during remedial design. Clean cap material will be transported to the site by truck or barge. The method of cap placement will be determined during remedial design.

A hydrodynamic model that considers a 100-year storm event in conjunction with sea level rise will be used to develop backfill and cap particle size requirements that resist erosion from tidal current and wave action during remedial design.

Control measures such as BMPs will be implemented during sediment removal and cap placement to minimize releases of contaminated material to the surrounding water column. Water quality monitoring will be performed to monitor chemical resuspension and turbidity.

The selected remedy will achieve the RAO RGs in Area III sediments in water depths less than 30 feet immediately after remedial construction is complete. Contaminated sediments in deeper water exceeding RAO 1 RGs will not be addressed through capping or removal due to the lack of exposure by the surf scoter, which does not forage in water depths greater than 30 feet. Although lead does not have an RG, there are only three locations, two in deeper water and one in the excavation area, with elevated concentrations of lead as compared to the ER-M screening level of 218 mg/kg based on protection of the benthic community.

The selected remedy for Area III achieves the RAOs established for the site by eliminating exposure to COCs exceeding the RAO 1 cleanup levels and by achieving the RAO 2 and RAO 3 cleanup levels for total PCBs on an AWA basis following construction of the remedy. Incorporation of additional sustainability elements such as selection of capping material and disposal options will be considered during remedial design.

Areas IX and X

The selected remedy for Areas IX and X is a combination remedy consisting of focused sediment removal with backfill, *in situ* treatment, MNR, and ICs (**Figures 9** and **10**). Characterization will be required prior to remedy construction for the purpose of refining the remedial action footprint, establishing dredge volumes, assessing geotechnical characteristics, managing and disposing of contaminated sediments and water generated during construction as well as coordinating with the Yosemite Slough site and HPNS Parcel E and E-2 shoreline remedial activities. The selection and specifications of backfill material will be finalized during design of the cleanup remedy. Sediments will be cleaned up based on PCB concentration, as follows:

- Intertidal PCB concentration exceeding 1,240 µg/kg = focused removal with backfill
- Subtidal PCB concentration exceeding 12,400 µg/kg = focused removal with backfill
- Subtidal PCB concentration exceeding 1,240 µg/kg but below 12,400 µg/kg = *in situ* treatment
- PCB concentrations between 148[3] µg/kg and less than or equal to 1,240 µg/kg = MNR

Based on the above bullets, intertidal and subtidal sediments with total PCB concentrations above 1,240 µg/kg and 12,400 µg/kg, respectively, will be removed to a target depth of 1 foot (0 to 30 centimeters). The final removal depth will be based on ability of the backfill material to contain contamination left in place and resist erosion and will be determined during the remedial design. Subtidal sediments with total PCB concentrations ranging from 1,240 to 12,400 µg/kg will be treated *in situ* and PCB concentrations ranging from 148 to 1,240 µg/kg will be designated for MNR. The technology assignment framework (i.e., which remedial technology is planned to be employed in which grid location), was modified in this ROD to minimize the impacts to the Yosemite Slough remedial action by increasing the removal area in close proximity to Yosemite Slough. This modification achieves a lower overall post-remedial action PCB AWA concentration of 193 ug/kg for Area X, thereby reducing the MNR timeframe

[3] If the background PCB concentrations are found to be greater than 148 µg/kg either through long-term monitoring at Areas IX/X, a site-specific background sediment study, an updated sediment trap study, or similar study, the Navy may evaluate a higher background PCB value as part of the FYR pursuant to CERCLA §121 and the NCP.

to achieve RAOs in Area X. This modification is documented in the *Final Technical Memorandum Revision to Total PCB Background Concentration and RAO 3 Remediation Goal* (ECC-Insight and CDM Smith, 2022), presented in **Attachment 5 (Part 3)**. Future adjustments to the technology assignment framework will be made during remedial design based on pre-remedial action sediment characterization data.

Sediments with metal concentrations above the RAO 1 RGs (or ER-M for lead) are confined to intertidal sediments, or areas of subtidal sediment with PCB concentrations exceeding 12,400 μg/kg and are planned for removal to a depth of approximately 1 foot. Hence, copper concentrations above 271 mg/kg and mercury concentrations above 1.87 mg/kg will be remediated through removal regardless of tidal zone location. Since the distribution of lead concentrations follows the distribution of PCBs, achieving the RGs for PCBs via removal will also reduce the risks associated with lead. The target 1 foot removal depth will effectively remove contaminated sediments from the biologically active zone, and excavated areas will be backfilled with clean material to the same elevation as was removed. In addition, long-term monitoring will include performance of periodic bathymetric surveys to monitor that the surface elevation of the backfilled material remains consistent over time. The type of backfill material will be determined during remedial design. The estimated removal volume is 47,200 cubic yards. Removal of sediments is expected to occur using a barge-mounted or shoreline excavator fitted with an articulated bucket, although the selection of specific dredging equipment will be finalized during remedial design or as part of the remedial action work plan. Excavated sediments will be dewatered prior to transport for off-site disposal. Water generated during the dewatering process will be discharged into San Francisco Bay or the sanitary sewer. Water will be treated as necessary prior to discharge to meet required regulatory discharge limits. Contaminated sediments will be disposed at an off-site landfill. Re-use opportunities for removed sediments will be considered during remedial design. Potential re-use opportunities include placement at beneficial re-use sites within the San Francisco Bay such as Cullinan Ranch, Suisun Marsh, Montezuma Wetland, and Winter Island and the use of sediments as fill material to support California Department of Transportation infrastructure projects.

Control measures such as BMPs will be implemented during sediment removal and backfill placement to minimize releases of contaminated material to the surrounding water column. Water quality monitoring will be performed to monitor chemical resuspension and turbidity. The RAO RGs will be achieved immediately after remedial construction in the focused removal with backfill remediation zone in Areas IX and X.

In situ treatment will be accomplished using carbon-based amendments. *In situ* treatment will be used to treat PCBs only. Metals exceeding RAO 1 RGs are to be remediated through the removal action per the above paragraph regardless of the tidal zone location. Application of the carbon-based *in situ* treatment amendments will rely on bioturbation to mix amendments into the sediment bed. As a result, treatment will extend to the full bioturbation depth associated with benthic organisms present within Areas IX and X. Sediment profile imaging conducted during the pilot study demonstrated that mixing associated with physical processes and bioturbation resulted in complete incorporation of the treatment amendment into the native sediment 26 months after placement (KCH, 2018). *In situ* treatment amendments include direct placement and mixing of activated carbon or commercially available materials such as AquaGate®+PAC or SediMite™. The concentration of carbon amendments and placement material will be determined during remedial design and will be based on the results of the pilot study (KCH, 2018). The maximum total PCB concentration subject to treatment during the pilot study (KCH, 2018) was 1,410 µg/kg. Although this concentration is less than the maximum total PCB concentration to be treated using carbon-based amendments, bioavailability of PCBs was reduced by 90% during the pilot study. Therefore, assuming the remedial action *in situ* treatment will achieve similar results, the effective, i.e., bioavailable, PCB concentrations will be reduced by 90% in the treatment zone, e.g., from 12,400 µg/kg to 1,240 µg/kg.

This multi-component remedial strategy will result in an AWA total PCB concentration of approximately 260 µg/kg for Area IX and 193 µg/kg for Area X at the completion of construction, which is expected to take 6 months to complete. The selected remedy will rely on MNR to achieve the RAO 3 cleanup level for total PCBs as a long-term RG. Natural recovery modeling using the SEDCAM model shows that surface sediments within Areas IX and X will reach 148 µg/kg, which represents ambient sediment total PCB concentrations in San Francisco Bay (RAO 3 RG) on an AWA basis, within 13 and 8 years, respectively, through MNR. A formal monitoring plan will be developed during the remedial design phase.

Institutional Controls

The Navy will implement ICs as a component of the selected remedy in Areas III, IX, and X to manage the site-wide potential of low-level radiological objects in Parcel F sediments (**Figure 10**). ICs for Parcel F will entail legal and administrative requirements and processes to limit human exposure to hazardous substances remaining on the property and to maintain the integrity of the remedial action until RGs have been achieved. These requirements and processes may include deed restrictions, covenants, easements, laws, and regulations, and will be developed during the Land Use Control

Remedial Design (LUC RD). The Navy will prepare a LUC RD as the land use component of the Remedial Design as specified in the FFA schedule. The Navy shall prepare and submit to EPA, DTSC, and the Water Board for review and approval, a LUC RD that shall contain implementation and maintenance actions, including periodic inspections. ICs to be implemented at HPNS Parcel F may include:

- Parcel F Site-wide ICs - Procedures for the proper assessment of sediments and the segregation, proper management, and disposal of low-level radiological objects (e.g., radioluminescent dials, gauges, and deck markers) if encountered during future site redevelopment or other sediment disturbing activities such as dredging or sampling.
- Parcel F Areas III, IX and X ICs:
  - Restricted water uses to limit the potential for human exposure and protect the remedy from disturbance, including limitations on digging or clamming (**Figure 10**). The clamming and digging restrictions would be implemented by posting warning signs or public outreach and education.
  - Restricted activities in accordance with the Covenant(s) to Restrict Use of Property, and quitclaim deed(s):
    - Sediment disturbing activity, which includes: (1) dredging of sediments or (2) any other activity that involves movement of sediments.
    - Alteration, disturbance, or removal of any component of a response or cleanup action (including cap/containment systems).
    - Removal of or damage to security features or signs.
  - Periodic inspections and reporting requirements, including the statutory CERCLA FYR, to verify cleanup within Area III and Areas IX and X is functioning properly.

The Navy is responsible for implementing, maintaining, reporting on, and enforcing ICs. Although the Navy may later transfer these procedural responsibilities to another party by contract, property transfer agreement, or through other means, the Navy shall retain ultimate responsibility for integrity of the remedy.

Monitoring and Maintenance

The selected remedies for Areas III, IX, and X include the monitoring and maintenance activities that will be performed, as long as necessary, to achieve the RAOs and to comply with the substantive provisions of pertinent state and federal ARARs (see **Attachment 4**). In addition, the selected remedies will be subject to statutory reviews every 5 years pursuant to CERCLA to ensure that they remain protective of human health and the environment. The details of the monitoring programs will be developed during remedial design. Performance and long-term effectiveness monitoring details, including the frequency and triggers, will be included in a post-remedial action monitoring plan.

Baseline Monitoring

Baseline monitoring will be performed prior to remedy implementation to characterize pre-remedy conditions and to aid in the design of the remedy prior to construction. Baseline monitoring may include sediment sampling as well as hydrodynamic modeling within Areas III, IX, and X.

Baseline monitoring results would be used to refine the various remediation zones (removal and capping within Area III, and focused removal with backfill, *in situ* treatment, and MNR within Areas IX and X) before construction begins. Remediation zone footprints would be refined based on surface sediment (0 to 6 inches) concentrations. Removal depths would be refined based on the collection and analysis of sediment cores. Hydrodynamic modeling would be used to aid in the design of cap, post-removal backfill, and *in situ* amendment placement to resist erosion from tidal currents and wave action. The details of a baseline monitoring study, including the need for such investigation, will be determined during the remedial design.

Construction Monitoring

Monitoring will be implemented during remedial activities for construction quality control and to minimize off-site impacts. Care will be taken during construction to not affect adjacent sediment sites. Construction monitoring is conducted to confirm mitigation controls are effective and ensure target cleanup levels are achieved. BMPs such as silt curtains will be in place to control sediment migration during remediation activities occurring along the shoreline. Construction monitoring for dredging would include: water quality monitoring; confirmation sampling; and, as prescribed in the remedial design, bathymetric surveying to ensure sediments are removed to required depths, backfill and cap materials are placed to required elevations, and *in situ* treatment materials are placed appropriately. Post-excavation, sediment confirmation samples will be collected for all COCs (copper, lead, mercury, and PCBs).

Performance Monitoring

After the remedy is implemented, performance monitoring will be conducted to verify that the remedy is performing as intended and off-site impacts are minimized. Immediately following construction, data will be collected to ensure that backfill, capping, and *in situ* treatment materials have been placed to design specifications.

Physical inspections (e.g., for erosion) of the backfill and cap remediation zones in Area III and the focused removal with backfill remediation zone in Areas IX/X will be conducted annually in years 1 through 5 post-construction, and then at 5-year intervals during the FYR process thereafter. Bioavailability monitoring, such as porewater or biota analysis and carbon amendment mixing zone depth, will also be conducted annually in years 1 through 5 post-construction, and then at 5-year intervals during the FYR process thereafter. Inspections, monitoring, and repairs, as necessary, will be conducted of the backfill and cap zones and Areas IX/X *in situ* treatment area after high intensity storms. The FYR process will include sediment sampling and Areas IX/X *in situ* treatment area bioavailability monitoring to ensure that the remedy continues to perform as designed. If it is determined that the remedy is not performing as intended, contingency measures will be evaluated and implemented as necessary.

<u>Long-Term Remedial Goal Monitoring</u>

Long-term RG monitoring of surface sediments will be conducted in the Area IX and X MNR remediation zone to monitor progress towards achieving the RAO 3 148 μg/kg total PCB RG on an AWA basis, and to minimize off-site impacts. Sediment sampling density within the MNR remediation zone will be designed in a manner to provide statistically defensible coverage of the MNR remediation zone. Surface sediment PCB concentrations within the MNR remediation zone will be used to calculate area-weighted PCB concentrations and then an AWA PCB concentration that will apply to all of Areas IX and X. The first FYR is due 5 years from the start of remedial action at the first HPNS operable unit. Parcel F FYR will occur according to the schedule for the overall HPNS site. Long-term RG monitoring within the Area IX and X MNR remediation zone will be conducted annually during the first 5 years post-construction and then at 5-year intervals thereafter until the RAO 3 RG is achieved on an AWA basis. Results will be incorporated into the FYR. Long-term remedial goal monitoring will cease when the RAO 3 RG has been achieved in Areas IX and X.

Long-term RG monitoring will not be conducted in Area III or in the focused removal with backfill remediation zone of Areas IX and X, because all RAO RGs will be achieved immediately after remedy implementation. Long-term RG monitoring will not be conducted in the *in situ* treatment remediation zone either because PCBs will be left in-place. However, the *in situ* treatment will bind to the PCBs in sediment, making them unavailable for uptake by benthic organisms and subsequent biomagnification up the food chain. Therefore, the bioavailability of PCBs resulting from Navy activity will be significantly reduced, resulting in human and ecological risk reduction, until MNR results in achievement of the RAO 3 RG. South Basin is a net depositional environment, and sediment from the greater San Francisco Bay will overlay the *in situ* treatment remediation zone over time. Periodic post-remedial action bathymetric surveys will be conducted to confirm sediment deposition in Areas IX/X.

2.10.3 Expected Outcomes of the Selected Remedy

Implementation of the selected remedies will result in RAO achievement and a reduction of human health and ecological risk to acceptable levels as described below:

- Removal and off-site disposal of contaminated sediments will reduce site risks.
- *In situ* treatment will reduce the bioavailability of PCBs thus reducing toxicity and contaminant uptake to benthic organisms and animals that feed on these organisms.
- Capping within Area III will isolate and prevent exposure to marine animals to contaminated sediments.
- MNR will rely on the deposition of clean material to reduce surface sediment contaminant concentrations and site risk.
- ICs will maintain protectiveness of the remedy by limiting actions that may damage the remedy, and through periodic monitoring and maintenance.

The timeframe for achieving future recreational and navigational waterway uses of Parcel F by implementing the selected remedies could vary from 8 to 13 years. This timeframe could be significantly impacted by funding and speed of regulatory concurrence on plans and completion of remediation. In addition, there is uncertainty in the parameters that influence recovery and recovery projections, which could influence, and potentially shorten, the actual timeframes for achieving future uses. Since Area IX/X is a net depositional environment, PCB concentrations, as of the date of this ROD, may have reduced since sampling was conducted in 2002-2003. Recovery through MNR is a component of the selected remedy for Areas IX/X, whereas there is not an MNR component for the selected remedy for Area III.

2.10.4 Statutory Determinations

In accordance with the NCP, the selected remedies meet the following statutory determinations.

- **Protection of Human Health and the Environment** – The selected remedies will adequately protect human health and the environment by preventing exposure to COCs through (1) removal and off-site disposal of sediments; (2) *in situ* treatment to reduce the bioavailability, toxicity, and uptake of PCBs in sediment; (3) capping to isolate and prevent exposure to contaminated sediments; (4) MNR to reduce contaminant concentrations through deposition of cleaner material; and (5) ICs to prevent exposure to site contaminants by recreational fishers through fish and shellfish consumption, and to maintain protectiveness of the remedy by limiting actions that may damage the remedy and through periodic monitoring and maintenance.

- **Compliance with Applicable or Relevant and Appropriate Requirements** – CERCLA § 121(d)(1) states that remedial actions on CERCLA sites must attain (or the decision document must justify the waiver of) any federal or more stringent state environmental standards, requirements, criteria, or limitations that are determined to be legally applicable or relevant and appropriate. The selected remedies for Parcel F will comply with the substantive provisions of the federal and state requirements identified as ARARs.
- **Cost-effectiveness** – As specified in the NCP, the cost-effectiveness of a remedy is determined in two steps. First, the overall effectiveness of a remedial alternative is determined by evaluating the following three of the five balancing criteria: (1) long-term effectiveness and permanence; (2) reduction in toxicity, mobility, or volume through treatment, and (3) short-term effectiveness. The overall effectiveness is compared to cost to determine whether a remedy is cost-effective. The selected remedies have a high overall effectiveness because, relative to the other remedial alternatives, they offer a high degree of long-term effectiveness in a manner that maximizes the use of treatment (to reduce the toxicity, mobility, or volume of contaminants) and minimizes short-term risks. The selected remedy will provide high overall effectiveness proportional to their costs and is therefore considered cost-effective.
- Use of Permanent Solution and Alternative Treatment Technologies (or Resource Recovery Technologies) to the Maximum Extent Practicable – The Navy has determined that the selected remedies represent the maximum extent to which permanent solutions and treatment are practicable at this site. The selected remedies include treatment components to reduce toxicity, mobility, or volume of PCBs in sediment through *in situ* treatment with carbon-based amendments.

Five-Year Review Requirements – Statutory FYRs pursuant to CERCLA §121 and the NCP will be conducted because the selected remedies may leave contamination in place at Parcel F above levels that allow for unrestricted use and unlimited exposure. FYRs for Parcel F will follow the ongoing schedule of FYRs established for other remedies in place at HPNS.

2.10.5 Documentation of Significant Changes

Following the Proposed Plan public comment period and development of the draft and draft final ROD, a lower PCB background value was evaluated in response to a comment from the Water Board. The impact of the lower PCB background value is described in the Technical Memorandum (ECC-Insight and CDM Smith, 2022) included in **Attachment 5 (Part 3)**.

The technology assignment framework (i.e., which remedial technology is planned to be employed in which grid location), for Areas IX/X was modified in this ROD to minimize impacts to the Yosemite Slough remedial action by increasing the removal area in close proximity to Yosemite Slough. This modification achieves a lower overall post-remedial action PCB AWA concentration of 193 ug/kg for Area X, thereby reducing the MNR timeframe to achieve RAOs in Area X. This modification is documented in the *Final Technical Memorandum Revision to Total PCB Background Concentration and RAO 3 Remediation Goal* (ECC-Insight and CDM Smith, 2022), presented in **Attachment 5 (Part 3)**. Future adjustments to the technology assignment framework will be made during the remedial design based on pre-remedial action sediment characterization data and regulatory agencies' concurrence. Based on the evaluation, documented in the 2022 Technical Memorandum (ECC-Insight and CDM Smith 2022; **Attachment 5 [Part 3]**), no significant changes were made to the remedy for Areas IX/X from the information presented for the preferred alternative for Areas IX/X in the Proposed Plan.

The revised PCB background value does not influence the Area III preferred remedy. Therefore, no changes were made to the selected remedy for Area III from the information presented for the Area III preferred alternative in the Proposed Plan.

2.11 Community Participation

Community participation at HPNS includes public meetings, public information repositories, newsletters and fact sheets, public notices, and site tours. The community involvement plan for HPNS provides detailed information on community participation and documents interests, issues, and concerns raised by the community regarding ongoing investigation and cleanup activities at HPNS.

In accordance with CERCLA § 113 and § 117, the Navy provided a public comment period from April 7 to May 7, 2018, for the proposed remedial actions described in the Proposed Plan for Parcel F. A public meeting to present the proposed plan was held on April 11, 2018, at Office of the Community Investment and Infrastructure Community Room, 451 Galvez Avenue, San Francisco, California. At the public meeting, the Navy gave presentations on the conditions at Parcel F and representatives from the Navy and regulatory agencies were available to answer questions. A court reporter documented Public Comments (**Attachment 3**) as part of the Responsiveness Summary, included as part of the Administrative Record for this ROD. Responses to spoken comments received during the public meeting and written comments received during the public comment period are included in the Responsiveness Summary in **Attachment 3**. Key supporting documents that pertain to Parcel F and a complete index of all Navy HPNS documents are available at the following information repositories:

- City of San Francisco Main Library Science, Technical, &
  Government Document Room
  100 Larkin Street, San Francisco, CA 94102
  (415) 557-4400
- U.S. Navy Hunters Point Naval Shipyard Site Trailer
  690 Hudson Ave, San Francisco, CA 94124
- Superfund Records Center
  Mail Stop SFD-7C
  75 Hawthorne Street, Room 3110
  San Francisco, CA 94105
  (415) 820-4700

The Administrative Record is also available electronically at:

https://administrative-records.navfac.navy.mil/?M7Q7P6J7G4PK3KL

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3.0 Responsiveness Summary

The responsiveness summary is the third component of a ROD; its purpose is to summarize information about the views of the public and regulatory agencies on both the remedial alternatives and general concerns about Parcel F submitted during the public comment period. It documents in the record how public comments were integrated into the decision-making process. The participants in the public meeting, held on April 11, 2018, included community members and representatives of the Navy, EPA, DTSC, and the Water Board. Questions and concerns received during the meeting are documented in the meeting transcript (**Attachment 3**). Responses to comments provided at the meeting and received during the public comment period by the Navy, EPA, DTSC, or the Water Board are included in the responsiveness summary (**Attachment 3**).

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TABLES

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Table 1. Investigation and Key Document Summary Table*

Date(s)	Investigation	Activities
1991	Environmental Sampling and Analysis Plan	Characterization of chemicals in sediment, water chemistry, and toxicity (Aqua Terra Technologies, 1991).
1994	Phase 1A Ecological Risk Assessment	Qualitative analysis of existing site data and offshore areas (PRC, 1994).
1996	Phase 1B Ecological Risk Assessment	Characterization of Phase 1 data gaps and completion of a screening level risk assessment. Included collection of sediment core samples (PRC, 1996).
1998	Feasibility Study	Delineation of preliminary remediation footprints. Identified Areas I, III, VIII, IX, and X as areas with the highest potential for ecological risk (Tetra Tech and LFR, 1998).
2000	Validation Study	Sediment characterization focused on evaluation of chemical distribution within each area. Determined that the primary chemicals posing ecological risk were copper and mercury in Area III and polychlorinated biphenyls (PCBs) in Area X. Also determined that PCBs posed potentially unacceptable risks to human health in Areas IX and X (Battelle et al., 2005).
2002	Shoreline Investigation	A shoreline investigation was conducted to evaluate contaminant migration to Parcel F from Parcels E and E-2. The investigation also included a screening level ecological risk assessment (SLERA). The shoreline investigation and SLERA determined that source control measures were warranted along the shoreline at Parcels E and E-2 and that remedial alternatives should be evaluated to address the potential risk to invertebrates, birds, and mammals (SulTech, 2007).
2003	Feasibility Study Data Gaps Investigation	A sediment investigation was conducted to support the Parcel F feasibility study for Areas III, IX and X. The investigation included further delineation of copper, mercury, and PCB contamination within Area III, PCB contamination within Areas IX and X and mercury contamination between Areas VIII and IX (Barajas et al., 2007).
2009 to 2013	Parcel F Radiological Investigations	Characterization of radionuclides in sediment. The investigations included a Phase 1 screening investigation (2009), a Phase 2a data gaps investigation (2011). Phase 1 and Phase 2a were documented in Battelle and Sea Engineering, 2013. Phase 2b data gaps investigation (ITSI Gilbane & SAIC, 2013). The investigations were

Date(s)	Investigation	Activities
		used to support the 2017 Feasibility Study Addendum (KCH 2017a).
2017	Feasibility Study Addendum	This Feasibility Study Addendum re-evaluates the entire historical dataset at Parcel F and provides new risk analysis in order to incorporate radionuclides of concern (ROCs) into the risk evaluation at Parcel F (KCH, 2017a).
2017	Final Technical Memorandum, Optimized Remedial Alternative for Parcel F	Presents the technology assignment framework used to assess the applicability as well as the development of an optimized alternative for Hunters Point Naval Shipyard (HPNS) Parcel F (ECC-Insight and CDM Smith, 2017)
2018	Final Demonstration of Activated Carbon Amendments to Reduce PCB Bioavailability	Results of activated carbon pilot study at HPNS Parcel F (KCH, 2018).
2018	Final Sediment Investigation Beneath Former Parcels B and C Pier and Wharf Structures and Bathymetric Survey	Characterization of the footprint of six separate former Parcels B and C pier and wharf structures (Pier B, Pier C, Berth 61, Berth 64, the wooden Quay Wall, and Wharf #2) and an updated bathymetric survey (ECC-Insight and CDM Smith, 2018).
2022	Final Technical Memorandum, Revision to Total PCB Background Concentration and RAO 3 RG	SEDCAM modeling and uncertainty analysis surrounding varying biologically active zones and deposition rates to bound potential monitored natural recovery (MNR) timeframes with a revised PCB background concentration (ECC-Insight and CDM Smith, 2022).

* Full list of reference documents are in the Administrative Record Index (**Attachment 1**).

Table 2. COC Concentration Summary

Area	COC	Units	Detection Frequency	Minimum	Maximum	Mean
Point Avisadero Area (III)	Copper	mg/kg	19/19	32.7	425	172
	Lead	mg/kg	19/19	18.1	104	43.8
	Mercury	mg/kg	19/19	0.1	2.5	0.9
	Total PCBs	mg/kg	19/19	0.0	1.7	0.3
Oil Reclamation Area (IX)	Copper	mg/kg	6/6	55.1	84.3	69.4
	Lead	mg/kg	6/6	11.9	54.5	40.5
	Mercury	mg/kg	6/6	0.303	0.518	0.432
	Total PCBs	mg/kg	6/6	0.088	0.339	0.227
South Basin Area (X)	Copper	mg/kg	23/23	66.1	149	121
	Lead	mg/kg	23/23	11.0	98.0	85.2
	Mercury	mg/kg	23/23	0.232	0.821	0.707
	Total PCBs	mg/kg	23/23	0.113	1.70	1.16

Notes:
COC – chemical of concern
mg/kg – milligrams per kilogram
PCB – polychlorinated biphenyl

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Table 3. Human Health Risk Assessment Summary

Chemical	Exposure Pathway	Area-Specific Human Health Risk Estimate				
		I	III	VIII	IX	X
Excess Lifetime Cancer Risk						
Total PCBs	Direct Contact Sediment	*3×10^{-6}*	5×10^{-7}	9×10^{-7}	1×10^{-7}	*5×10^{-5}*
Total PCBs	Shellfish Consumption	3×10^{-7}	4×10^{-7}	7×10^{-7}	*6×10^{-6}*	*8×10^{-6}*
Total PCBs	Fish Consumption	*9×10^{-5}*				
Noncancer Hazard Quotient						
Total PCBs	Direct Contact Sediment	0.006	0.1	0.002	0.02	0.1
Total PCBs	Shellfish Consumption	0.02	0.04	0.06	0.2	0.4
Total PCBs	Fish Consumption	**8**				

Notes:
Italicized numbers indicate risk level exceeding acceptable risk level of 1×10^{-6}; **bold numbers** indicate hazard index equal or exceeding 1. Source: KCH (2017a).
PCB – polychlorinated biphenyl

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Table 4. Ecological Risk Assessment Summary

Chemical	Receptor	Area-Specific Hazard Quotient (Unitless)				
		I	III	VIII	IX	X
Copper	Surf Scoter	0.5	**3**	0.7	0.7	0.8
Mercury		0.3	**4**	0.3	0.3	0.3
Total PCBs		0.1	0.3	0.2	**1**	**2**

Notes:
Bold Numbers indicate hazard index equal or exceeding 1
Source: *Hunters Point Shipyard Parcel F Validation Study Report, San Francisco, California.* Battelle et al. (2005).
Note: The Navy and regulatory agencies decided to take action at Area IX since the total PCB area weighted average exceeds background, even though the hazard quotient is at or below 1 and the not-to-exceed RAO 1 RG was not exceeded.
PCB – polychlorinated biphenyl

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Table 5. Remediation Goals for Parcel F Surface Sediment COCs

RAO	COC	Remediation Goal	Basis
RAO 1	Copper	271 mg/kg	Not to exceed threshold
	Lead	Not Established	
	Mercury	1.87 mg/kg	
	PCBs	1,240 µg/kg[1]	
RAO 2	PCBs	1,350 µg/kg[1]	Area-weighted average
RAO 3	PCBs	148 µg/kg[1,2]	

Notes:
[1] This Remediation Goal will be met by analyzing for all 208 PCB congeners.
[2] 148 µg/kg represents the ambient sediment total PCB concentrations in San Francisco Bay which is based on a non-parametric 95th percentile of the 2015 San Francisco Estuary Institute Regional Monitoring Program (SFEI RMP) ambient concentration dataset after removing data from Marin County and a visually high sample result in the vicinity of known impacted properties.
µg/kg – micrograms per kilogram
COC – chemical of concern
mg/kg – milligrams per kilogram
PCB – polychlorinated biphenyl
RAO – remedial action objective

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Table 6. Area III Alternatives Summary

Alternative	Components of Remedy*
1	**No Action.** No actions taken to reduce risks to human health or the environment. This alternative is required by CERCLA to serve as the baseline condition for comparison with the other alternatives.
2	**Removal/Backfill and Off-Site Disposal (Unrestricted Use/Unrestricted Exposure [UU/UE]).** Full sediment removal uses excavation or dredging of sediment with concentrations above the not to exceed RGs for copper, mercury, and PCBs (approximately 26,500 cubic yards). Contaminated sediments disposed at off-site landfill. Removal may require placement of backfill or residual management layers to limit exposure to contamination that remains. May require dewatering of dredged sediment prior to transport and disposal.
3	**Focused Removal/Backfill, Off-Site Disposal, Armored Cap, and ICs**. Focused sediment removal (approximately 1,790 cubic yards) and capping for contaminated sediment (approximately 454,550 square feet) exceeding the RGs for copper, mercury, and PCBs. Most of the area would be capped with a thick layer of sand overlain by armor stone for erosion protection. Nearshore sediments too shallow to be capped will be dredged or excavated to prevent potential loss of shallow water habitat. Expected to be protective of surf scoters, based on foraging depth, and limit exposure to the benthic community and fish. ICs will protect cap integrity from human disturbance. Off-site disposal of contaminated sediments.
3A	**Focused Removal/Backfill, Off-Site Disposal, Reactive Cap, and ICs**. Same as Alternative 3, but uses a reactive cap (e.g., AquaBlok® or equivalent) to limit transport of chemicals and prevent exposure to contaminated sediment below.
4**	**Focused Removal/Backfill, Off-Site Disposal, Modified Armored Cap, and ICs.** Combination remedy similar to Alternative 3, comprising focused sediment removal (approximately 1,790 cubic yards) with capping footprint (approximately 68,670 square feet) limited to areas with water depths less than 30 feet. Expected to be protective of surf scoters, based on foraging depth, and limit exposure to the benthic community or fish.
4A**	**Focused Removal/Backfill, Off-Site Disposal, Modified Reactive Cap, and ICs.** Combination remedy identical to Alternative 3A. Capping is limited to areas with depths less than 30 feet with same volume and areas as Alternative 4. Expected to be protective of surf scoters, based on foraging depth, and limit exposure to benthic community or fish. As with 3A, the reactive cap (e.g., AquaBlok® or equivalent) limits transport of chemicals and prevents exposure to contaminated sediments below.

Notes:
* Remediated volumes are estimated and will be refined during the remedial design.
** The selection of capping material will be determined during remedial design based on characterization findings and sustainability considerations. Depending on the type of cap, either Alternative 4 or 4A will be implemented (not both).
The selected remedy is based on Alternative 4/4A.
CERCLA – Comprehensive Environmental Response, Compensation, and Liability Act
ICs – Institutional Controls
MNR – monitored natural recovery
PCB – polychlorinated biphenyl
RG – remedial goal
UU/UE – Unrestricted Use/Unrestricted Exposure

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Table 7. Areas IX and X Alternatives Summary

Alternative	Components of Remedy*
1	**No Action.** No actions taken to reduce risks to human health or the environment. This alternative is required by CERCLA to serve as the baseline condition for comparison with the other alternatives.
2	**Removal/Backfill and Off-Site Disposal *(*UU/UE*)*.** Full sediment removal (approximately 150,520 cubic yards) option includes excavation or dredging of sediment above the not to exceed RGs for copper, mercury, and PCBs and disposal of contaminated sediments at an off-site landfill.
3	***In situ* Treatment and ICs**. Full sediment treatment option (approximately 1,787,400 square feet) with ***activated carbon*** mixed into top 1 foot of the sediment bed (approximately 66,200 cubic yards). Cost effective and implementable. Some disruption of benthic community during mixing, but it is less invasive than remedies using removal or capping with sand or stone. Effects can be mitigated with natural mixing through bioturbation. ICs would prevent disturbance of treated sediment from human disturbance. Performance monitoring may require both bulk sediment and pore water sampling.
4	**MNR and ICs.** Full sediment MNR option relies on natural processes, such as deposition and dispersion, to reduce concentrations. ICs limit exposure until RAOs are met. Less expensive and disruptive than more active cleanup approaches. Although the 2008 FS estimated MNR would take 10 years to achieve RAOs, there is uncertainty regarding that time frame.
5	**Focused Removal/Backfill, Off-Site Disposal, MNR, and ICs.** Focused removal of sediment contamination (approximately 57,850 cubic yards) in areas above the not to exceed RGs for copper, mercury, and PCBs in sediment (less than 1 foot deep). MNR would reduce chemical concentrations beyond removal area. Sediments removed to a depth of 1 foot and backfilled with clean sand or other suitable material to existing grade. ICs would protect sediment from human disturbance after backfill is placed.
5A	**Focused Removal/Activated Backfill, Off-Site Disposal, MNR, and ICs**. Identical to Alternative 5, except clean backfill would be mixed with activated carbon as an additional barrier to any contamination left in place. Combination remedy that increases long-term effectiveness and permanence.
6	**Focused Removal/Backfill, Modified Shoreline Removal/Backfill, Off-Site Disposal, MNR, and ICs.** Combination remedy with targeted sediment and shoreline removal (approximately 61,940 cubic yards) that limits sediment disturbance. Targeted removal of nearshore contaminated sediments (to about 2.5 feet) limits exposure to humans on shoreline.
6A	**Focused Removal/Activated Backfill, Modified Shoreline Removal/Backfill, Off-Site Disposal, MNR, and ICs.** Identical to Alternative 6, except clean backfill would be mixed with activated carbon as an additional barrier to any contamination left in place. Reactive materials increase long-term effectiveness and permanence.

Alternative	Components of Remedy*
7	**Focused Removal/Backfill, *In situ* treatment, Off-Site Disposal, MNR, and ICs.** Removal of approximately 47,200 cubic yards of sediments followed by placement of clean backfill, along with *in situ* treatment of approximately 644,000 square feet of sediments. Sediments would be removed to a target depth of 1 foot. MNR would be implemented to attain the total PCB background level of 148 ug/kg. ICs would protect sediments from human disturbance. Would result in an area-weighted average total PCB concentration of approximately 260 ug/kg for Area IX and approximately 193 ug/kg for Area X. Attenuation modeling supporting MNR shows surface sediments in Areas IX and X would reach 148 ug/kg, which represents the upper end of nearshore ambient sediment total PCB concentrations in San Francisco Bay, on an area-weighted average basis, within 13 years and 8 years, respectively, following completion of the active treatments.

Notes:
*Remediated volumes are estimated and will be refined during the remedial design.
The selected remedy is based on Alternative 7.

µg/kg – micrograms per kilogram
CERCLA – Comprehensive Environmental Response, Compensation, and Liability Act
FS – Feasibility Study
ICs – Institutional Controls
MNR – monitored natural recovery
RAO – remedial action objective
RG – remedial goal
UU/UE – Unrestricted Use/Unrestricted Exposure

Table 8. Remedial Alternative Cost Summary

Alternative	Description	Capital Costs[1]	30-Year O&M	Total Present Worth Cost
Area III				
2	**Removal/Backfill and Off-Site Disposal**	$15.4	$0.0	$15.4
3	**Focused Removal/Backfill, Off-Site Disposal, Armored Cap, and ICs**	$10.6	$2.3	$12.9
3A	**Focused Removal/Backfill, Off-Site Disposal, Reactive Cap, and ICs**	$13.5	$2.4	$15.9
4	**Focused Removal/Backfill, Off-Site Disposal, Modified Armored Cap, and ICs**	$5.3	$2.0	$7.3
4A	**Focused Removal/Backfill, Off-Site Disposal, Modified Reactive Cap, and ICs**	$7.0	$2.2	$9.2
Areas IX/X				
2	**Removal/Backfill and Off-Site Disposal**	$39.7	$0.0	$39.7
3	***In Situ* Treatment and ICs**	$16.3	$1.8	$18.1
4	**Monitored Natural Recovery and ICs**	$0.9	$1.7	$2.6
5	**Focused Removal/Backfill, Off-Site Disposal, MNR, and ICs**	$18.6	$2.3	$20.9
5A	**Focused Removal/Activated Backfill, Off-Site Disposal, MNR, and ICs**	$25.0	$2.2	$27.2
6	**Focused Removal/Backfill, Modified Shoreline Removal/Backfill, Off-Site Disposal, MNR, and ICs**	$19.1	$2.2	$21.3
6A	**Focused Removal/Backfill, Modified Shoreline Removal/Activated Backfill, Off-Site Disposal, MNR, and ICs**	$25.9	$2.2	$28.1
7	**Optimized Alternative: Focused Removal/Backfill, *In Situ* Treatment, Off-Site Disposal, MNR, ICs**	$21.5	$1.8	$23.3

Notes:
[1] Costs are presented in millions of dollars
Discount rate = 3.1%
Capital costs include engineering and construction
Operation and maintenance (O&M) costs estimated over 30-year time period

ICs – Institutional Controls
MNR – monitored natural recovery

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FIGURES

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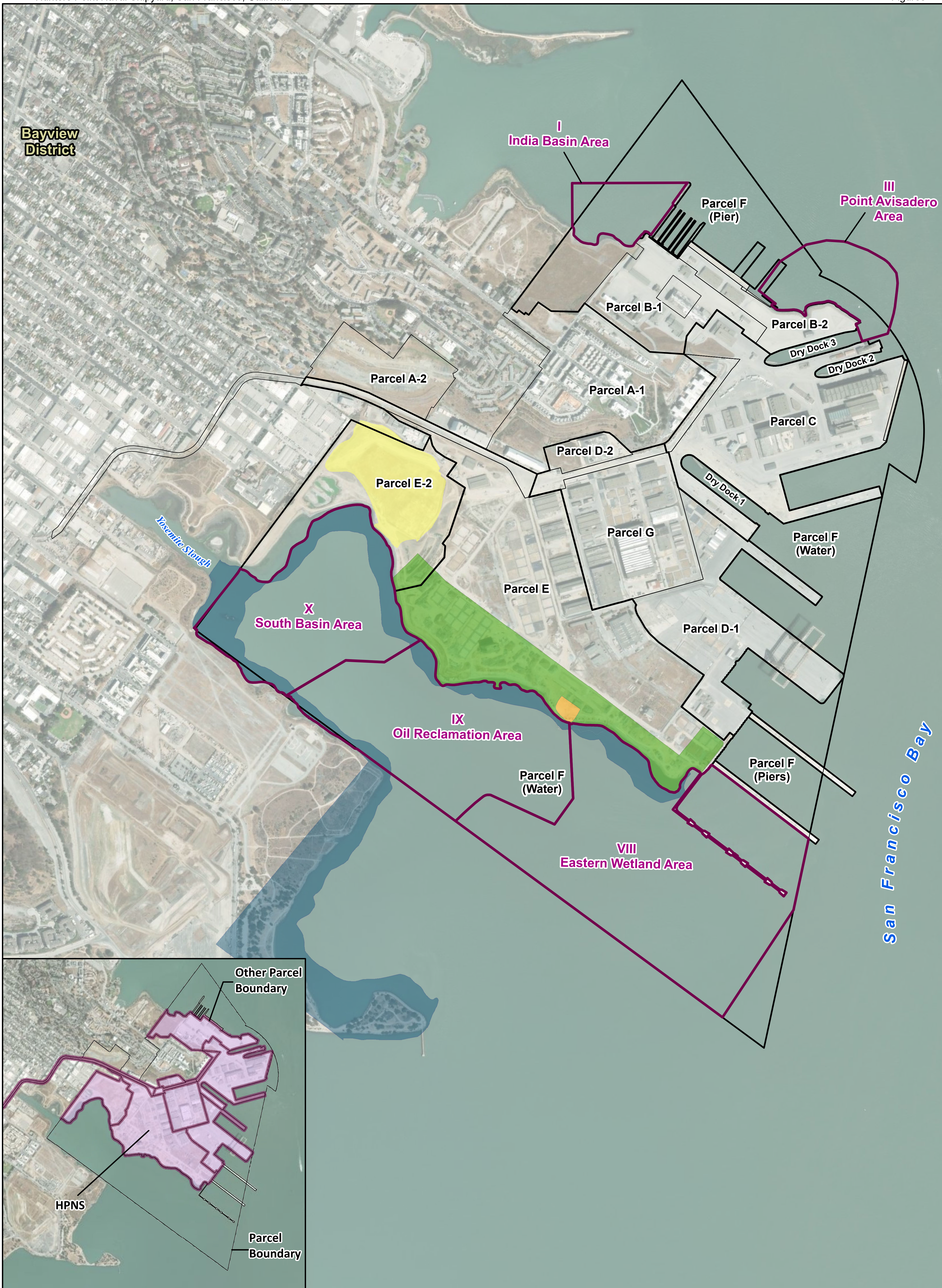

Legend

- Parcel F Boundary
- Parcel F Subarea Boundary
- Parcel E-2 Landfill
- Intertidal (greater than 0 foot MLLW)

Installation Restoration

- IR-02
- IR-03

Notes:
HPNS - Hunters Point Naval Shipyard
IR - Installation Restoration
MLLW - mean lower low water
PCB - Polychlorinated Biphenyl

Hunters Point Naval Shipyard, San Francisco, California
U.S. Department of the Navy, BRAC PMO West

Figure 1
Parcel F Areas

Parcel F Record of Decision

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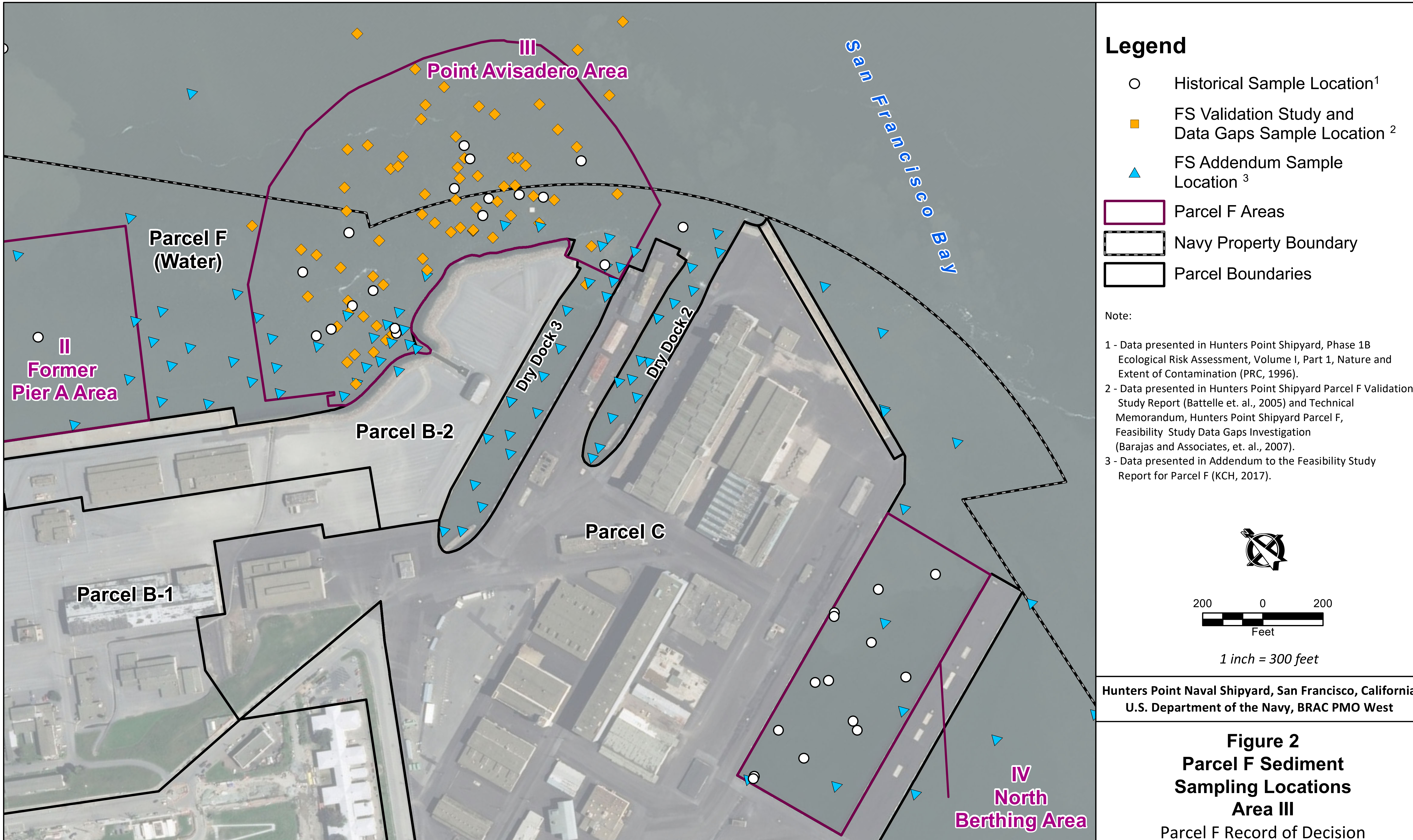

Hunters Point Naval Shipyard, San Francisco, California
U.S. Department of the Navy, BRAC PMO West

Figure 2
Parcel F Sediment Sampling Locations Area III
Parcel F Record of Decision

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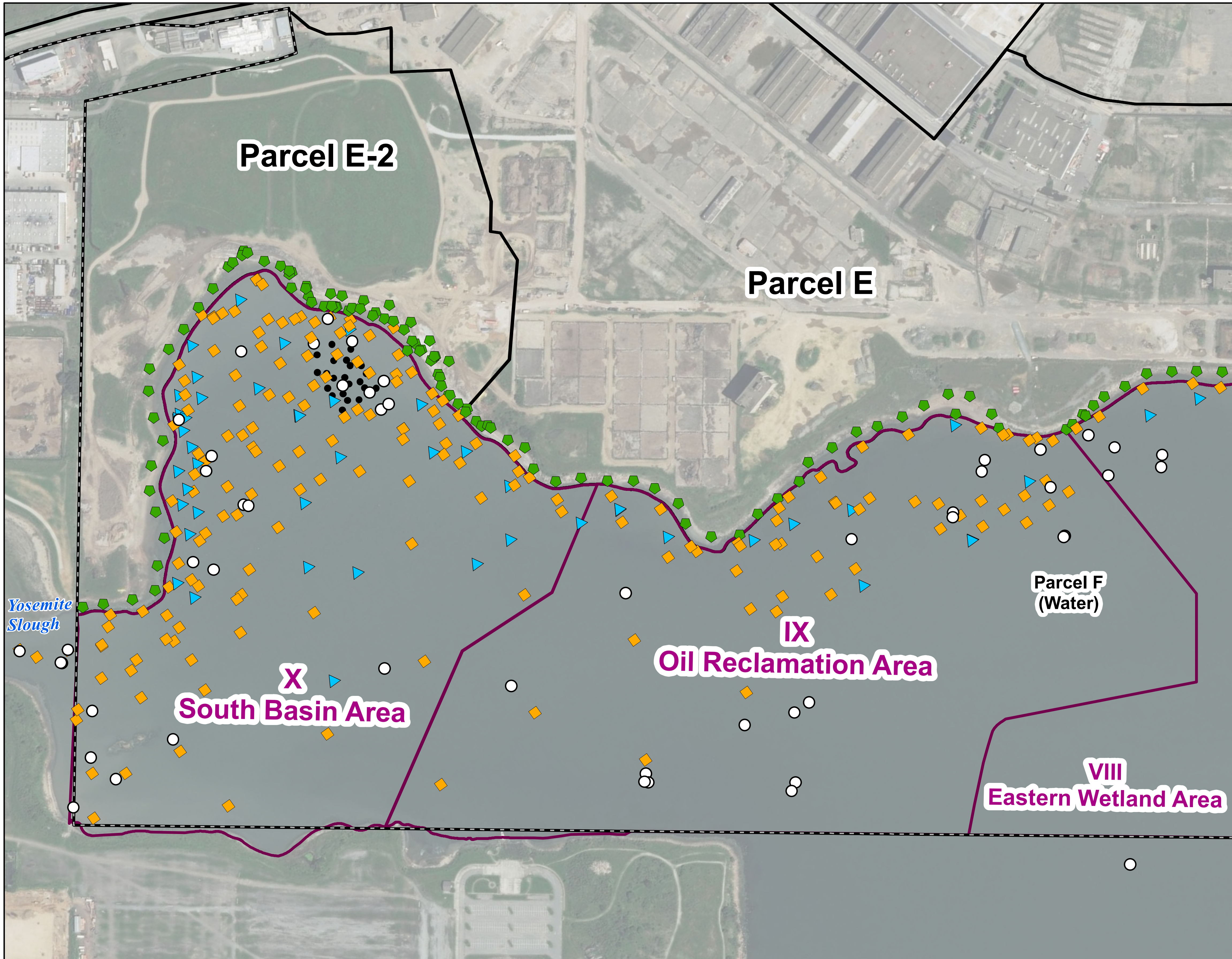

Legend

- Historical Sample Location [1]
- FS Validation Study and Data Gaps Sample Location [2]
- FS Addendum Sample Location[3]
- Shoreline Sample Location [4]
- Pilot Study Sample Location [5]
- Parcel F
- Navy Property Boundary
- Parcel Boundary

Note:

1 - Data presented in Hunters Point Shipyard, Phase 1B Ecological Risk Assessment, Volume I, Part 1, Nature and Extent of Contamination (PRC, 1996).
2 - Data presented in Hunters Point Shipyard Parcel F Validation Study Report (Battelle et. al., 2005) and Technical Memorandum, Hunters Point Shipyard Parcel F, Feasibility Study Data Gaps Investigation (Barajas and Associates, et. al., 2007).
3 - Data presented in Addendum to the Feasibility Study Report for Parcel F (KCH, 2017).
4 - Shoreline sample locations collected during onshore investigations and Parcel F Feasibility Study Data Gaps Investigation (Barajas and Associates, et. al., 2007).
5 - Pilot study sample locations presented in Final Demonstration of Activated Carbon Amendments to Reduce PCB Bioavailability (KCH, 2018).

500 0 500
Feet
1 inch = 400 feet

Hunters Point Naval Shipyard, San Francisco, California
U.S. Department of the Navy, BRAC PMO West

Figure 3
Parcel F Sediment and Shoreline Sampling Locations Areas IX and X
Parcel F Record of Decision

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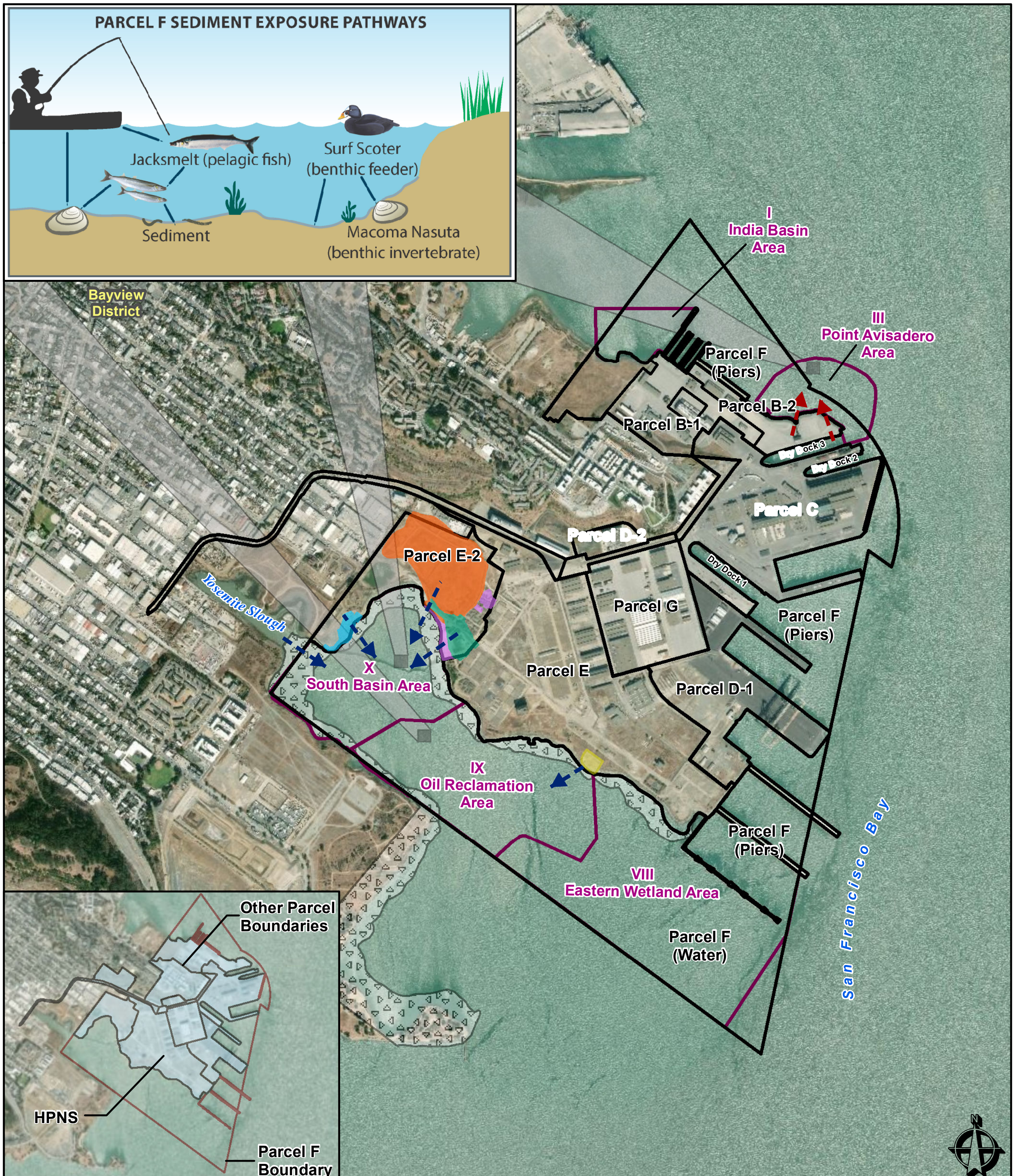

Legend

- Parcel E-2 Landfill
- PCB Hot Spot Area
- Additional Excavation Area
- Metal Slag Area
- IR-03 Former Oily Waste Pond
- Intertidal Area (greater than 0 foot MLLW)
- Navy / Parcel Boundary
- Parcel F Areas

Note:

MLLW - Mean Lower Low Water
HPNS - Hunters Point Naval Shipyard

Point Avisadero Migration Pathways: Maintenance Activities, Overland Runoff and Discharge

South Basin and Oil Reclamation Migration Pathways: Filling, Overland Runoff and Discharge

600 300 0 600 1,200
Feet
1 inch = 1,800 feet

Hunters Point Naval Shipyard, San Francisco, California
U.S. Department of the Navy, BRAC PMO West

Figure 4
Conceptual Site Model

Parcel F Record of Decision

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Figure 5. NCP Evaluation Criteria

THRESHOLD CRITERIA	**Overall Protection of Health and the Environment** Risk management of human and environmental health.
	Compliance with Applicable or Relevant and Appropriate Requirements (ARARs) Federal and state environment statutes met.
PRIMARY BALANCING CRITERIA	**Long-term Effectiveness** Maintain reliable protection of human health and the environment over time, once cleanup goals are met.
	Reduction of Toxicity, Mobility, or Volume (TMV) through Treatment Reduction in toxicity, mobility, and mass of contaminants via remedial action.
	Short-term Effectiveness Protection of human health and the environment during construction and implementation until cleanup objectives are met.
	Implementability Technical and administrative feasibility of a remedy, including the availability of materials and services needed to carry it out.
	Cost Estimated capital, operation, and maintenance costs of each alternative.
MODIFYING CRITERIA	**State Acceptance** State concerns addressed; State preferences considered.
	Community Acceptance Community concerns addressed; community preferences considered.

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Figure 6. Area III Alternatives Evaluation Summary

	Alternative 1 No Action	Alternative 2 Removal/Backfill and Off-Site Disposal (UU/UE)	Alternative 3 Focused Removal/Backfill, Off-Site Disposal, Armored Cap, and ICs	Alternative 3A Focused Removal/Backfill, Off-Site Disposal, Reactive Cap, and ICs	Alternative 4 Focused Removal/Backfill, Off-Site Disposal, Modified Armored Cap, and ICs	Alternative 4A Focused Removal/Backfill, Off-Site Disposal, Reactive Cap, and ICs
Overall Protection of Human Health and the Environment	Not Protective	Protective	Protective	Protective	Protective	Protective
Compliance with ARARs	Does not comply with ARARs	Complies with ARARs	Complies with ARARs	Complies with ARARs	Complies with ARARs	Complies with ARARs
Long-Term Effectiveness and Permanence	Low	Low to Moderate	Moderate to High	Moderate to High	Moderate	Moderate
Reduction in Toxicity, Mobility and Volume through Treatment	Low	Low	Low	Low	Low	Low
Short Term Effectiveness	Low	Moderate	Moderate	Moderate	Moderate to High	Moderate to High
Implementability	High	Moderate	Moderate	Moderate	Moderate to High	Moderate to High
Cost ($M)[1]	$0	$15.4	$12.9	$15.9	$7.3	$9.2

Low　Low to Moderate　Moderate　Moderate to High　High

[1] The 2017 costs were updated based on the same escalation factor of 2.1% (1.021) which was utilized in the Final Feasibility Study (FS) for Parcel F (Barajas & Associates, Inc., 2008) and was developed based on the Remedial Action Cost Engineering and Requirements System (RACER) Cost Database Software, Version 8.1.0 (Earth Tech, Inc. 2006).

Acronyms:
ARAR - Applicable or Relevant and Appropriate Requirement
FS - Feasibility Study
ICs - Institutional Controls
M - Million
UU/UE - Unrestricted Use/Unrestricted Exposure

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Figure 7. Areas IX and X Alternatives Evaluation Summary

	Alternative 1 No Action	Alternative 2 Removal/ Backfill and Off-Site Disposal (UU/UE)	Alternative 3 *In situ* Treatment[2] and ICs	Alternative 4 MNR and ICs	Alternative 5 Focused Removal/ Backfill, Off-Site Disposal, MNR, and ICs	Alternative 5A Focused Removal/ Activated Backfill, Off-Site Disposal, MNR, and ICs	Alternative 6 Focused Removal/ Backfill, Modified Shoreline Removal/ Backfill, Off-Site Disposal, MNR, and ICs	Alternative 6A Focused Removal/ Activated Backfill, Modified Shoreline Removal/ Backfill, Off-Site Disposal, MNR, and ICs	Alternative 7 Focused Removal/ Backfill, *In situ* treatment, Off-Site Disposal, MNR, and ICs
Overall Protection of Human Health and the Environment	Not protective	Protective	Protective	Protective	Protective	Protective	Protective	Protective	Protective
Compliance with ARARs	Does not comply with ARARs	Complies with ARARs	Complies with ARARs	Complies with ARARs	Complies with ARARs	Complies with ARARs	Complies with ARARs	Complies with ARARs	Complies with ARARs
Long-Term Effectiveness and Permanence	Low	Moderate	Low	Low to Moderate	High	High	High	High	High
Reduction in Toxicity, Mobility and Volume through Treatment	Low	Low	Moderate to High	Low	Low	Moderate	Low	Moderate	Moderate to High
Short Term Effectiveness	Moderate	Low to Moderate	Moderate	Moderate	Moderate to High	Moderate to High	High	High	Moderate to High
Implementability	High	Moderate	Moderate	Moderate to High	Moderate	Moderate	Moderate	Moderate	Moderate
Cost ($M)[1]	$0	$39.7	$18.1	$2.6	$20.9	$27.2	$21.3	$28.1	$23.3

Low — Low to Moderate — Moderate — Moderate to High — High

[1] The 2017 costs were updated based on the same escalation factor of 2.1% (1.021) which was utilized in the Final Feasibility Study (FS) for Parcel F (Barajas & Associates, Inc., 2008) and was developed based on the Remedial Action Cost Engineering and Requirements System (RACER) Cost Database Software, Version 8.1.0 (Earth Tech, Inc. 2006).

[2] This technology was referred to as *in situ* stabilization in the Parcel F FS, but is referred to here as *in situ* treatment, which is more appropriate for the application of carbon-based amendments. Stabilization technologies often use other amendments (i.e. cement) which are not included here.

Acronyms:
ARAR - Applicable or Relevant and Appropriate Requirement
FS - Feasibility Study
ICs - Institutional Controls
M - Million
MNR - Monitored Natural Recovery

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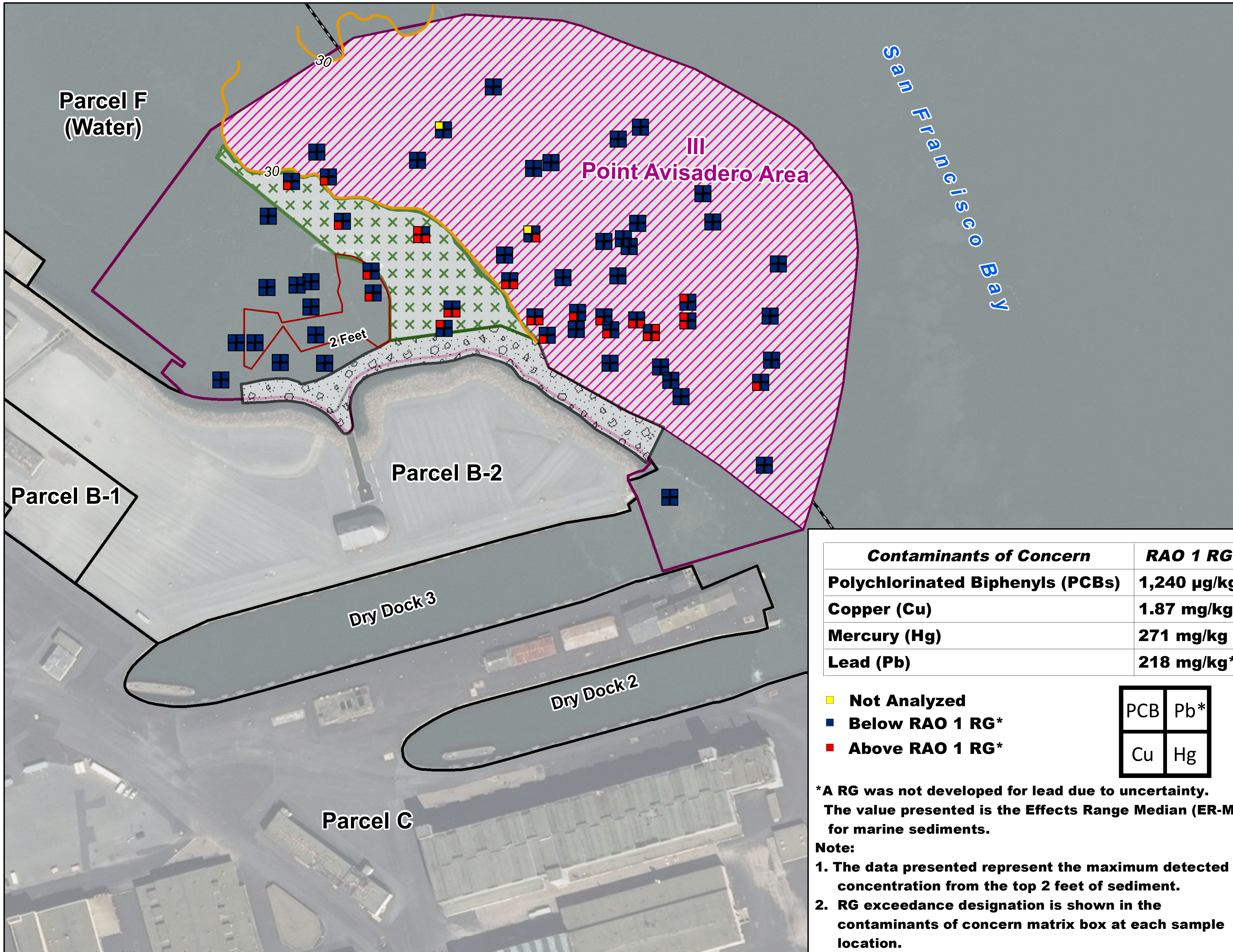

Contaminants of Concern	*RAO 1 RG*
Polychlorinated Biphenyls (PCBs)	**1,240 µg/kg**
Copper (Cu)	**1.87 mg/kg**
Mercury (Hg)	**271 mg/kg**
Lead (Pb)	**218 mg/kg***

Not Analyzed
Below RAO 1 RG*
Above RAO 1 RG*

PCB	Pb*
Cu	Hg

***A RG was not developed for lead due to uncertainty. The value presented is the Effects Range Median (ER-M) for marine sediments.**

Note:

1. **The data presented represent the maximum detected concentration from the top 2 feet of sediment.**
2. **RG exceedance designation is shown in the contaminants of concern matrix box at each sample location.**

Legend

- 30-foot Bathymetry Contour Line
- Removal to Labeled Depth Below Sediment Surface
- Cap
- Existing Rip Rap
- Surf Scoter Limited Forage Area
- Parcel F Areas
- Navy Property Boundary
- Parcel Boundaries

Note:

µg/kg – microgram per kilogram
mg/kg – milligram per kilogram
RG – Remediation Goal
RAO – Remedial Action Objective

200 0 200
Feet
1 inch = 200 feet

Hunters Point Naval Shipyard, San Francisco, California
U.S. Department of the Navy, BRAC PMO West

Figure 8
Footprint of Cleanup Alternative 4/4A, Area III

Parcel F Record of Decision

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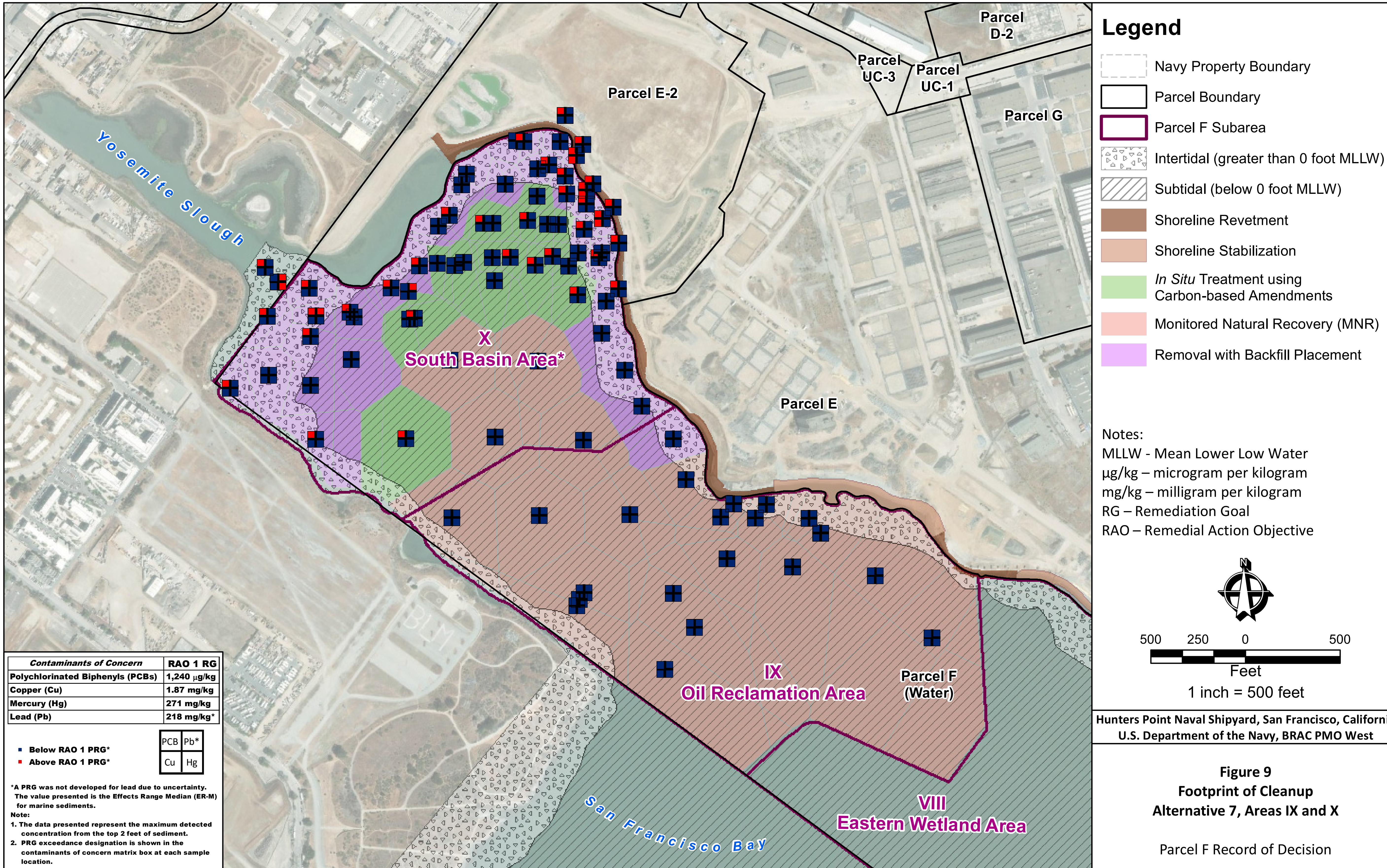

Contaminants of Concern	RAO 1 RG
Polychlorinated Biphenyls (PCBs)	1,240 µg/kg
Copper (Cu)	1.87 mg/kg
Mercury (Hg)	271 mg/kg
Lead (Pb)	218 mg/kg*

*A PRG was not developed for lead due to uncertainty. The value presented is the Effects Range Median (ER-M) for marine sediments.

Note:
1. The data presented represent the maximum detected concentration from the top 2 feet of sediment.
2. PRG exceedance designation is shown in the contaminants of concern matrix box at each sample location.

Hunters Point Naval Shipyard, San Francisco, California
U.S. Department of the Navy, BRAC PMO West

Figure 9
Footprint of Cleanup
Alternative 7, Areas IX and X

Parcel F Record of Decision

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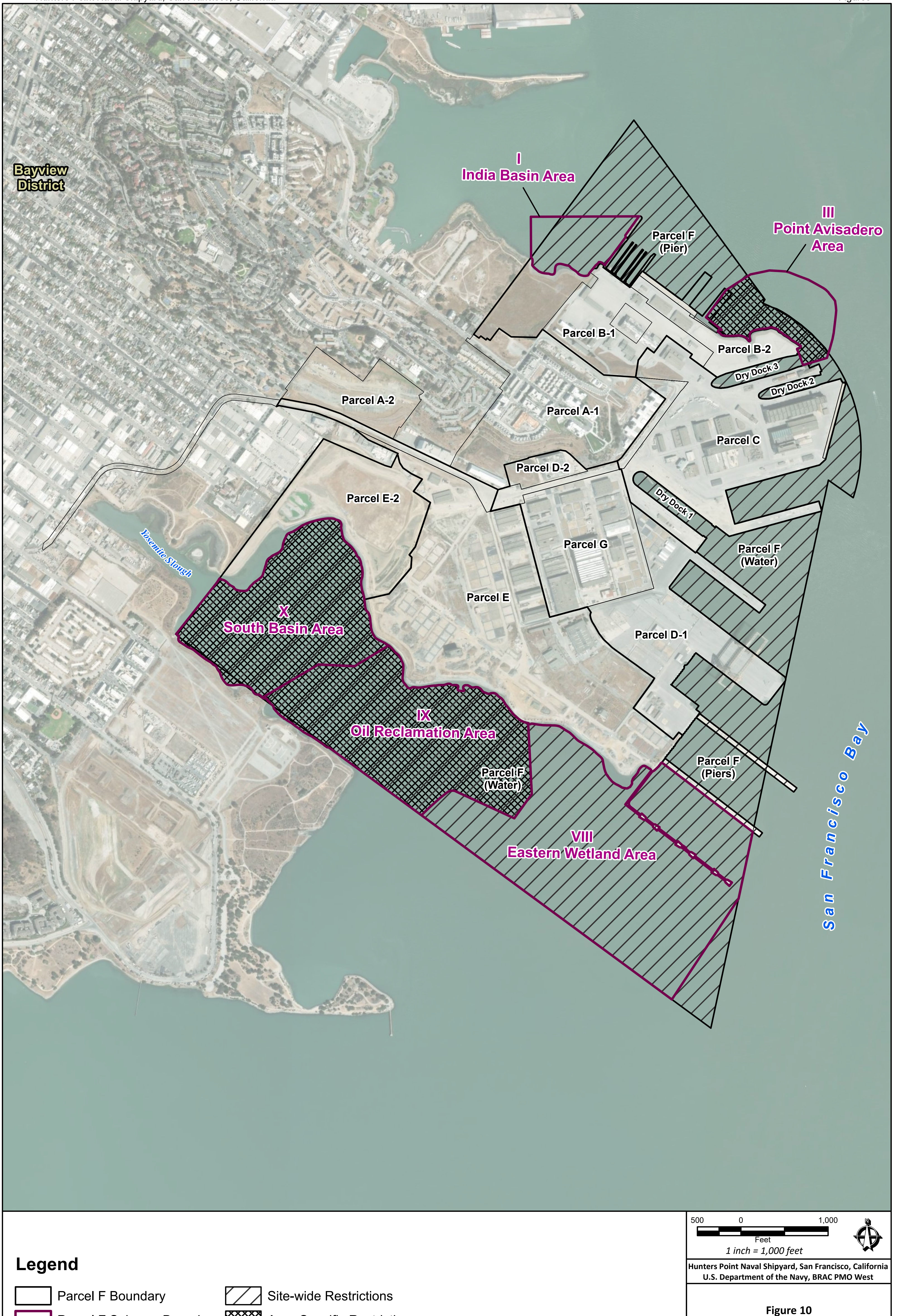

Figure 10
Parcel F Areas
Requiring Institutional Controls

Parcel F Record of Decision

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ATTACHMENT 1

ADMINISTRATIVE RECORD INDEX

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ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_003004 MINUTES 8	**06-13-1994**	PRC ENVIRONMENTAL MANAGEMENT, INC.	MEETING MINUTES FOR TECHNICAL MEETING HELD ON 11 APRIL 1994 TO DISCUSS ECOLOGICAL RISK ASSESSMENT	YES	PARCEL E-2 PARCEL F SITE 00001 SITE 00078
AR_N00217_003055 CORRESPONDENCE 3	**11-23-1994**	NAVFAC - WESTERN DIVISION	RESPONSE TO LETTERS DATED 7 OCTOBER 1994 AND 15 NOVEMBER 1994 REQUESTING NAVY'S POSITION REGARDING STATUS OF OFF-SHORE AREA; PROPOSAL TO CREATE PARCEL F AND INCLUDE IT IN PHASE 1B ECOLOGICAL RISK ASSESSMENT	YES	PARCEL A PARCEL B PARCEL C PARCEL D PARCEL E PARCEL F SITE 00007 SITE 00028 SITE 00036 SITE 00039 SITE 00078
AR_N00217_003227 CORRESPONDENCE 3	**03-05-1995**	NAVFAC - EFA WEST	TRANSMITTAL OF DRAFT PARCEL F PRELIMINARY ASSESSMENT, DATED 22 FEBRUARY 1995	YES	PARCEL B PARCEL F SITE 00007 SITE 00078

Wednesday, September 18, 2024

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UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_003093 CORRESPONDENCE 11	**06-30-1995**	NAVFAC - EFA WEST	TRANSMITTAL OF MAY 1995 MONTHLY PROGRESS REPORT, DATED 30 JUNE 1995	YES	PARCEL A PARCEL B PARCEL C PARCEL D PARCEL E PARCEL F SITE 00001 SITE 00002 SITE 00003 SITE 00006 SITE 00007 SITE 00009 SITE 00011 SITE 00012 SITE 00014 SITE 00015 SITE 00021 SITE 00028 SITE 00036 SITE 00039 SITE 00057 SITE 00078

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UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_003183 CORRESPONDENCE 8	**12-04-1995**	NAVY ENVIRONMENTAL HEALTH CENTER - NORFOLK, VA	TRANSMITTAL OF 1) COMMENTS ON PRELIMINARY DRAFT BASEWIDE QUALITY ASSURANCE PROJECT PLAN, VOLUMES 1 AND 2 OF 2, DATED 4 OCTOBER 1995; AND 2) MEDICAL/HEALTH COMMENTS SURVEY	YES	BASEWIDE PARCEL B PARCEL C PARCEL D PARCEL E PARCEL F SITE 00007 SITE 00028 SITE 00036 SITE 00039 SITE 00078

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UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_003189 CORRESPONDENCE 14	**12-20-1995**	NAVFAC - EFA WEST	TRANSMITTAL OF NOVEMBER 1995 MONTHLY PROGRESS REPORT, DATED 15 DECEMBER 1995	YES	PARCEL A PARCEL B PARCEL C PARCEL D PARCEL E PARCEL F SITE 00002 SITE 00003 SITE 00006 SITE 00007 SITE 00009 SITE 00011 SITE 00018 SITE 00023 SITE 00026 SITE 00028 SITE 00033 SITE 00036 SITE 00037 SITE 00039 SITE 00050 SITE 00053 SITE 00055 SITE 00057 SITE 00058 SITE 00078

Wednesday, September 18, 2024

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UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_003191 CORRESPONDENCE 8	**01-02-1996**	NAVY ENVIRONMENTAL HEALTH CENTER - NORFOLK, VA	TRANSMITTAL OF 1) COMMENTS ON RESPONSE TO COMMENTS PRELIMINARY DRAFT BASEWIDE QUALITY ASSURANCE PROJECT PLAN, VOLUMES 1 AND 2 OF 2, DATED 4 OCTOBER 1995; AND 2) MEDICAL/HEALTH COMMENTS SURVEY	YES	BASEWIDE PARCEL B PARCEL C PARCEL D PARCEL E PARCEL F SITE 00007 SITE 00028 SITE 00036 SITE 00039 SITE 00078
AR_N00217_003198 CORRESPONDENCE 6	**01-29-1996**	U.S. EPA - SAN FRANCISCO, CA	COMMENTS ON DRAFT BASEWIDE QUALITY ASSURANCE PROJECT PLAN, REVISION 1, DATED 11 DECEMBER 1995	YES	BASEWIDE PARCEL B PARCEL C PARCEL D PARCEL E PARCEL F SITE 00007 SITE 00028 SITE 00036 SITE 00039 SITE 00078

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UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_003203 CORRESPONDENCE 2	**02-13-1996**	PRC ENVIRONMENTAL MANAGEMENT, INC.	TRANSMITTAL OF DRAFT UPDATED COMMUNITY RELATIONS PLAN, DATED 1 FEBRUARY 1996	YES	PARCEL A PARCEL B PARCEL C PARCEL D PARCEL E PARCEL F SITE 00007 SITE 00028 SITE 00036 SITE 00039 SITE 00078
AR_N00217_003204 CORRESPONDENCE 2	**02-13-1996**	PRC ENVIRONMENTAL MANAGEMENT, INC.	TRANSMITTAL OF DRAFT UPDATED COMMUNITY RELATIONS PLAN, DATED 1 FEBRUARY 1996	YES	PARCEL A PARCEL B PARCEL C PARCEL D PARCEL E PARCEL F SITE 00007 SITE 00028 SITE 00036 SITE 00039 SITE 00078

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UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_003205 CORRESPONDENCE 2	**02-13-1996**	PRC ENVIRONMENTAL MANAGEMENT, INC.	TRANSMITTAL OF DRAFT UPDATED COMMUNITY RELATIONS PLAN, DATED 1 FEBRUARY 1996	YES	PARCEL A PARCEL B PARCEL C PARCEL D PARCEL E PARCEL F SITE 00007 SITE 00028 SITE 00036 SITE 00039 SITE 00078
AR_N00217_003219 CORRESPONDENCE 2	**02-15-1996**	U.S. EPA - SAN FRANCISCO, CA	CONCURRENCE WITH FIELD VARIANCE ON THE PHASE 1B ECOLOGICAL RISK ASSESSMENT	YES	PARCEL F SITE 00078

Wednesday, September 18, 2024

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UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_003257 CORRESPONDENCE 13	**04-18-1996**	NAVFAC - EFA WEST	TRANSMITTAL OF MARCH 1996 MONTHLY PROGRESS REPORT, DATED 18 APRIL 1996	YES	BLDG 0000364 OU 0000001 OU 0000002 PARCEL B PARCEL C PARCEL D PARCEL E PARCEL F SITE 00001 SITE 00002 SITE 00003 SITE 00006 SITE 00007 SITE 00009 SITE 00018 SITE 00021 SITE 00028 SITE 00036 SITE 00039 SITE 00078
AR_N00217_003340 CORRESPONDENCE 5	**07-24-1996**	NAVFAC - EFA WEST	PROPOSED MODIFICATION TO FEDERAL FACILITIES AGREEMENT SCHEDULE FOR DELIVERY OF DRAFT ECOLOGICAL RISK ASSESSMENT PHASE 1B REPORT	YES	PARCEL E PARCEL F SITE 00039 SITE 00078

Wednesday, September 18, 2024

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UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_003354 CORRESPONDENCE 3	**08-12-1996**	U.S. EPA - SAN FRANCISCO, CA	CONCURRENCE WITH PROPOSED MODIFICATION TO FEDERAL FACILITIES AGREEMENT SCHEDULE FOR DELIVERY OF DRAFT ECOLOGICAL RISK ASSESSMENT PHASE 1B REPORT	YES	PARCEL E PARCEL F SITE 00039 SITE 00078

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UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_003364 REPORT 13	**09-10-1996**	NAVFAC - EFA WEST	TRANSMITTAL OF JULY 1996 MONTHLY PROGRESS REPORT, DATED 22 AUGUST 1996	YES	PARCEL A PARCEL B PARCEL C PARCEL D PARCEL E PARCEL F SITE 00001 SITE 00002 SITE 00003 SITE 00006 SITE 00007 SITE 00009 SITE 00011 SITE 00018 SITE 00021 SITE 00023 SITE 00026 SITE 00028 SITE 00033 SITE 00036 SITE 00037 SITE 00039 SITE 00050 SITE 00053 SITE 00055 SITE 00057 SITE 00058 SITE 00072

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UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
					SITE 00078

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UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_003365 REPORT 14	**09-16-1996**	NAVFAC - EFA WEST	TRANSMITTAL OF AUGUST 1996 MONTHLY PROGRESS REPORT, DATED 17 SEPTEMBER 1996	YES	PARCEL A PARCEL B PARCEL C PARCEL D PARCEL E PARCEL F SITE 00001 SITE 00001/21 SITE 00003 SITE 00006 SITE 00007 SITE 00009 SITE 00011 SITE 00021 SITE 00023 SITE 00026 SITE 00028 SITE 00033 SITE 00036 SITE 00037 SITE 00039 SITE 00050 SITE 00053 SITE 00055 SITE 00057 SITE 00058 SITE 00078

Wednesday, September 18, 2024

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_003368 CORRESPONDENCE 4	**09-19-1996**	NAVFAC - EFA WEST	PROPOSED MODIFICATION ON FEDERAL FACILITY AGREEMENT SCHEDULE FOR DELIVERY OF DRAFT ECOLOGICAL RISK ASSESSMENT PHASE 1B REPORT	YES	PARCEL E-2 PARCEL F SITE 00001 SITE 00078
AR_N00217_003376 CORRESPONDENCE 3	**09-30-1996**	NAVFAC - EFA WEST	TRANSMITTAL OF DRAFT PHASE 1B ECOLOGICAL RISK ASSESSMENT, VOLUMES 1 AND 2 OF 2, DATED 30 SEPTEMBER 1996	YES	PARCEL E-2 PARCEL F SITE 00001 SITE 00078
AR_N00217_003410 CORRESPONDENCE 3	**11-15-1996**	NAVFAC - EFA WEST	TRANSMITTAL OF DRAFT PHASE 1B ECOLOGICAL RISK ASSESSMENT, VOLUME 1 OF 2 - PART 2, RISK CHARACTERIZATION TO AQUATIC RECEPTORS, DATED 15 NOVEMBER 1996	YES	PARCEL E-2 PARCEL F SITE 00001 SITE 00078

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ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_003461 CORRESPONDENCE 4	**12-01-1996**	NAVFAC - EFA WEST	RESPONSE TO COMMENTS ON DRAFT FINAL UPDATED COMMUNITY RELATIONS PLAN, DATED 1 DECEMBER 1996	YES	PARCEL A PARCEL B PARCEL C PARCEL D PARCEL E PARCEL F SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00018 SITE 00020 SITE 00021 SITE 00022 SITE 00023

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ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
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ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
					SITE 00063 SITE 00064 SITE 00065 SITE 00066 SITE 00067 SITE 00068 SITE 00069 SITE 00070 SITE 00071 SITE 00072 SITE 00073 SITE 00076 SITE 00078 SITE SI-31 SITE SI-32 SITE SI-38 SITE SI-40 SITE SI-44 SITE SI-45 SITE SI-47 SITE SI-48 SITE SI-54 SITE SI-74 SITE SI-75

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_003439 CORRESPONDENCE 7	**12-16-1996**	NAVFAC - EFA WEST	TRANSMITTAL OF PUBLIC SUMMARY ECOLOGICAL RISK ASSESSMENT, PHASE 1B	YES	PARCEL E PARCEL F SITE 00039 SITE 00078

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_003458 CORRESPONDENCE 2	**01-31-1997**	NAVFAC - EFA WEST	TRANSMITTAL OF 1) DRAFT FINAL UPDATED COMMUNITY RELATIONS PLAN, DATED 1 DECEMBER 1996; AND 2) RESPONSE TO COMMENTS FROM DTSC ON DRAFT FINAL UPDATED COMMUNITY RELATIONS PLAN, DATED 1 MAY 1996	YES	PARCEL A PARCEL B PARCEL C PARCEL D PARCEL E PARCEL F SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00018 SITE 00020 SITE 00021 SITE 00022 SITE 00023

Wednesday, September 18, 2024

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
					SITE 00024 SITE 00025 SITE 00026 SITE 00027 SITE 00028 SITE 00029 SITE 00030 SITE 00033 SITE 00034 SITE 00035 SITE 00036 SITE 00037 SITE 00039 SITE 00042 SITE 00045 SITE 00046 SITE 00049 SITE 00050 SITE 00051 SITE 00052 SITE 00053 SITE 00055 SITE 00056 SITE 00057 SITE 00058 SITE 00060 SITE 00061 SITE 00062

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
					SITE 00063 SITE 00064 SITE 00065 SITE 00066 SITE 00067 SITE 00068 SITE 00069 SITE 00070 SITE 00071 SITE 00072 SITE 00073 SITE 00076 SITE 00078 SITE SI-31 SITE SI-32 SITE SI-38 SITE SI-40 SITE SI-44 SITE SI-45 SITE SI-47 SITE SI-48 SITE SI-54 SITE SI-74 SITE SI-75

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_003462 CORRESPONDENCE 3	**02-04-1997**	NAVFAC - EFA WEST	TRANSMITTAL OF DRAFT RESPONSE TO COMMENTS FROM MULTIPLE AGENCIES ON DRAFT PHASE 1B ECOLOGICAL RISK ASSESSMENT	YES	PARCEL E-2 PARCEL F SITE 00001 SITE 00078
AR_N00217_003466 CORRESPONDENCE 11	**02-19-1997**	NAVFAC - EFA WEST	TRANSMITTAL OF JANUARY 1997 MONTHLY PROGRESS REPORT, DATED 20 FEBRUARY 1997	YES	PARCEL A PARCEL B PARCEL C PARCEL D PARCEL E PARCEL F SITE 00001 SITE 00003 SITE 00006 SITE 00007 SITE 00021 SITE 00028 SITE 00036 SITE 00039 SITE 00050 SITE 00078

Wednesday, September 18, 2024

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_005645 REPORT 404	**02-21-1997**	PRC ENVIRONMENTAL MANAGEMENT, INC.	BASE REALIGNMENT AND CLOSURE (BRAC) CLEANUP PLAN, REVISION 3	YES	DRY DOCK 0004 PARCEL A PARCEL B PARCEL C PARCEL D PARCEL E PARCEL F SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00028 SITE 00036 SITE 00039 SITE 00078

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_003476 CORRESPONDENCE 4	**03-07-1997**	NAVFAC - EFA WEST	TRANSMITTAL OF BASE REALIGNMENT AND CLOSURE (BRAC) CLEANUP PLAN (BCP), REVISION 3, DATED 21 FEBRUARY 1997	YES	PARCEL A PARCEL B PARCEL C PARCEL D PARCEL E PARCEL F SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00018 SITE 00020 SITE 00021 SITE 00022 SITE 00023

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
					SITE 00024 SITE 00025 SITE 00026 SITE 00027 SITE 00028 SITE 00029 SITE 00030 SITE 00032 SITE 00033 SITE 00034 SITE 00035 SITE 00036 SITE 00037 SITE 00039 SITE 00040 SITE 00042 SITE 00044 SITE 00046 SITE 00047 SITE 00048 SITE 00049 SITE 00052 SITE 00053 SITE 00054 SITE 00055 SITE 00056 SITE 00057 SITE 00058

Wednesday, September 18, 2024

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
					SITE 00060 SITE 00061 SITE 00062 SITE 00063 SITE 00064 SITE 00065 SITE 00066 SITE 00067 SITE 00068 SITE 00069 SITE 00070 SITE 00071 SITE 00072 SITE 00073 SITE 00074 SITE 00075 SITE 00076 SITE 00078 SITE SI-19 SITE SI-31 SITE SI-41 SITE SI-43 SITE SI-51 SITE SI-59 SITE SI-77 SITE SI-78

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_003473 CORRESPONDENCE 116	**03-17-1997**	PRC ENVIRONMENTAL MANAGEMENT, INC.	RESPONSE TO COMMENTS FROM MULTIPLE AGENCIES ON DRAFT PHASE 1B ECOLOGICAL RISK ASSESSMENT, VOLUME 1 - PART 1 AND VOLUME 2, DATED 30 SEPTEMBER 1996; AND VOLUME 1 - PART 2, DATED 15 NOVEMBER 1996	YES	PARCEL E-2 PARCEL F SITE 00001 SITE 00078
AR_N00217_003477 CORRESPONDENCE 11	**03-18-1997**	NAVFAC - EFA WEST	TRANSMITTAL OF FEBRUARY 1997 MONTHLY PROGRESS REPORT, DATED 19 MARCH 1997	YES	PARCEL A PARCEL B PARCEL C PARCEL D PARCEL E PARCEL F SITE 00001 SITE 00002 SITE 00003 SITE 00006 SITE 00007 SITE 00021 SITE 00028 SITE 00036 SITE 00039 SITE 00050 SITE 00078

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_003478 CORRESPONDENCE 11	**04-15-1997**	NAVFAC - EFA WEST	TRANSMITTAL OF MARCH 1997 MONTHLY PROGRESS REPORT, DATED 15 APRIL 1997	YES	PARCEL A PARCEL B PARCEL C PARCEL D PARCEL E PARCEL F SITE 00001 SITE 00002 SITE 00003 SITE 00006 SITE 00007 SITE 00021 SITE 00028 SITE 00036 SITE 00039 SITE 00050 SITE 00078

Wednesday, September 18, 2024

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_003513 REPORT 10	**06-16-1997**	NAVFAC - EFA WEST	TRANSMITTAL OF MAY 1997 MONTHLY PROGRESS REPORT, DATED 17 JUNE 1997	YES	PARCEL A PARCEL B PARCEL C PARCEL D PARCEL E PARCEL F SITE 00001 SITE 00003 SITE 00006 SITE 00007 SITE 00011 SITE 00021 SITE 00023 SITE 00026 SITE 00028 SITE 00033 SITE 00036 SITE 00037 SITE 00039 SITE 00050 SITE 00053 SITE 00055 SITE 00057 SITE 00058 SITE 00078

Wednesday, September 18, 2024

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_003518 REPORT 10	**07-16-1997**	NAVFAC - EFA WEST	TRANSMITTAL OF JUNE 1997 MONTHLY PROGRESS REPORT, DATED 16 JULY 1997	YES	PARCEL A PARCEL B PARCEL C PARCEL D PARCEL E PARCEL F SITE 00001 SITE 00003 SITE 00006 SITE 00007 SITE 00011 SITE 00021 SITE 00023 SITE 00026 SITE 00028 SITE 00033 SITE 00036 SITE 00037 SITE 00039 SITE 00050 SITE 00053 SITE 00055 SITE 00057 SITE 00058 SITE 00078

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_003528 REPORT 9	**08-15-1997**	NAVFAC - EFA WEST	TRANSMITTAL OF JULY 1997 MONTHLY PROGRESS REPORT, DATED 15 AUGUST 1997	YES	PARCEL B PARCEL C PARCEL D PARCEL E PARCEL F SITE 00001 SITE 00003 SITE 00006 SITE 00007 SITE 00009 SITE 00011 SITE 00021 SITE 00023 SITE 00026 SITE 00028 SITE 00033 SITE 00036 SITE 00037 SITE 00039 SITE 00050 SITE 00053 SITE 00055 SITE 00057 SITE 00058 SITE 00078

Wednesday, September 18, 2024

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_003532 REPORT 10	**09-18-1997**	NAVFAC - EFA WEST	TRANSMITTAL OF AUGUST 1997 MONTHLY PROGRESS REPORT, DATED 17 SEPTEMBER 1997	YES	PARCEL B PARCEL C PARCEL D PARCEL E PARCEL F SITE 00001 SITE 00003 SITE 00006 SITE 00007 SITE 00009 SITE 00011 SITE 00021 SITE 00023 SITE 00026 SITE 00028 SITE 00033 SITE 00036 SITE 00037 SITE 00039 SITE 00050 SITE 00053 SITE 00055 SITE 00057 SITE 00058 SITE 00078

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_003669 CORRESPONDENCE 65	**10-21-1997**	NAVFAC - EFA WEST	REQUEST FOR IDENTIFICATION OF STATE APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS FOR PARCELS C, E, AND F STUDIES	YES	PARCEL C PARCEL E PARCEL F SITE 00028 SITE 00039 SITE 00078
AR_N00217_003671 CORRESPONDENCE 10	**11-17-1997**	NAVFAC - EFA WEST	TRANSMITTAL OF OCTOBER 1997 MONTHLY PROGRESS REPORT, DATED 17 NOVEMBER 1997	YES	PARCEL B PARCEL C PARCEL D PARCEL E PARCEL F SITE 00001 SITE 00006 SITE 00007 SITE 00021 SITE 00028 SITE 00036 SITE 00039 SITE 00050 SITE 00078

Wednesday, September 18, 2024

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_003691 REPORT 9	**12-15-1997**	NAVFAC - EFA WEST	TRANSMITTAL OF NOVEMBER 1997 MONTHLY PROGRESS REPORT, DATED 15 DECEMBER 1997	YES	PARCEL A PARCEL B PARCEL C PARCEL D PARCEL E PARCEL F SITE 00001 SITE 00003 SITE 00006 SITE 00007 SITE 00009 SITE 00021 SITE 00028 SITE 00036 SITE 00039 SITE 00050 SITE 00057 SITE 00078

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_003705 CORRESPONDENCE 9	**01-15-1998**	NAVFAC - EFA WEST	TRANSMITTAL OF DECEMBER 1997 MONTHLY PROGRESS REPORT, DATED 15 JANUARY 1998	YES	PARCEL A PARCEL B PARCEL C PARCEL D PARCEL E PARCEL F SITE 00001 SITE 00003 SITE 00006 SITE 00007 SITE 00009 SITE 00021 SITE 00028 SITE 00036 SITE 00039 SITE 00050 SITE 00057 SITE 00078

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_003706 CORRESPONDENCE 9	**02-18-1998**	NAVFAC - EFA WEST	TRANSMITTAL OF JANUARY 1998 MONTHLY PROGRESS REPORT, DATED 18 FEBRUARY 1998	YES	PARCEL A PARCEL B PARCEL C PARCEL D PARCEL E PARCEL F SITE 00001 SITE 00003 SITE 00006 SITE 00007 SITE 00009 SITE 00011 SITE 00021 SITE 00023 SITE 00026 SITE 00028 SITE 00033 SITE 00036 SITE 00037 SITE 00039 SITE 00050 SITE 00053 SITE 00055 SITE 00057 SITE 00058 SITE 00078

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_003717 CORRESPONDENCE 9	**03-16-1998**	NAVFAC - EFA WEST	TRANSMITTAL OF FEBRUARY 1998 MONTHLY PROGRESS REPORT, DATED 17 MARCH 1998	YES	PARCEL A PARCEL B PARCEL C PARCEL D PARCEL E PARCEL F SITE 00001 SITE 00003 SITE 00005 SITE 00007 SITE 00009 SITE 00011 SITE 00021 SITE 00023 SITE 00026 SITE 00028 SITE 00033 SITE 00037 SITE 00039 SITE 00050 SITE 00053 SITE 00055 SITE 00057 SITE 00058 SITE 00078

Wednesday, September 18, 2024

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_003719 CORRESPONDENCE 3	**04-03-1998**	NAVFAC - EFA WEST	TRANSMITTAL OF DRAFT PARCEL F FEASIBILITY STUDY REPORT, DATED 3 APRIL 1998	YES	PARCEL F SITE 00078
AR_N00217_003728 CORRESPONDENCE 9	**04-15-1998**	NAVFAC - EFA WEST	TRANSMITTAL OF MARCH 1998 MONTHLY PROGRESS REPORT, DATED 15 APRIL 1998	YES	PARCEL A PARCEL B PARCEL C PARCEL D PARCEL E PARCEL F SITE 00001 SITE 00003 SITE 00006 SITE 00007 SITE 00009 SITE 00021 SITE 00028 SITE 00036 SITE 00039 SITE 00050 SITE 00057 SITE 00078
AR_N00217_003727 CORRESPONDENCE 7	**04-16-1998**	NAVFAC - EFA WEST	TRANSMITTAL OF PUBLIC SUMMARY, DRAFT PARCEL F FEASIBILITY STUDY REPORT	YES	PARCEL F SITE 00078

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_003743 CORRESPONDENCE 17	**04-18-1998**	NAVFAC - EFA WEST	TRANSMITTAL OF 1) APRIL 1998 MONTHLY PROGRESS REPORT, DATED 14 MAY 1998; AND 2) SCHEDULES, PARCELS A THROUGH F AND BASEWIDE	YES	BASEWIDE PARCEL A PARCEL B PARCEL C PARCEL D PARCEL E PARCEL F SITE 00001 SITE 00003 SITE 00006 SITE 00007 SITE 00009 SITE 00021 SITE 00028 SITE 00036 SITE 00039 SITE 00050 SITE 00057 SITE 00078

Wednesday, September 18, 2024

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_003739 REPORT 11	**06-15-1998**	NAVFAC - EFA WEST	TRANSMITTAL OF 1) MAY 1998 MONTHLY PROGRESS REPORT, DATED 15 JUNE 1998; AND 2) SCHEDULE, PARCEL E	YES	PARCEL A PARCEL B PARCEL C PARCEL D PARCEL E PARCEL F SITE 00001 SITE 00003 SITE 00007 SITE 00021 SITE 00028 SITE 00036 SITE 00039 SITE 00078
AR_N00217_003791 CORRESPONDENCE 9	**06-25-1998**	DTSC - BERKELEY, CA	COMMENTS FROM HUMAN AND ECOLOGICAL RISK DIVISION, DATED 25 JUNE 1998 ON DRAFT PARCEL F FEASIBILITY STUDY REPORT, DATED 3 APRIL 1998	YES	AOC 000078 PARCEL F SITE 00078
AR_N00217_003792 CORRESPONDENCE 8	**07-02-1998**	ARC ECOLOGY	COMMENTS ON DRAFT PARCEL F FEASIBILITY STUDY REPORT, DATED 3 APRIL 1998	YES	AOC 000078 PARCEL F SITE 00078

Wednesday, September 18, 2024

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_003764 CORRESPONDENCE 10	**09-15-1998**	NAVFAC - EFA WEST	TRANSMITTAL OF AUGUST 1998 MONTHLY PROGRESS REPORT, DATED 15 SEPTEMBER 1998	YES	PARCEL B PARCEL C PARCEL D PARCEL E PARCEL F SITE 00001 SITE 00003 SITE 00006 SITE 00007 SITE 00009 SITE 00010 SITE 00018 SITE 00021 SITE 00028 SITE 00036 SITE 00039 SITE 00050 SITE 00057 SITE 00060 SITE 00078
AR_N00217_003765 CORRESPONDENCE 3	**09-24-1998**	NAVFAC - EFA WEST	SUMMARY OF MAJOR COMMENTS FROM MULTIPLE AGENCIES ON DRAFT PARCEL F FEASIBILITY STUDY REPORT, DATED 3 APRIL 1998	YES	PARCEL F SITE 00078
AR_N00217_003766 REPORT 70	**09-30-1998**	TETRA TECH EM, INC.	ANALYSIS OF INTEGRATION OF PARCEL E REMEDIAL ALTERNATIVES AND PARCEL F REMEDIAL ALTERNATIVES	YES	PARCEL E PARCEL F SITE 00039 SITE 00078

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_003779 CORRESPONDENCE 11	**12-04-1998**	NAVFAC - EFA WEST	TRANSMITTAL OF OCTOBER 1998 MONTHLY PROGRESS REPORT, DATED 18 NOVEMBER 1998	YES	PARCEL A PARCEL B PARCEL C PARCEL D PARCEL E PARCEL F SITE 00001 SITE 00003 SITE 00006 SITE 00007 SITE 00009 SITE 00010 SITE 00018 SITE 00021 SITE 00028 SITE 00036 SITE 00039 SITE 00050 SITE 00057 SITE 00060 SITE 00078

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_003785 CORRESPONDENCE 11	**01-15-1999**	NAVFAC - EFA WEST	TRANSMITTAL OF DECEMBER 1998 MONTHLY PROGRESS REPORT, DATED 15 JANUARY 1999	YES	PARCEL A PARCEL B PARCEL C PARCEL D PARCEL E PARCEL F SITE 00001 SITE 00003 SITE 00006 SITE 00009 SITE 00010 SITE 00011 SITE 00021 SITE 00023 SITE 00026 SITE 00028 SITE 00033 SITE 00036 SITE 00037 SITE 00039 SITE 00053 SITE 00055 SITE 00057 SITE 00058 SITE 00078

Wednesday, September 18, 2024

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_003799 CORRESPONDENCE 11	**02-22-1999**	NAVFAC - EFA WEST	TRANSMITTAL OF JANUARY 1999 MONTHLY PROGRESS REPORT, DATED 22 FEBRUARY 1999	YES	PARCEL A PARCEL B PARCEL C PARCEL D PARCEL E PARCEL F SITE 00001 SITE 00007 SITE 00010 SITE 00018 SITE 00021 SITE 00028 SITE 00036 SITE 00039 SITE 00078
AR_N00217_003807 CORRESPONDENCE 4	**03-22-1999**	CRWQCB - OAKLAND, CA	COMMENTS ON RESPONSE TO COMMENTS ON DRAFT PARCEL F FEASIBILITY STUDY REPORT, DATED 3 APRIL 1998	YES	AOC 000078 PARCEL F SITE 00078

Wednesday, September 18, 2024

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_003819 CORRESPONDENCE 11	**03-22-1999**	NAVFAC - EFA WEST	TRANSMITTAL OF FEBRUARY 1998 MONTHLY PROGRESS REPORT, DATED 18 MARCH 1999	YES	PARCEL A PARCEL B PARCEL C PARCEL D PARCEL E PARCEL F SITE 00007 SITE 00010 SITE 00018 SITE 00028 SITE 00036 SITE 00039 SITE 00078
AR_N00217_000541 CORRESPONDENCE 7	**04-27-1999**	NAVFAC - EFA WEST	RESPONSE TO COMMENTS FROM MULTIPLE AGENCIES ON NAVY'S REQUEST FOR SCHEDULE REVISIONS; AND TRANSMITTAL OF FEDERAL FACILITY AGREEMENT SCHEDULES, PARCELS B, C, D, E AND F	YES	PARCEL B PARCEL C PARCEL D PARCEL E PARCEL F SITE 00007 SITE 00028 SITE 00036 SITE 00039 SITE 00078

Wednesday, September 18, 2024

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_003901 CORRESPONDENCE 11	**07-01-1999**	NAVFAC - EFA WEST	TRANSMITTAL OF MAY 1999 MONTHLY PROGRESS REPORT, DATED 30 JUNE 1999	YES	PARCEL A PARCEL B PARCEL C PARCEL D PARCEL E PARCEL F SITE 00001 SITE 00003 SITE 00006 SITE 00009 SITE 00011 SITE 00021 SITE 00023 SITE 00026 SITE 00028 SITE 00033 SITE 00036 SITE 00037 SITE 00039 SITE 00053 SITE 00055 SITE 00057 SITE 00058 SITE 00078

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_003877 CORRESPONDENCE 5	**08-02-1999**	NAVFAC - EFA WEST	REQUEST FOR FEDERAL FACILITY AGREEMENT SCHEDULE EXTENSION REQUEST FOR ISSUANCE OF DRAFT ECOLOGICAL RISK ASSESSMENT WORK PLAN FOR PARCEL F, OFFSHORE AREA; AND TRANSMITTAL OF REVISED FEDERAL FACILITY AGREEMENT SCHEDULE, PARCEL F, DATED 2 AUGUST 1999	YES	AOC 000078 PARCEL F SITE 00078

Wednesday, September 18, 2024

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_003907 CORRESPONDENCE 12	**09-01-1999**	NAVFAC - EFA WEST	TRANSMITTAL OF JULY 1999 MONTHLY PROGRESS REPORT, DATED 1 SEPTEMBER 1999	YES	PARCEL A PARCEL B PARCEL C PARCEL D PARCEL E PARCEL F SITE 00001 SITE 00003 SITE 00006 SITE 00007 SITE 00009 SITE 00011 SITE 00021 SITE 00023 SITE 00026 SITE 00028 SITE 00033 SITE 00036 SITE 00037 SITE 00039 SITE 00055 SITE 00057 SITE 00058 SITE 00078

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_005224 REPORT 6	**09-23-1999**	NAVFAC - WESTERN DIVISION	DOCUMENT SCHEDULES - PARCELS B THROUGH F	YES	PARCEL B PARCEL C PARCEL D PARCEL E PARCEL F SITE 00007 SITE 00028 SITE 00036 SITE 00039 SITE 00078
AR_N00217_003917 CORRESPONDENCE 2	**10-26-1999**	NAVFAC - EFA WEST	FEDERAL FACILITY AGREEMENT SCHEDULE EXTENSION FOR DRAFT PARCEL F FEASIBILITY STUDY REPORT, VOLUME 1	YES	PARCEL F SITE 00078
AR_N00217_007217 CORRESPONDENCE 3	**11-23-1999**	NAVFAC - EFA WEST	TRANSMITTAL OF 1) WORKING DRAFT DATA SUMMARY MEMORANDUM, PARCEL F, DATED 23 NOVEMBER 1999; 2) ATTACHMENT 1 - REPRESENTATIVE MAPS AND BOX PLOTS OF EXISTING DATA; 3) ATTACHMENT 2 - LETTER REPORT PRETEST TO EVALUATE THE POTENTIAL INFLUENCE OF CONFOUNDING FACTORS IN SEDIMENT BIOASSAYS; AND 4) ATTACHMENT 3 - DOSE ASSESSMENT MEMO FOR PARCEL F	YES	PARCEL F SITE 00078

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_006562 CORRESPONDENCE 10	**12-01-1999**	NAVFAC - EFA WEST	TRANSMITTAL OF MONTHLY PROGRESS REPORT, OCTOBER 1999, DATED 29 NOVEMBER 1999	YES	PARCEL A PARCEL B PARCEL C PARCEL D PARCEL E PARCEL F SITE 00006 SITE 00007 SITE 00009 SITE 00028 SITE 00036 SITE 00039 SITE 00078
AR_N00217_006565 CORRESPONDENCE 10	**12-20-1999**	NAVFAC - EFA WEST	TRANSMITTAL OF MONTHLY PROGRESS REPORT, NOVEMBER 1999, DATED 20 DECEMBER 1999	YES	PARCEL A PARCEL B PARCEL C PARCEL D PARCEL E PARCEL F SITE 00001 SITE 00007 SITE 00021 SITE 00028 SITE 00036 SITE 00039 SITE 00078 UST S-812

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_000245 MINUTES 67	**02-24-2000**	BECHTEL ENVIRONMENTAL, INC.	MEETING HANDOUTS FOR RESTORATION ADVISORY BOARD (RAB) MEETING HELD ON 24 FEBRUARY 2000 - INCLUDES AGENDA; RAB LISTING; MEETING MINUTES OF 10/21/99; 12/09/99; 01/18/00; AND 1/27/00; AND VARIOUS HANDOUTS	YES	PARCEL A PARCEL B PARCEL C PARCEL D PARCEL E PARCEL F SITE 00007 SITE 00028 SITE 00036 SITE 00039 SITE 00078
AR_N00217_000247 MINUTES 71	**04-27-2000**	BECHTEL ENVIRONMENTAL, INC.	MEETING HANDOUTS FOR RESTORATION ADVISORY BOARD (RAB) MEETING HELD ON 27 APRIL 2000 - INCLUDES AGENDA; 23 MARCH 2000 MEETING MINUTES; BRAC CLEANUP TEAM (BCT) 3 MARCH 2000 MEETING MINUTES; AND DRAFT EXPLANATION OF SIGNIFICANT DIFFERENCES	YES	PARCEL A PARCEL B PARCEL C PARCEL D PARCEL E PARCEL F SITE 00001 SITE 00007 SITE 00028 SITE 00036 SITE 00039 SITE 00078

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_003945 CORRESPONDENCE 3	**05-05-2000**	U.S. EPA - SAN FRANCISCO, CA	REQUEST TO ASSIST IN CALCULATING REALISTIC COST TO COMPLETE ESTIMATE TO HELP ADVANCE DISCUSSIONS ON EARLY TRANSFER	YES	PARCEL B PARCEL C PARCEL D PARCEL E PARCEL F SITE 00007 SITE 00028 SITE 00036 SITE 00039 SITE 00078
AR_N00217_003971 CORRESPONDENCE 7	**06-21-2000**	DTSC - BERKELEY, CA	COMMENTS OF DRAFT VALIDATION STUDY WORK PLAN, PARCEL F, DATED 15 MAY 2000	YES	PARCEL F SITE 00078
AR_N00217_003982 CORRESPONDENCE 7	**06-22-2000**	U.S. EPA - SAN FRANCISCO, CA	COMMENTS TO DRAFT VALIDATION STUDY WORK PLAN, PARCEL F, DATED 15 MAY 2000	YES	PARCEL F SITE 00078
AR_N00217_000082 CORRESPONDENCE 5	**06-28-2000**	CRWQCB - SAN FRANCISCO, CA	COMMENTS ON DRAFT VALIDATION STUDY WORK PLAN, PARCEL F, DATED 15 MAY 2000	YES	PARCEL F SITE 00078
AR_N00217_000060 CORRESPONDENCE 7	**06-29-2000**	NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION (NOAA) - SAN FRANCISCO, CA	COMMENTS ON DRAFT VALIDATION STUDY WORK PLAN, PARCEL F, DATED 15 MAY 2000	YES	PARCEL F SITE 00078

Wednesday, September 18, 2024

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_000111 CORRESPONDENCE 3	**08-03-2000**	NAVFAC - SOUTHWEST DIVISION	NOTICE TO THE FEDERAL FACILITY AGREEMENT SIGNATORIES THAT AN ADDITIONAL 30 DAYS WILL BE REQUIRED TO COMPLETE A DRAFT FINAL VALIDATION STUDY WORK PLAN FOR PARCEL F	YES	PARCEL F SITE 00078
AR_N00217_000158 CORRESPONDENCE 4	**08-22-2000**	CRWQCB - OAKLAND, CA	COMMENTS ON PROPOSAL FOR BIOACCUMULATION LINE OF EVIDENCE, PARCEL F VALIDATION STUDY, DATED 7 AUGUST 2000	YES	PARCEL F SITE 00078
AR_N00217_006657 CORRESPONDENCE 3	**08-28-2000**	NAVFAC - SOUTHWEST DIVISION	TRANSMITTAL OF FEDERAL FACILITY AGREEMENT SCHEDULE, DATED 28 AUGUST 2000	YES	PARCEL F SITE 00078
AR_N00217_000399 CORRESPONDENCE 10	**08-31-2000**	NAVFAC - SOUTHWEST DIVISION	TRANSMITTAL OF JULY 2000 MONTHLY PROGRESS REPORT	YES	PARCEL B PARCEL C PARCEL D PARCEL E PARCEL F SITE 00007 SITE 00028 SITE 00036 SITE 00039 SITE 00078

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_000258 FACT SHEET 11	**09-01-2000**	BECHTEL NATIONAL, INC.	ENVIRONMENTAL CLEANUP NEWSLETTER - PARCEL B, CLEANUP MOVING FORWARD	YES	PARCEL A PARCEL B PARCEL C PARCEL D PARCEL E PARCEL F SITE 00007 SITE 00028 SITE 00036 SITE 00039 SITE 00078
AR_N00217_000165 CORRESPONDENCE 6	**09-05-2000**	DTSC - BERKELEY, CA	COMMENTS FROM HUMAN AND ECOLOGICAL RISK DIVISION, DATED 23 AUGUST 2000 ON PROPOSAL FOR BIOACCUMULATION LINE OF EVIDENCE, PARCEL F VALIDATION STUDY, DATED 7 AUGUST 2000	YES	PARCEL F SITE 00078
AR_N00217_000223 CORRESPONDENCE 8	**10-10-2000**	U.S. EPA - SAN FRANCISCO, CA	COMMENT ON DRAFT FINAL VALIDATION STUDY WORK PLAN, PARCEL F	YES	PARCEL F SITE 00078
AR_N00217_000237 CORRESPONDENCE 5	**10-13-2000**	SAN FRANCISCO REDEVELOPMENT AGENCY - SAN FRANCISCO, CA	COMMENTS ON DRAFT FINAL VALIDATION STUDY WORK PLAN, PARCEL F	YES	PARCEL F SITE 00078

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_000240 ANALYTICAL DATA 9	**10-19-2000**	NAVFAC - SOUTHWEST DIVISION	TRANSMITTAL OF TECHNICAL JUSTIFICATION FOR THE PARCEL B THROUGH F INTERFACE, BEACH AMORTIZATION CONCEPTUAL DESIGN, DATED 19 OCTOBER 2000	YES	PARCEL B PARCEL C PARCEL D PARCEL E PARCEL F SITE 00007 SITE 00028 SITE 00036 SITE 00039 SITE 00078
AR_N00217_006662 CORRESPONDENCE 6	**10-19-2000**	NAVFAC - SOUTHWEST DIVISION	TRANSMITTAL OF FEDERAL FACILITY AGREEMENT SCHEDULE, PARCEL F, DATED 18 OCTOBER 2000	YES	PARCEL F SITE 00078
AR_N00217_000272 CORRESPONDENCE 7	**10-20-2000**	DTSC - BERKELEY, CA	COMMENTS ON DRAFT FINAL VALIDATION STUDY WORK PLAN, PARCEL F	YES	PARCEL F SITE 00078
AR_N00217_000282 CORRESPONDENCE 4	**10-24-2000**	CRWQCB - OAKLAND, CA	REQUEST FOR EXTENSION AND COMMENTS ON DRAFT FINAL VALIDATION STUDY WORK PLAN, PARCEL F	YES	PARCEL F SITE 00078

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_000256 MINUTES 20	**10-26-2000**	BECHTEL ENVIRONMENTAL, INC.	MEETING HANDOUTS FOR RESTORATION ADVISORY BOARD (RAB) MEETING HELD ON 26 OCTOBER 2000 - INCLUDES AGENDA; MEETING MINUTES; VARIOUS HANDOUTS; SEPTEMBER 2000 MONTHLY PROGRESS REPORT; AND FACT SHEET NO. 3	YES	PARCEL B PARCEL C PARCEL D PARCEL E PARCEL F SITE 00007 SITE 00028 SITE 00036 SITE 00039
AR_N00217_000283 CORRESPONDENCE 3	**10-26-2000**	U.S. EPA - SAN FRANCISCO, CA	REGULATOR CONCURRENCE OF AN EXTENSION REQUEST FOR PARCEL F BY THE NAVY	YES	PARCEL F SITE 00078
AR_N00217_000289 CORRESPONDENCE 3	**10-31-2000**	U.S. EPA - SAN FRANCISCO, CA	REVIEW OF TECHNICAL JUSTIFICATION FOR THE PARCEL B THROUGH F INTERFACE, BEACH AMORTIZATION CONCEPTUAL DESIGN, DATED 19 OCTOBER 2000	YES	PARCEL B PARCEL C PARCEL D PARCEL E PARCEL F SITE 00007 SITE 00028 SITE 00036 SITE 00039 SITE 00078

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_000297 CORRESPONDENCE 3	**10-31-2000**	CRWQCB - SAN FRANCISCO, CA	COMMENTS ON TECHNICAL JUSTIFICATION FOR THE PARCEL B THROUGH F INTERFACE, BEACH AMORTIZATION CONCEPTUAL DESIGN, DATED 19 OCTOBER 2000	YES	PARCEL B PARCEL C PARCEL D PARCEL E PARCEL F SITE 00007 SITE 00028 SITE 00036 SITE 00039 SITE 00078
AR_N00217_000290 CORRESPONDENCE 6	**11-02-2000**	SAN FRANCISCO REDEVELOPMENT AGENCY - SAN FRANCISCO, CA	COMMENTS ON TECHNICAL JUSTIFICATION FOR THE PARCEL B THROUGH F INTERFACE, BEACH AMORTIZATION CONCEPTUAL DESIGN, DATED 19 OCTOBER 2000	YES	PARCEL B PARCEL C PARCEL D PARCEL E PARCEL F SITE 00007 SITE 00028 SITE 00036 SITE 00039 SITE 00078

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_000410 CORRESPONDENCE 35	**11-14-2000**	NAVFAC - SOUTHWEST DIVISION	TRANSMITTAL OF REVISED FEDERAL FACILITY AGREEMENT SCHEDULE, 1) MICROSOFT PROJECT COMPLETE VERSION; AND 2) MICROSOFT EXCEL VERSION, DATED 13 NOVEMBER 2000	YES	PARCEL B PARCEL C PARCEL D PARCEL E PARCEL F SITE 00007 SITE 00028 SITE 00036 SITE 00039 SITE 00078
AR_N00217_006671 CORRESPONDENCE 3	**11-20-2000**	U.S. EPA - SAN FRANCISCO, CA	COMMENTS ON REVISED FEDERAL FACILITY AGREEMENT SCHEDULES, DATED 14 NOVEMBER 2000	YES	PARCEL B PARCEL C PARCEL D PARCEL E PARCEL F SITE 00007 SITE 00028 SITE 00036 SITE 00039 SITE 00078
AR_N00217_006714 CORRESPONDENCE 6	**11-20-2000**	NAVFAC - SOUTHWEST DIVISION	RESPONSE TO LETTER DATED 26 OCTOBER 2000 REGARDING PROPOSED FEDERAL FACILITY AGREEMENT SCHEDULE EXTENSION FOR PARCEL F	YES	PARCEL F SITE 00078

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_006673 CORRESPONDENCE 2	**11-21-2000**	CRWQCB - OAKLAND, CA	COMMENTS ON REVISED FEDERAL FACILITIES AGREEMENT SCHEDULES, DATED 14 NOVEMBER 2000	YES	PARCEL B PARCEL C PARCEL D PARCEL E PARCEL F SITE 00007 SITE 00028 SITE 00036 SITE 00039 SITE 00078
AR_N00217_006674 CORRESPONDENCE 4	**11-21-2000**	DTSC - BERKELEY, CA	COMMENTS ON PROPOSED REVISED FEDERAL FACILITIES AGREEMENT SCHEDULES, DATED 14 NOVEMBER 2000	YES	PARCEL B PARCEL C PARCEL D PARCEL E PARCEL F SITE 00007 SITE 00028 SITE 00036 SITE 00039 SITE 00078

Wednesday, September 18, 2024

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_006675 CORRESPONDENCE 4	**11-21-2000**	NAVFAC - SOUTHWEST DIVISION	REQUEST FOR CONCURRENCE WITH PROPOSED SURVEY PLANS TO DISTINGUISH CITY OF SAN FRANCISCO'S REUSE BOUNDARIES FOR CLEANUP AND TRANSFER OF PARCELS	YES	PARCEL B PARCEL C PARCEL D PARCEL E PARCEL F SITE 00007 SITE 00028 SITE 00036 SITE 00039 SITE 00078
AR_N00217_006677 CORRESPONDENCE 3	**11-22-2000**	NAVFAC - SOUTHWEST DIVISION	TRANSMITTAL OF RESPONSE TO COMMENTS FROM MULTIPLE AGENCIES ON DRAFT FINAL VALIDATION STUDY WORK PLAN, PARCEL F, DATED 22 NOVEMBER 2000	YES	PARCEL F SITE 00078
AR_N00217_000358 MINUTES 79	**12-07-2000**	BECHTEL ENVIRONMENTAL, INC.	MEETING MINUTES FOR RESTORATION ADVISORY BOARD (RAB) MEETING HELD ON 7 DECEMBER 2000 - INCLUDES MEETING MINUTES OF 26 OCTOBER 2000; REPORTER'S TRANSCRIPT; AGENDA; PUBLIC NOTICE; AND HANDOUTS	YES	PARCEL B PARCEL C PARCEL D PARCEL E PARCEL F SITE 00003 SITE 00007 SITE 00028 SITE 00036 SITE 00039 SITE 00078

Wednesday, September 18, 2024

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_006687 CORRESPONDENCE 7	**12-15-2000**	NAVFAC - SOUTHWEST DIVISION	RESPONSE TO LETTER DATED 21 NOVEMBER 2000 REGARDING PROPOSED REVISIONS TO FEDERAL FACILITY AGREEMENT SCHEDULE AND REQUEST FOR SIGNATORY MANAGEMENT MEETING IN EARLY JANUARY 2001	YES	PARCEL B PARCEL C PARCEL D PARCEL F SITE 00007 SITE 00028 SITE 00036 SITE 00078
AR_N00217_006689 CORRESPONDENCE 5	**12-27-2000**	DTSC - BERKELEY, CA	COMMENTS ON RESPONSE TO COMMENTS TO LETTER DATED 21 NOVEMBER 2000 REGARDING PROPOSED REVISIONS TO FEDERAL FACILITY AGREEMENT SCHEDULE	YES	PARCEL B PARCEL C PARCEL D PARCEL F SITE 00007 SITE 00028 SITE 00036 SITE 00078
AR_N00217_005800 CORRESPONDENCE 4	**01-16-2001**	NAVFAC - SOUTHWEST DIVISION	TRANSMITTAL OF DRAFT HUMAN HEALTH EVALUATION WORK PLAN, PARCEL F, DATED 12 JANUARY 2001	YES	PARCEL F SITE 00078

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_006698 CORRESPONDENCE 5	**01-24-2001**	NAVFAC - SOUTHWEST DIVISION	RESPONSE TO COMMENTS ON LETTER DATED 27 DECEMBER 2000 REGARDING PROPOSED REVISIONS TO FEDERAL FACILITY AGREEMENT SCHEDULE	YES	PARCEL B PARCEL C PARCEL D PARCEL E PARCEL F SITE 00007 SITE 00028 SITE 00036 SITE 00039 SITE 00078
AR_N00217_000363 MINUTES 61	**01-25-2001**	BECHTEL ENVIRONMENTAL, INC.	MEETING PUBLIC INFORMATION MATERIAL PACKAGE FOR RESTORATION ADVISORY BOARD (RAB) MEETING HELD ON 25 JANUARY 2001 - INCLUDES REPORTER'S TRANSCRIPT OF 25 JANUARY 2001 MEETING	YES	PARCEL B PARCEL C PARCEL D PARCEL E PARCEL F SITE 00007 SITE 00028 SITE 00036 SITE 00039 SITE 00078
AR_N00217_006701 CORRESPONDENCE 3	**02-19-2001**	NAVFAC - SOUTHWEST DIVISION	TRANSMITTAL OF FINAL MEETING MINUTES FOR PARCEL F MEETING HELD ON 11 JANUARY 2001	YES	PARCEL F SITE 00078

Wednesday, September 18, 2024

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_000386 CORRESPONDENCE 6	**02-20-2001**	OFFICE OF THE MAYOR - SAN FRANCISCO, CA	RESPONSE ON PROPOSAL FOR EXPLANATION OF SIGNIFICANT DIFFERENCES TO RECORD OF DECISION	YES	PARCEL B PARCEL F SITE 00007 SITE 00078
AR_N00217_000401 CORRESPONDENCE 60	**02-21-2001**	NAVFAC - SOUTHWEST DIVISION	TRANSMITTAL OF 1) DRAFT FINAL PARCEL F VALIDATION STUDY WORK PLAN ERRATA; 2) RESPONSE TO COMMENTS ON DRAFT FINAL; 3) TOXICITY IDENTIFICATION EVALUATION PROCEDURES ASSOCIATED WITH SEDIMENT-WATER INTERFACE LARVAL EVALUATIONS; AND 4) ADDENDUM NO. 1 TO DRAFT FINAL QUALITY ASSURANCE PROJECT PLAN VALIDATION STUDY, PARCEL F	YES	PARCEL F SITE 00078
AR_N00217_000362 MINUTES 58	**02-22-2001**	BECHTEL ENVIRONMENTAL, INC.	MEETING PUBLIC INFORMATION MATERIAL PACKAGE FOR RESTORATION ADVISORY BOARD (RAB) MEETING HELD ON 22 FEBRUARY 2001 - INCLUDES REPORTER'S TRANSCRIPT OF 22 FEBRUARY 2001 MEETING	YES	PARCEL B PARCEL C PARCEL D PARCEL E PARCEL F SITE 00007 SITE 00028 SITE 00036 SITE 00039 SITE 00078

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_000388 CORRESPONDENCE 8	**02-22-2001**	NAVFAC - SOUTHWEST DIVISION	NAVY PROPOSAL TO PREPARE AN EXPLANATION OF SIGNIFICANT DIFFERENCES TO THE RECORD OF DECISION AND RESPONSE TO EPA, CRWQCB AND CITY OF SAN FRANCISCO COMMENTS	YES	BLDG 0000123 PARCEL B PARCEL C PARCEL F SITE 00007 SITE 00010-1 SITE 00025 SITE 00028 SITE 00078
AR_N00217_000412 CORRESPONDENCE 6	**03-05-2001**	CRWQCB - OAKLAND, CA	COMMENTS ON DRAFT HUMAN HEALTH EVALUATION WORK PLAN, PARCEL F, DATED 12 JANUARY 2001 - INCLUDES ADDITIONAL COMMENTS DATED 28 FEBRUARY 2001	YES	PARCEL F SITE 00078
AR_N00217_000393 CORRESPONDENCE 5	**03-16-2001**	NAVFAC - SOUTHWEST DIVISION	LETTER STATING NAVY POSITION REGARDING SIX ISSUES RELATED TO THE RECORD OF DECISION	YES	BLDG 0000123 PARCEL B PARCEL C PARCEL F SITE 00007 SITE 00010 SITE 00025 SITE 00028 SITE 00078
AR_N00217_000414 CORRESPONDENCE 7	**03-20-2001**	DTSC - BERKELEY, CA	COMMENTS FROM HUMAN AND ECOLOGICAL RISK DIVISION, DATED 16 MARCH 2001 ON DRAFT HUMAN HEALTH EVALUATION WORK PLAN, PARCEL F, DATED 12 JANUARY 2001	YES	PARCEL F SITE 00078

Wednesday, September 18, 2024

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_000395 MINUTES 86	**03-22-2001**	BECHTEL ENVIRONMENTAL, INC.	MEETING MATERIALS FOR PUBLIC / RESTORATION ADVISORY BOARD (RAB) MEETING HELD ON 22 MARCH 2001 - INCLUDES AGENDA; PUBLIC NOTICE; TRANSCRIPT; 22 FEBRUARY 2001 MEETING MINUTES; AND VARIOUS HANDOUTS	YES	PARCEL D PARCEL E PARCEL F SITE 00036 SITE 00039 SITE 00078
AR_N00217_007136 CORRESPONDENCE 3	**04-20-2001**	CITY AND COUNTY OF SAN FRANCISCO - SAN FRANCISCO, CA	REQUEST FOR ASSURANCE THAT ONGOING CLEANUP WILL NOT POSE A RISK TO FUTURE RESIDENTS AND WORKERS AND MEASURES THAT WILL BE TAKEN TO ENSURE THAT ONGOING CLEANUP OF PARCELS C THROUGH F WILL NOT NEGATIVELY IMPACT THE FUTURE RE-USE OF PARCELS A AND B	YES	PARCEL B PARCEL C PARCEL D PARCEL D-1 PARCEL D-2 PARCEL E PARCEL E-2 PARCEL F SITE 00001 SITE 00007 SITE 00028 SITE 00036 SITE 00039 SITE 00078
AR_N00217_000369 REPORT 555	**04-23-2001**	BATTELLE	FINAL PARCEL F VALIDATION STUDY WORK PLAN	YES	PARCEL F SITE 00078

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_000433 FACT SHEET 100	**05-03-2001**	BECHTEL ENVIRONMENTAL, INC.	FACT SHEET - ENVIRONMENTAL CLEANUP NEWSLETTER NO. 4, JANUARY-MARCH 2001	YES	PARCEL B PARCEL C PARCEL D PARCEL E PARCEL F SITE 00007 SITE 00028 SITE 00036 SITE 00039 SITE 00078
AR_N00217_006627 CORRESPONDENCE 5	**05-03-2001**	NAVFAC - SOUTHWEST DIVISION	TRANSMITTAL OF DRAFT FINAL HUMAN HEALTH EVALUATION WORK PLAN, PARCEL F, DATED 2 MAY 2001	YES	PARCEL F SITE 00078
AR_N00217_000437 MINUTES 120	**05-22-2001**	BECHTEL ENVIRONMENTAL, INC.	MEETING MATERIALS FOR PUBLIC MEETING/RESTORATION ADVISORY BOARD (RAB) MEETING HELD ON 26 APRIL 2001 - INCLUDES AGENDA; 26 APRIL 2001 MEETING TRANSCRIPT; 22 MARCH 2001 MEETING MINUTES; HANDOUTS; RAB APPLICATIONS; AND MAILING LIST	YES	PARCEL B PARCEL C PARCEL D PARCEL E PARCEL F SITE 00007 SITE 00028 SITE 00036 SITE 00039 SITE 00078

Wednesday, September 18, 2024

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_007137 CORRESPONDENCE 4	**06-25-2001**	DEPARTMENT OF NAVY, ASSISTANT SECRETARY OF THE NAVY - WASHINGTON, D.C.	RESPONSE TO LETTER DATED 20 APRIL 2001 REGARDING CONCERNS ABOUT SAFEGUARDING SHIPYARD TENANTS DURING REMEDIAL ACTIONS. REMEDIAL DECISIONS WILL PROTECT HUMAN HEALTH AND THE ENVIRONMENT	YES	PARCEL B PARCEL C PARCEL D PARCEL D-1 PARCEL D-2 PARCEL E PARCEL E-2 PARCEL F SITE 00001 SITE 00007 SITE 00028 SITE 00036 SITE 00039 SITE 00078
AR_N00217_000483 MINUTES 114	**06-28-2001**	BECHTEL ENVIRONMENTAL, INC.	MEETING MATERIALS FOR RESTORATION ADVISORY BOARD (RAB) MEETING HELD ON 28 JUNE 2001 - INCLUDES AGENDA; PUBLIC NOTICE; REPORTER'S TRANSCRIPT OF 6/28/01 & MEETING MINUTES OF 5/24/01; FACT SHEET DATED 6/19/01 SANDBLAST GRIT AND HANDOUTS	YES	PARCEL B PARCEL C PARCEL D PARCEL E PARCEL F SITE 00007 SITE 00028 SITE 00036 SITE 00039 SITE 00078
AR_N00217_001472 CORRESPONDENCE 5	**07-26-2001**	NAVFAC - SOUTHWEST DIVISION	TRANSMITTAL OF VALIDATION STUDY AND HUMAN HEALTH EVALUATION FIELD SUMMARY REPORT, PARCEL F, DATED 26 JULY 2001	YES	PARCEL F SITE 00078

Wednesday, September 18, 2024

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_000507 MINUTES 102	**08-13-2001**	BECHTEL ENVIRONMENTAL, INC.	MEETING MATERIALS FOR PUBLIC MEETING/RESTORATION ADVISORY BOARD (RAB) MEETING HELD ON 26 JULY 2001 - INCLUDES AGENDA; MEETING TRANSCRIPT; MONTHLY PROGRESS REPORT OF JUNE 2001; AND VARIOUS HANDOUTS	YES	PARCEL B PARCEL C PARCEL D PARCEL E PARCEL F SITE 00007 SITE 00028 SITE 00036 SITE 00039 SITE 00078
AR_N00217_007138 CORRESPONDENCE 4	**08-17-2001**	CITY AND COUNTY OF SAN FRANCISCO - SAN FRANCISCO, CA	FOLLOW UP TO LETTER OF 25 JUNE 2001 CONCERNING CLEANUP PROGRAM AND REQUEST FOR MORE COMMUNICATION WITH THE CITY AND COMMUNITY TO COMPLETE CLEANUP QUICKLY AND FULLY THAT RESPONDS TO COMMUNITY CONCERNS	YES	PARCEL B PARCEL C PARCEL D PARCEL D-1 PARCEL D-2 PARCEL E PARCEL E-2 PARCEL F SITE 00001 SITE 00007 SITE 00028 SITE 00036 SITE 00039 SITE 00078
AR_N00217_001442 CORRESPONDENCE 6	**08-29-2001**	NAVFAC - SOUTHWEST DIVISION	TRANSMITTAL OF WINTER 2001 SEDIMENT DYNAMICS STUDY TECHNICAL MEMORANDUM, DATED 12 JULY 2001	YES	PARCEL F SITE 00078

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_001445 CORRESPONDENCE 6	**10-04-2001**	NAVFAC - SOUTHWEST DIVISION	TRANSMITTAL OF 1) RESPONSE TO COMMENTS ON WINTER 2001 SEDIMENT DYNAMICS STUDY TECHNICAL MEMORANDUM, PARCEL F, DATED 12 JULY 2001; AND 2) SUMMER 2001 SEDIMENT DYNAMICS STUDY FIELD SUMMARY REPORT, PARCEL F, DATED 28 SEPTEMBER 2001	YES	PARCEL F SITE 00078
AR_N00217_006750 CORRESPONDENCE 3	**10-16-2001**	NAVFAC - SOUTHWEST DIVISION	TRANSMITTAL OF SEPTEMBER 2001 MONTHLY PROGRESS REPORT, DATED 16 OCTOBER 2001	YES	PARCEL B PARCEL C PARCEL D PARCEL E PARCEL F SITE 00007 SITE 00028 SITE 00036 SITE 00039 SITE 00078
AR_N00217_006751 REPORT 4	**10-16-2001**	TETRA TECH EM, INC.	SEPTEMBER 2001 MONTHLY PROGRESS REPORT	YES	PARCEL B PARCEL C PARCEL D PARCEL E PARCEL F SITE 00007 SITE 00028 SITE 00036 SITE 00039 SITE 00078

Wednesday, September 18, 2024

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_001475 CORRESPONDENCE 6	**10-18-2001**	DTSC - BERKELEY, CA	COMMENTS FROM HUMAN AND ECOLOGICAL RISK DIVISION, DATED 23 SEPTEMBER 2001 ON VALIDATION STUDY AND HUMAN HEALTH EVALUATION FIELD SUMMARY REPORT, PARCEL F, DATED 26 JULY 2001	YES	PARCEL F SITE 00078
AR_N00217_000523 MINUTES 64	**10-23-2001**	BECHTEL ENVIRONMENTAL, INC.	MEETING MATERIALS FOR PUBLIC MEETING/RESTORATION ADVISORY BOARD (RAB) MEETING HELD ON 26 SEPTEMBER 2001 - INCLUDES AGENDA; 26 SEPTEMBER 2001 MEETING TRANSCRIPT; MONTHLY PROGRESS REPORT OF AUGUST 2001; AND HANDOUTS	YES	PARCEL B PARCEL C PARCEL D PARCEL E PARCEL F SITE 00007 SITE 00028 SITE 00036 SITE 00039 SITE 00078
AR_N00217_000529 REPORT 32	**11-19-2001**	TETRA TECH EM, INC.	FINAL BASEWIDE RADIOLOGICAL REMOVAL ACTION - ACTION MEMORANDUM	YES	PARCEL A PARCEL B PARCEL C PARCEL D PARCEL D-1 PARCEL D-2 PARCEL E PARCEL E-2 PARCEL F SITE 00001 SITE 00007 SITE 00021 SITE 00028 SITE 00078

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_006146 CORRESPONDENCE 2	**11-19-2001**	NAVFAC - SOUTHWEST DIVISION	TRANSMITTAL OF FINAL BASEWIDE RADIOLOGICAL REMOVAL ACTION - ACTION MEMORANDUM, DATED 19 NOVEMBER 2001	YES	PARCEL A PARCEL B PARCEL C PARCEL D PARCEL D-1 PARCEL D-2 PARCEL E PARCEL E-2 PARCEL F SITE 00001 SITE 00007 SITE 00021 SITE 00036 SITE 00039
AR_N00217_001447 CORRESPONDENCE 6	**11-20-2001**	U.S. EPA - SAN FRANCISCO, CA	COMMENTS ON SEDIMENT DYNAMICS STUDY SUMMER 2001 FIELD SUMMARY REPORT, PARCEL F, DATED 28 SEPTEMBER 2001	YES	PARCEL F SITE 00078
AR_N00217_001448 CORRESPONDENCE 7	**11-20-2001**	U.S. EPA - SAN FRANCISCO, CA	COMMENTS ON WINTER 2001 SEDIMENT DYNAMICS STUDY TECHNICAL MEMORANDUM, PARCEL F, DATED 12 JULY 2001	YES	PARCEL F SITE 00078

Wednesday, September 18, 2024

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_006676 CORRESPONDENCE 3	**11-21-2001**	NAVFAC - SOUTHWEST DIVISION	TRANSMITTAL OF REVISED FEDERAL FACILITY AGREEMENT SCHEDULE	YES	PARCEL B PARCEL C PARCEL D PARCEL E PARCEL F SITE 00007 SITE 00028 SITE 00036 SITE 00039 SITE 00078
AR_N00217_006755 CORRESPONDENCE 3	**11-21-2001**	NAVFAC - SOUTHWEST DIVISION	TRANSMITTAL OF OCTOBER 2001 MONTHLY PROGRESS REPORT, DATED 21 NOVEMBER 2001	YES	PARCEL B PARCEL C PARCEL D PARCEL E PARCEL F SITE 00007 SITE 00028 SITE 00036 SITE 00039 SITE 00078

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_006756 REPORT 5	**11-21-2001**	TETRA TECH EM, INC.	OCTOBER 2001 MONTHLY PROGRESS REPORT	YES	PARCEL B PARCEL C PARCEL D PARCEL E PARCEL F SITE 00007 SITE 00028 SITE 00036 SITE 00039 SITE 00078
AR_N00217_000533 MINUTES 149	**11-28-2001**	BECHTEL ENVIRONMENTAL, INC.	MEETING MATERIALS FOR PUBLIC MEETING/RESTORATION ADVISORY BOARD (RAB) MEETING HELD ON 24 OCTOBER 2001 - INCLUDES AGENDA; PUBLIC NOTICE; 26 SEPTEMBER 2001 MEETING MINUTES; 24 OCTOBER 2001 REPORTERS TRANSCRIPT; AND HANDOUTS	YES	PARCEL B PARCEL C PARCEL D PARCEL E PARCEL F SITE 00007 SITE 00028 SITE 00036 SITE 00039 SITE 00078

Wednesday, September 18, 2024

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_000557 MINUTES 92	**01-24-2002**	BECHTEL ENVIRONMENTAL, INC.	MEETING PUBLIC INFORMATION MATERIALS PACKAGE FOR RESTORATION ADVISORY BOARD (RAB) MEETING HELD ON 24 JANUARY 2002 - INCLUDES AGENDA; PUBLIC NOTICE; ATTENDANCE LIST; MEETING MINUTES FROM 11/29/01 MEETING; REPORTERS TRANSCRIPT OF 1/24/02 MEETING AND HANDOUTS	YES	PARCEL B PARCEL C PARCEL E PARCEL F SITE 00007 SITE 00028 SITE 00039 SITE 00078
AR_N00217_000589 MINUTES 75	**02-28-2002**	BECHTEL ENVIRONMENTAL, INC.	28 FEBRUARY 2002 RESTORATION ADVISORY BOARD (RAB) MEETING PUBLIC INFORMATION MATERIAL PACKAGE - INCLUDES AGENDA, PUBLIC NOTICE, MEETING MINUTES FROM 01/24/02 MEETING, REPORTERS TRANSCRIPT OF 02/28/02 MEETING, ATTENDANCE SHEET AND HANDOUTS	YES	PARCEL B PARCEL C PARCEL D PARCEL E PARCEL F SITE 00007 SITE 00010 SITE 00028 SITE 00036 SITE 00039 SITE 00078

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_000583 FACT SHEET 10	**03-07-2002**	BECHTEL ENVIRONMENTAL, INC.	ENVIRONMENTAL CLEANUP NEWSLETTER OCTOBER-DECEMBER 2001	YES	PARCEL A PARCEL B PARCEL C PARCEL D PARCEL E PARCEL F SITE 00007 SITE 00010 SITE 00026 SITE 00028 SITE 00036 SITE 00039 SITE 00078
AR_N00217_000604 REPORT 70	**04-22-2002**	TETRA TECH EM, INC.	EVALUATION OF STORM WATER AND SOLIDS DELIVERY TO PARCEL F	YES	PARCEL F SITE 00078

Wednesday, September 18, 2024

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_000615 MINUTES 78	**04-25-2002**	BECHTEL ENVIRONMENTAL, INC.	MEETING PUBLIC INFORMATION MATERIALS FOR RESTORATION ADVISORY BOARD (RAB) MEETING HELD ON 25 APRIL 2002 - INCLUDES AGENDA; PUBLIC NOTICE; MINUTES FROM 28 MARCH 2002 MEETING; TRANSCRIPT OF MINUTES FROM 25 APRIL 2002 MEETING; MONTHLY PROGRESS REPORT; AND HANDOUTS	YES	BLDG 0000123 PARCEL A PARCEL B PARCEL C PARCEL D PARCEL E PARCEL F SITE 00007 SITE 00018 SITE 00028 SITE 00029 SITE 00036 SITE 00039 SITE 00078
AR_N00217_006779 CORRESPONDENCE 5	**04-26-2002**	NAVFAC - SOUTHWEST DIVISION	TRANSMITTAL OF DRAFT VALIDATION STUDY REPORT, PARCEL F, DATED 25 APRIL 2002	YES	PARCEL F SITE 00078

Wednesday, September 18, 2024

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_000620 MINUTES 63	**05-30-2002**	BECHTEL ENVIRONMENTAL, INC.	MEETING PUBLIC INFORMATION MATERIALS FOR RESTORATION ADVISORY BOARD (RAB) MEETING HELD ON 30 MAY 2002 - INCLUDES AGENDA; PUBLIC NOTICE; MINUTES FROM 25 APRIL 2002 MEETING; TRANSCRIPT OF MINUTES FROM 30 MAY 2002 MEETING; MONTHLY PROGRESS REPORT; AND HANDOUTS	YES	BLDG 0000815 BLDG 0000830 PARCEL A PARCEL B PARCEL C PARCEL D PARCEL E PARCEL F SITE 00001 SITE 00003 SITE 00007 SITE 00012 SITE 00018 SITE 00021 SITE 00028 SITE 00036 SITE 00039 SITE 00059 SITE 00078
AR_N00217_006787 CORRESPONDENCE 9	**06-20-2002**	SAN FRANCISCO CITY AND COUNTY DEPARTMENT OF PUBLIC HEALTH - SAN FRANCISCO, CA	COMMENTS ON DRAFT VALIDATION STUDY REPORT, PARCEL F, DATED 25 APRIL 2002	YES	PARCEL F SITE 00078
AR_N00217_006789 CORRESPONDENCE 11	**06-24-2002**	U.S. EPA - SAN FRANCISCO, CA	COMMENTS ON DRAFT VALIDATION STUDY REPORT, PARCEL F, DATED 25 APRIL 2002	YES	PARCEL F SITE 00078

Wednesday, September 18, 2024

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_000621 MINUTES 83	**06-27-2002**	BECHTEL ENVIRONMENTAL, INC.	MEETING PUBLIC INFORMATION MATERIALS FOR RESTORATION ADVISORY BOARD (RAB) MEETING HELD ON 27 JUNE 2002 - INCLUDES AGENDA; PUBLIC NOTICE; MINUTES FROM 30 MAY 2002 MEETING; TRANSCRIPT OF MINUTES FROM 27 JUNE 2002 MEETING; MONTHLY PROGRESS REPORT; AND HANDOUTS	YES	BLDG 0000123 BLDG 0000816 BLDG 0000821 PARCEL A PARCEL B PARCEL C PARCEL D PARCEL E PARCEL F SITE 00007 SITE 00018 SITE 00028 SITE 00036 SITE 00059 SITE 00078
AR_N00217_006809 CORRESPONDENCE 5	**10-24-2002**	NAVFAC - SOUTHWEST DIVISION	TRANSMITTAL OF RESPONSE TO COMMENTS ON DRAFT VALIDATION STUDY REPORT, PARCEL F, AREA X, SOUTH BASIN	YES	PARCEL F SITE 00078

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_000657 FACT SHEET 16	**12-12-2002**	BECHTEL ENVIRONMENTAL, INC.	ENVIRONMENTAL CLEANUP NEWSLETTER SUMMER/FALL EXPANDED ISSUE - AMBIENT AIR AND SOIL GAS SURVEYS CONDUCTED AT PARCEL E LANDFILL - REMOVAL ACTION UNDERWAY, APRIL-SEPTEMBER 2002	YES	BLDG 0000123 BLDG 0000364 BLDG 0000406 PARCEL A PARCEL B PARCEL C PARCEL D PARCEL E PARCEL F SITE 00007 SITE 00018 SITE 00028 SITE 00036 SITE 00039 SITE 00078
AR_N00217_007143 CORRESPONDENCE 3	**04-03-2003**	U.S. EPA - SAN FRANCISCO, CA	CONCURRENCE WITH LETTER DATED 18 FEBRUARY 2003 FROM CAL EPA/RWQCB REGARDING POLYCHLORINATED BIPHENYL (PCB) LEVELS IN SEDIMENT FOR PARCEL F IS BEING ADEQUATELY PROTECTIVE OF HUMAN HEALTH	YES	PARCEL F SITE 00078

Wednesday, September 18, 2024

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_000748 MINUTES 79	**07-15-2003**	INNOVATIVE TECHNICAL SOLUTIONS, INC.	MEETING MATERIALS FOR PUBLIC MEETING/RESTORATION ADVISORY BOARD (RAB) MEETING HELD ON 22 MAY 2003 - INCLUDES AGENDA; 24 APRIL 2003 MEETING MINUTES; HANDOUTS; AND 22 MAY 2003 MEETING REPORTER'S TRANSCRIPT	YES	PARCEL B PARCEL C PARCEL D PARCEL E PARCEL F SITE 00007 SITE 00028 SITE 00036 SITE 00039 SITE 00078
AR_N00217_000754 MINUTES 86	**07-24-2003**	INNOVATIVE TECHNICAL SOLUTIONS, INC.	MEETING MATERIALS FOR PUBLIC MEETING/RESTORATION ADVISORY BOARD (RAB) MEETING HELD ON 24 JULY 2003 - INCLUDES MEETING AGENDA; 26 JUNE 2003 MEETING MINUTES; REPORTER'S TRANSCRIPT; AND VARIOUS HANDOUTS	YES	PARCEL B PARCEL C PARCEL D PARCEL E PARCEL F SITE 00007 SITE 00028 SITE 00036 SITE 00039 SITE 00078
AR_N00217_004066 CORRESPONDENCE 6	**08-22-2003**	NAVFAC - SOUTHWEST DIVISION	TRANSMITTAL OF DRAFT FEASIBILITY STUDY DATA GAPS INVESTIGATION WORK PLAN, PARCEL F, DATED 22 AUGUST 2003	YES	PARCEL F SITE 00078

Wednesday, September 18, 2024

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_000774 MINUTES 90	**10-14-2003**	INNOVATIVE TECHNICAL SOLUTIONS, INC.	MEETING MATERIALS FOR PUBLIC MEETING/RESTORATION ADVISORY BOARD (RAB) MEETING HELD ON 28 AUGUST 2003 - INCLUDES AGENDA; 24 JULY 2003 MEETING MINUTES; AND VARIOUS HANDOUTS	YES	PARCEL B PARCEL C PARCEL D PARCEL E PARCEL F SITE 00002 SITE 00007 SITE 00028 SITE 00036 SITE 00039 SITE 00078

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_004035 MINUTES 91	**12-04-2003**	INNOVATIVE TECHNICAL SOLUTIONS, INC.	MEETING MATERIALS FOR PUBLIC/RESTORATION ADVISORY BOARD (RAB) MEETING HELD ON 4 DECEMBER 2003 - INCLUDES AGENDA; 23 OCTOBER 2003 MEETING MINUTES; 4 DECEMBER 2003 TRANSCRIPT; AND VARIOUS HANDOUTS	YES	BLDG 0000134 BLDG 0000231 BLDG 0000253 BLDG 0000272 BLDG 0000281 BLDG 0000366 PARCEL A PARCEL B PARCEL C PARCEL D PARCEL E PARCEL F SITE 00002 SITE 00007 SITE 00028 SITE 00036 SITE 00039 SITE 00078

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_000797 MINUTES 96	**02-02-2004**	INNOVATIVE TECHNICAL SOLUTIONS, INC.	MEETING MATERIALS FOR PUBLIC MEETING/RESTORATION ADVISORY BOARD (RAB) MEETING HELD ON 23 OCTOBER 2003 - INCLUDES 25 SEPTEMBER 2003 MEETING MINUTES; ATTENDANCE SHEET; 23 OCTOBER 2003 MEETING TRANSCRIPT; SEPTEMBER 2003 PROGRESS REPORT; AND VARIOUS HANDOUTS	YES	PARCEL B PARCEL C PARCEL D PARCEL E PARCEL F SITE 00007 SITE 00028 SITE 00036 SITE 00039 SITE 00078
AR_N00217_005657 REPORT 564	**02-04-2004**	BATTELLE	FINAL FIELD SURVEY REPORT, PARCEL F, FEASIBILITY STUDY DATA GAPS INVESTIGATION	YES	PARCEL F SITE 00078
AR_N00217_000801 MINUTES 57	**02-18-2004**	INNOVATIVE TECHNICAL SOLUTIONS, INC.	MEETING MATERIALS FOR PUBLIC MEETING/RESTORATION ADVISORY BOARD (RAB) MEETING HELD ON 22 JANUARY 2004 - INCLUDES AGENDA; 22 JANUARY 2004 MEETING REPORTER'S TRANSCRIPT; 4 DECEMBER 2003 MEETING MINUTES; DECEMBER 2003 MONTHLY PROGRESS REPORT; AND VARIOUS HANDOUTS	YES	PARCEL B PARCEL C PARCEL D PARCEL E PARCEL F SITE 00007 SITE 00028 SITE 00036 SITE 00039 SITE 00078

Wednesday, September 18, 2024

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_004032 MINUTES 97	**03-25-2004**	INNOVATIVE TECHNICAL SOLUTIONS, INC.	MEETING MATERIALS FOR PUBLIC MEETING/RESTORATION ADVISORY BOARD (RAB) MEETING HELD ON 25 MARCH 2004 - INCLUDES AGENDA; 26 FEBRUARY 2004 MEETING MINUTES; 25 MARCH 2004 REPORTER'S TRANSCRIPT; AND VARIOUS HANDOUTS	YES	PARCEL A PARCEL C PARCEL D PARCEL E PARCEL F SITE 00028 SITE 00036 SITE 00039 SITE 00057 SITE 00078
AR_N00217_000806 REPORT 315	**04-21-2004**	INNOVATIVE TECHNICAL SOLUTIONS, INC.	FINAL COMMUNITY INVOLVEMENT PLAN	YES	BLDG 0000123 BLDG 0000272 BLDG 0000281 PARCEL B PARCEL C PARCEL D PARCEL E PARCEL F SITE 00001 SITE 00007 SITE 00010 SITE 00018 SITE 00021 SITE 00028 SITE 00036 SITE 00039 SITE 00078

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_005822 CORRESPONDENCE 2	**04-21-2004**	NAVFAC - SOUTHWEST DIVISION	TRANSMITTAL OF FINAL COMMUNITY INVOLVEMENT PLAN, DATED 21 APRIL 2004	YES	BLDG 0000123 BLDG 0000272 BLDG 0000281 PARCEL B PARCEL C PARCEL D PARCEL E PARCEL F SITE 00001 SITE 00007 SITE 00010 SITE 00018 SITE 00021 SITE 00028 SITE 00036 SITE 00039 SITE 00078

Wednesday, September 18, 2024

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_004031 MINUTES 129	**05-27-2004**	INNOVATIVE TECHNICAL SOLUTIONS, INC.	MEETING MATERIALS FOR PUBLIC/RESTORATION ADVISORY BOARD (RAB) MEETING HELD ON 27 MAY 2004 - INCLUDES AGENDA; 22 APRIL 2004 MEETING MINUTES; AND VARIOUS HANDOUTS	YES	BLDG 0000322 PARCEL A PARCEL B PARCEL C PARCEL D PARCEL E PARCEL F SITE 00002 SITE 00007 SITE 00028 SITE 00036 SITE 00039 SITE 00078
AR_N00217_004042 REPORT 109	**07-26-2004**	BATTELLE	FINAL PARCEL F TREATABILITY STUDY WORK PLAN	YES	PARCEL F SITE 00078
AR_N00217_006095 CORRESPONDENCE 5	**08-18-2004**	NAVFAC - SOUTHWEST DIVISION	TRANSMITTAL OF DRAFT FINAL PARCEL F VALIDATION STUDY REPORT, DATED 17 AUGUST 2004	YES	PARCEL F SITE 00078

Wednesday, September 18, 2024

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_000840 MINUTES 84	**12-09-2004**	SULTECH	MEETING MINUTES FOR RESTORATION ADVISORY BOARD (RAB) MEETING HELD ON 9 DECEMBER 2004 - INCLUDES AGENDA; 21 OCTOBER 2004 MONTHLY PROGRESS REPORT; REPORTER TRANSCRIPT; TECHNICAL REVIEW SUBCOMMITTEE MEETING MINUTES; AND VARIOUS HANDOUTS	YES	BLDG 0000101 BLDG 0000114 BLDG 0000123 BLDG 0000134 BLDG 0000146 BLDG 0000253 BLDG 0000272 BLDG 0000322 BLDG 0000351A BLDG 0000364 BLDG 0000366 BLDG 0000408 BLDG 0000500 BLDG 0000503 BLDG 0000521 BLDG 0000529 BLDG 0000813 BLDG 0000815 BLDG 0000819 BLDG 0000839 PARCEL A PARCEL B PARCEL C PARCEL D PARCEL E PARCEL E-2 PARCEL F SITE 00001

Wednesday, September 18, 2024

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
					SITE 00002 SITE 00007 SITE 00018 SITE 00021 SITE 00028 SITE 00036 SITE 00039 SITE 00078
AR_N00217_002190 CORRESPONDENCE 4	**02-25-2005**	BRAC PMO WEST	TRANSMITTAL OF DRAFT TECHNICAL MEMORANDUM, PARCEL F, FEASIBILITY STUDY DATA GAPS INVESTIGATION, DATED 25 FEBRUARY 2005	YES	PARCEL F SITE 00078

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_000842 MINUTES 94	**03-23-2005**	SULTECH	MEETING MINUTES FOR RESTORATION ADVISORY BOARD (RAB) MEETING HELD ON 23 MARCH 2005 - INCLUDES AGENDA; APRIL 2005 MONTHLY PROGRESS REPORT; REPORTER TRANSCRIPT; AND VARIOUS HANDOUTS	YES	BLDG 0000123 BLDG 0000134 BLDG 0000272 PARCEL A PARCEL A-1 PARCEL A-2 PARCEL B PARCEL C PARCEL D PARCEL E PARCEL E-2 PARCEL F SITE 00001 SITE 00002 SITE 00007 SITE 00028 SITE 00036 SITE 00039 SITE 00078

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_000839 MINUTES 67	**04-27-2005**	SULTECH	MEETING MINUTES FOR RESTORATION ADVISORY BOARD (RAB) MEETING HELD ON 27 APRIL 2005 - INCLUDES AGENDA; 27 APRIL 2008 MEETING MINUTES; SUB COMMITTEE MEETING MINUTES; MAY 2005 MONTHLY PROGRESS REPORT; REPORTER TRANSCRIPT; AND VARIOUS HANDOUTS	YES	PARCEL B PARCEL C PARCEL D PARCEL E PARCEL E-2 PARCEL F SITE 00001 SITE 00002 SITE 00007 SITE 00018 SITE 00028 SITE 00036 SITE 00039 SITE 00078
AR_N00217_004132 REPORT 1676	**05-02-2005**	BATTELLE	FINAL PARCEL F VALIDATION STUDY REPORT	YES	PARCEL F SITE 00078
AR_N00217_002196 CORRESPONDENCE 4	**05-03-2005**	NAVFAC - SOUTHWEST DIVISION	TRANSMITTAL OF FINAL VALIDATION STUDY REPORT, PARCEL F, DATED 2 MAY 2005	YES	PARCEL F SITE 00078

Wednesday, September 18, 2024

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_000838 MINUTES 148	**06-22-2005**	NAVFAC - SOUTHWEST DIVISION	MEETING MINUTES FOR RESTORATION ADVISORY BOARD (RAB) MEETING HELD ON 22 JUNE 2005 - INCLUDES AGENDA; LIST OF ATTENDEES; AND VARIOUS HANDOUTS	YES	BLDG 0000103 BLDG 0000113 BLDG 0000113A BLDG 0000114 BLDG 0000123 BLDG 0000128 BLDG 0000130 BLDG 0000131A BLDG 0000134 BLDG 0000140 BLDG 0000142 BLDG 0000146 BLDG 0000157 BLDG 0000203 BLDG 0000211 BLDG 0000214 BLDG 0000224 BLDG 0000231 BLDG 0000241 BLDG 0000251 BLDG 0000253 BLDG 0000271 BLDG 0000272 BLDG 0000274 BLDG 0000313 BLDG 0000317 BLDG 0000322 BLDG 0000351

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
					BLDG 0000351A BLDG 0000364 BLDG 0000365 BLDG 0000366 BLDG 0000383 BLDG 0000406 BLDG 0000408 BLDG 0000411 BLDG 0000414 BLDG 0000500 BLDG 0000503 BLDG 0000523 BLDG 0000701 BLDG 0000707 BLDG 0000708 BLDG 0000709 BLDG 0000808 BLDG 0000813 BLDG 0000819 DRY DOCK 0002 DRY DOCK 0003 DRY DOCK 0004 DRY DOCK 0005 DRY DOCK 0006 DRY DOCK 0007 PARCEL A PARCEL B PARCEL C

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
					PARCEL D PARCEL E PARCEL F SITE 00001 SITE 00007 SITE 00010 SITE 00018 SITE 00021 SITE 00028 SITE 00036 SITE 00039 SITE 00078 SITE 00506 SITE 00507 SITE 00508 SITE 00509 SITE 00510 SITE 00510A SITE 00517 SITE 00520 SITE 00529 SITE 00707 WELL EW-001 WELL IR-01-MW-038A WELL IR-01-MW-043A WELL IR-01-MW-366A

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
					WELL IR-03-MW-218A-2 WELL IR-03-MW-342A WELL IR-03-MW-373B WELL IR-04-MW-013A WELL IR-09-MW-061A WELL IR-09-MW-062A WELL IR-09-MW-063A WELL IR-10-MW-013A-1 WELL IR-25-MW-002A WELL IR-25-MW-053A WELL IR-25-MW-054A WELL IR-28-MW-136A WELL IR-28-MW-140F WELL IR-28-MW-150A WELL IR-28-MW-151A WELL IR-28-MW-211F

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
					WELL IR-28-MW-221A WELL IR-28-MW-221B WELL IR-28-MW-270A WELL IR-28-MW-341F WELL IR-28-MW-396B WELL IR-28-MW-397B WELL IR-28-MW-403A WELL IR-28-MW-407A WELL IR-28-MW-408A WELL IR-28-MW-409A WELL IR-28-MW-410A WELL IR-28-MW-412A WELL IR-58-MW-031A WELL IR-58-MW-033B WELL IR-70-MW-007A WELL IR-71-MW-003A

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
					WELL IR-71-MW-012B WELL IR-91-MW-004A WELL IW-002 WELL MW-033A WELL MW-053A WELL MW-054A WELL MW-061A WELL MW-062A WELL PA-50-MW-007A
AR_N00217_000835 MINUTES 64	**07-28-2005**	SULTECH	MEETING MINUTES FOR RESTORATION ADVISORY BOARD (RAB) MEETING HELD ON 28 JULY 2005 - INCLUDES AGENDA; 20 JULY 2005 MEETING MINUTES; JUNE 2005 MONTHLY PROGRESS REPORT; REPORTER TRANSCRIPT; AND VARIOUS HANDOUTS	YES	BLDG 0000366 PARCEL B PARCEL C PARCEL E PARCEL E-2 PARCEL F SITE 00001 SITE 00002 SITE 00007 SITE 00028 SITE 00039 SITE 00078

Wednesday, September 18, 2024

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_000834 MINUTES 59	**08-25-2005**	SULTECH	MEETING MINUTES FOR RESTORATION ADVISORY BOARD (RAB) MEETING HELD ON 25 AUGUST 2005 - INCLUDES AGENDA; AUGUST 2005 MONTHLY PROGRESS REPORT; REPORTER TRANSCRIPT; AND VARIOUS HANDOUTS	YES	BLDG 0000103 BLDG 0000104 BLDG 0000115 BLDG 0000116 BLDG 0000600 PARCEL B PARCEL C PARCEL D PARCEL E PARCEL E-2 PARCEL F SITE 00001 SITE 00002 SITE 00007 SITE 00028 SITE 00036 SITE 00039 SITE 00078

Wednesday, September 18, 2024

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_000851 MINUTES 85	**09-22-2005**	NAVFAC - SOUTHWEST DIVISION	MEETING MINUTES FOR RESTORATION ADVISORY BOARD (RAB) MEETING HELD ON 22 SEPTEMBER 2005 - INCLUDES AGENDA; PRESENTATION; TRANSCRIPT; MONTHLY PROGRESS REPORT; AND 6 SEPTEMBER 2005 SUBCOMMITTEE MEETING MINUTES	YES	BLDG 0000134 PARCEL A PARCEL B PARCEL C PARCEL D PARCEL E-2 PARCEL F SITE 00001 SITE 00007 SITE 00018 SITE 00028 SITE 00036 SITE 00078 WELL EW-001 WELL IW-002A WELL MW-053A WELL MW-054A WELL MW-902A

Wednesday, September 18, 2024

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_004172 CORRESPONDENCE 61	**09-23-2005**	BRAC PMO WEST	TRANSMITTAL OF 1) FEDERAL FACILITY AGREEMENT SCHEDULE; AND 2) PROJECT SCHEDULE	YES	PARCEL B PARCEL C PARCEL D PARCEL E PARCEL E-2 PARCEL F SITE 00001 SITE 00007 SITE 00018 SITE 00028 SITE 00039 SITE 00078

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_004178 REPORT 236	**11-01-2005**	CE2 - KLEINFELDER, JOINT VENTURE	FINAL WORK PLAN FOR CONTAMINATION DELINEATION AT REMEDIAL UNIT C5	YES	BLDG 0000108 BLDG 0000130 BLDG 0000134 PARCEL A PARCEL B PARCEL C PARCEL D PARCEL E PARCEL E-2 PARCEL F SITE 00001 SITE 00006 SITE 00007 SITE 00025 SITE 00028 SITE 00036 SITE 00039 SITE 00078 WELL IR-06-MW-034A WELL IR-06-MW-046A WELL IR-25-MW-037B WELL IR-25-MW-038B WELL IR-25-MW-039B

Wednesday, September 18, 2024

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_000855 CORRESPONDENCE 5	**11-15-2005**	BRAC PMO WEST	REQUEST FOR IDENTIFICATION OF POTENTIAL STATE CHEMICAL-SPECIFIC AND LOCATION-SPECIFIC APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS FOR THE FEASIBILITY STUDY FOR PARCEL F	YES	PARCEL F SITE 00078
AR_N00217_005954 CORRESPONDENCE 3	**11-23-2005**	BRAC PMO WEST	TRANSMITTAL OF FINAL WORK PLAN FOR CONTAMINATION DELINEATION AT REMEDIAL UNIT 5, DATED 1 NOVEMBER 2005	YES	BLDG 0000108 BLDG 0000130 BLDG 0000134 PARCEL A PARCEL B PARCEL C PARCEL D PARCEL E PARCEL E-2 PARCEL F SITE 00001 SITE 00006 SITE 00007 SITE 00025 SITE 00028 SITE 00036 SITE 00039 SITE 00078

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_000871 REPORT 224	**12-05-2005**	STANFORD UNIVERSITY	FINAL DEMONSTRATION PLAN FOR FIELD TESTING OF ACTIVATED CARBON MIXING AND IN SITU STABILIZATION OF POLYCHLORINATED BIPHENYLS (PCB) IN SEDIMENT AT PARCEL F	YES	PARCEL A PARCEL B PARCEL C PARCEL D PARCEL E PARCEL E-2 PARCEL F SITE 00001 SITE 00007 SITE 00028 SITE 00036 SITE 00039 SITE 00078
AR_N00217_000872 CORRESPONDENCE 4	**12-05-2005**	BRAC PMO WEST	TRANSMITTAL OF FINAL DEMONSTRATION PLAN FOR FIELD TESTING OF ACTIVATED CARBON MIXING AND IN SITU STABILIZATION OF POLYCHLORINATED BIPHENYLS (PCB) IN SEDIMENT AT PARCEL F, DATED 5 DECEMBER 2005	YES	PARCEL F SITE 00078

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_000863 CORRESPONDENCE 5	**02-01-2006**	BRAC PMO WEST	TRANSMITTAL OF 1) RESPONSE TO COMMENTS FROM US EPA-SAN FRANCISCO ON FINAL WORK PLAN FOR CONTAMINATION DELINEATION AT REMEDIAL UNIT C5, DATED 1 NOVEMBER 2005; AND 2) REVISED FIGURE A-14 - PROPOSED SAMPLE LOCATIONS	YES	BLDG 0000108 BLDG 0000130 BLDG 0000134 PARCEL A PARCEL B PARCEL C PARCEL D PARCEL E PARCEL E-2 PARCEL F SITE 00001 SITE 00006 SITE 00007 SITE 00025 SITE 00028 SITE 00036 SITE 00039 SITE 00078

Wednesday, September 18, 2024

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_000865 REPORT 49	**02-14-2006**	TETRA TECH EC, INC.	REVISED FINAL BASEWIDE RADIOLOGICAL REMOVAL ACTION, ACTION MEMORANDUM	YES	BLDG 0000114 BLDG 0000146 BLDG 0000322 BLDG 0000364 BLDG 0000509 BLDG 0000517 BLDG 0000529 BLDG 0000707 BLDG 0000819 PARCEL A PARCEL B PARCEL C PARCEL D PARCEL E PARCEL E-2 PARCEL F SITE 00001 SITE 00003 SITE 00007 SITE 00011 SITE 00014 SITE 00015 SITE 00021 SITE 00028 SITE 00036 SITE 00039 SITE 00078

Wednesday, September 18, 2024

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_000866 CORRESPONDENCE 4	**02-14-2006**	BRAC PMO WEST	TRANSMITTAL OF REVISED FINAL BASEWIDE RADIOLOGICAL REMOVAL ACTION, ACTION MEMORANDUM, DATED 14 FEBRUARY 2006	YES	BLDG 0000114 BLDG 0000146 BLDG 0000322 BLDG 0000364 BLDG 0000509 BLDG 0000517 BLDG 0000529 BLDG 0000707 BLDG 0000819 PARCEL A PARCEL B PARCEL C PARCEL D PARCEL E PARCEL E-2 PARCEL F SITE 00001 SITE 00003 SITE 00007 SITE 00011 SITE 00014 SITE 00015 SITE 00021 SITE 00028 SITE 00036 SITE 00039 SITE 00078

Wednesday, September 18, 2024

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_000942 MINUTES 14	**02-23-2006**	BARAJAS AND ASSOCIATES, INC.	FINAL MEETING MINUTES FOR RESTORATION ADVISORY BOARD (RAB) MEETING HELD ON 23 FEBRUARY 2006 - INCLUDES LIST OF ATTENDEES AND ACTION ITEMS	YES	BLDG 0000103 BLDG 0000113 BLDG 0000113A BLDG 0000114 BLDG 0000130 BLDG 0000142 BLDG 0000146 BLDG 0000157 BLDG 0000211 BLDG 0000406 BLDG 0000813 BLDG 0000819 PARCEL B PARCEL D PARCEL E PARCEL F SITE 00007 SITE 00018 SITE 00036 SITE 00039 SITE 00078

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_004185 MINUTES 24	**03-10-2006**	BARAJAS AND ASSOCIATES, INC.	FINAL MEETING TRANSCRIPT FOR RESTORATION ADVISORY BOARD (RAB) MEETING HELD ON 23 FEBRUARY 2006	YES	BLDG 0000103 BLDG 0000113 BLDG 0000113A BLDG 0000114 BLDG 0000142 BLDG 0000146 BLDG 0000157 BLDG 0000211 BLDG 0000406 BLDG 0000813 BLDG 0000819 PARCEL B PARCEL D PARCEL E PARCEL F SITE 00007 SITE 00036 SITE 00039 SITE 00078
AR_N00217_006998 CORRESPONDENCE 24	**03-10-2006**	MULTIPLE AGENCIES	IDENTIFICATION OF STATE APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS FOR DRAFT FEASIBILITY STUDY, PARCEL F	YES	PARCEL F SITE 00078

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_000889 CORRESPONDENCE 62	**03-31-2006**	BRAC PMO WEST	TRANSMITTAL OF 1) FEDERAL FACILITY AGREEMENT SCHEDULE; 2) PROJECT SCHEDULE; AND 3) RESPONSE TO COMMENTS FROM U.S. EPA - SAN FRANCISCO ON DRAFT FEDERAL FACILITY AGREEMENT SCHEDULE AND DRAFT PROJECT SCHEDULE, DATED 23 SEPTEMBER 2005	YES	PARCEL B PARCEL C PARCEL D PARCEL E PARCEL E-2 PARCEL F SITE 00001 SITE 00007 SITE 00028 SITE 00036 SITE 00039 SITE 00078
AR_N00217_000973 CORRESPONDENCE 4	**04-21-2006**	BRAC PMO WEST	TRANSMITTAL OF 1) FINAL BASEWIDE RADIOLOGICAL REMOVAL ACTION, ACTION MEMORANDUM - REVISION 2006, DATED 21 APRIL 2006; AND 2) RESPONSE TO COMMENTS ON REVISED FINAL BASEWIDE RADIOLOGICAL REMOVAL ACTION, ACTION MEMORANDUM, DATED 14 FEBRUARY 2006	YES	PARCEL A PARCEL B PARCEL C PARCEL D PARCEL E PARCEL E-2 PARCEL F SITE 00001 SITE 00007 SITE 00028 SITE 00036 SITE 00039 SITE 00078

Wednesday, September 18, 2024

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_000974 REPORT 50	**04-21-2006**	TETRA TECH EC, INC.	FINAL BASEWIDE RADIOLOGICAL REMOVAL ACTION, ACTION MEMORANDUM - REVISION 2006	YES	BLDG 0000114 BLDG 0000146 BLDG 0000322 BLDG 0000364 BLDG 0000506 BLDG 0000509 BLDG 0000517 BLDG 0000529 BLDG 0000707 BLDG 0000819 PARCEL A PARCEL B PARCEL C PARCEL D PARCEL E PARCEL E-2 PARCEL F SITE 00001 SITE 00007 SITE 00028 SITE 00036 SITE 00039 SITE 00078

Wednesday, September 18, 2024

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_000975 CORRESPONDENCE 9	**04-21-2006**	FOSTER WHEELER ENVIRONMENTAL CORPORATION	RESPONSE TO COMMENTS FROM MULTIPLE AGENCIES ON REVISED FINAL BASEWIDE RADIOLOGICAL REMOVAL ACTION, ACTION MEMORANDUM, DATED 14 FEBRUARY 2006	YES	PARCEL A PARCEL B PARCEL C PARCEL D PARCEL E PARCEL E-2 PARCEL F SITE 00001 SITE 00003 SITE 00007 SITE 00011 SITE 00014 SITE 00015 SITE 00021 SITE 00028 SITE 00036 SITE 00039 SITE 00078
AR_N00217_000918 REPORT 24	**05-17-2006**	TETRA TECH EC, INC.	FINAL TASK-SPECIFIC PLAN FOR THE DRYDOCK 5 AND 7 SCOPING SURVEY	YES	BLDG 0000258 DRY DOCK 0005 DRY DOCK 0007 PARCEL B PARCEL F SITE 00007 SITE 00078

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_000993 REPORT 29	**07-11-2006**	TETRA TECH EC, INC.	FINAL ADDENDUM 1 TO THE FINAL SAMPLING AND ANALYSIS PLAN FOR THE BASEWIDE SEWER SYSTEMS, (FIELD SAMPLING PLAN AND QUALITY ASSURANCE PROJECT PLAN), BASEWIDE STORM DRAIN AND SANITARY SEWER REMOVAL	YES	PARCEL A PARCEL B PARCEL C PARCEL D PARCEL E PARCEL E-2 PARCEL F SITE 00001 SITE 00007 SITE 00028 SITE 00036 SITE 00039 SITE 00078
AR_N00217_001021 MINUTES 12	**08-24-2006**	BARAJAS AND ASSOCIATES, INC.	MEETING MINUTES FOR RESTORATION ADVISORY BOARD (RAB) MEETING HELD ON 24 AUGUST 2006 - INCLUDES LIST OF ATTENDEES AND ACTION ITEMS	YES	PARCEL B PARCEL C PARCEL D PARCEL E PARCEL E-2 PARCEL F SITE 00001 SITE 00007 SITE 00028 SITE 00036 SITE 00039 SITE 00078

Wednesday, September 18, 2024

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_000992 CORRESPONDENCE 51	**09-08-2006**	BRAC PMO WEST	TRANSMITTAL OF 1) FEDERAL FACILITY AGREEMENT SCHEDULE; AND 2) PROJECT SCHEDULE	YES	PARCEL B PARCEL C PARCEL D PARCEL E PARCEL E-2 PARCEL F SITE 00001 SITE 00007 SITE 00028 SITE 00036 SITE 00039
AR_N00217_001028 REPORT 26	**10-23-2006**	TETRA TECH EC, INC.	AIR MONITORING PLAN, BASE-WIDE STORM DRAIN AND SANITARY SEWER REMOVAL	YES	PARCEL B PARCEL C PARCEL D PARCEL E PARCEL E-2 PARCEL F SITE 00007 SITE 00028 SITE 00036 SITE 00039 SITE 00078

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_004208 MINUTES 15	**12-07-2006**	BARAJAS AND ASSOCIATES, INC.	MEETING MINUTES FOR RESTORATION ADVISORY BOARD (RAB) MEETING HELD ON 7 DECEMBER 2006 - INCLUDES AGENDA AND ATTACHMENTS A AND B	YES	BLDG 0000123 BLDG 0000157 BLDG 0000164 BLDG 0000813 BLDG 0000819 PARCEL A PARCEL B PARCEL C PARCEL D PARCEL E PARCEL E-2 PARCEL F SITE 00001 SITE 00002 SITE 00003 SITE 00007 SITE 00028 SITE 00036 SITE 00039 SITE 00078

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_004209 MINUTES 28	**01-08-2007**	BARAJAS AND ASSOCIATES, INC.	MEETING TRANSCRIPT FOR RESTORATION ADVISORY BOARD (RAB) MEETING HELD ON 7 DECEMBER 2006	YES	BLDG 0000123 BLDG 0000157 BLDG 0000164 BLDG 0000813 BLDG 0000819 PARCEL A PARCEL B PARCEL C PARCEL D PARCEL E PARCEL E-2 PARCEL F SITE 00001 SITE 00002 SITE 00003 SITE 00007 SITE 00028 SITE 00036 SITE 00039 SITE 00078

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_004210 MINUTES 18	**01-25-2007**	BARAJAS AND ASSOCIATES, INC.	MEETING MINUTES FOR RESTORATION ADVISORY BOARD (RAB) MEETING HELD ON 25 JANUARY 2007 - INCLUDES AGENDA AND ATTACHMENTS A AND B	YES	BLDG 0000113 BLDG 0000113A BLDG 0000130 BLDG 0000133 BLDG 0000142 BLDG 0000144 BLDG 0000146 BLDG 0000157 PARCEL A PARCEL B PARCEL D PARCEL E PARCEL E-2 PARCEL F SITE 00001 SITE 00002 SITE 00007 SITE 00036 SITE 00039 SITE 00078

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_004211 MINUTES 34	**02-13-2007**	BARAJAS AND ASSOCIATES, INC.	MEETING TRANSCRIPT FOR RESTORATION ADVISORY BOARD (RAB) MEETING HELD ON 25 JANUARY 2007	YES	BLDG 0000113 BLDG 0000113A BLDG 0000130 BLDG 0000133 BLDG 0000142 BLDG 0000144 BLDG 0000146 BLDG 0000157 PARCEL A PARCEL B PARCEL D PARCEL E PARCEL E-2 PARCEL F SITE 00001 SITE 00002 SITE 00007 SITE 00036 SITE 00039 SITE 00078

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_004190 REPORT 3341	**05-01-2007**	CE2 - KLEINFELDER, JOINT VENTURE	QUARTERLY GROUNDWATER MONITORING REPORT (JULY-SEPTEMBER 2006), PARCEL B, REVISION 1	YES	BLDG 0000123 BLDG 0000134 BLDG 0000141 PARCEL A PARCEL B PARCEL C PARCEL E PARCEL E-2 PARCEL F SITE 00001 SITE 00007 SITE 00010 SITE 00026 SITE 00028 SITE 00039 SITE 00078 WELL IR-05-MW-050A WELL IR-06-MW-049A WELL IR-07-MW-019A WELL IR-07-MW-020A-1 WELL IR-10-MW-0012A WELL IR-10-MW-082A WELL IR-26-MW-046A

Wednesday, September 18, 2024

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
					WELL IR-26-MW-047A WELL IR-26-MW-048A WELL IR-26-MW-049A WELL IR-26-MW-050A WELL IR-60-MW-008A
AR_N00217_004224 CORRESPONDENCE 5	**05-11-2007**	BRAC PMO WEST	TRANSMITTAL OF REVISED DRAFT FEASIBILITY STUDY REPORT FOR PARCEL F, DATED 11 MAY 2007	YES	PARCEL F SITE 00078
AR_N00217_001141 REPORT 532	**05-25-2007**	BARAJAS AND ASSOCIATES, INC.	FINAL TECHNICAL MEMORANDUM, PARCEL F FEASIBILITY STUDY DATA GAPS INVESTIGATION	YES	PARCEL F SITE 00078
AR_N00217_001122 MINUTES 23	**06-05-2007**	BARAJAS AND ASSOCIATES, INC.	FINAL MEETING TRANSCRIPT FOR RESTORATION ADVISORY BOARD (RAB) MEETING HELD ON 24 MAY 2007	YES	PARCEL E-2 PARCEL F SITE 00001 SITE 00078

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_001106 REPORT 18	**07-06-2007**	BARAJAS AND ASSOCIATES, INC.	FEDERAL FACILITIES AGREEMENT SCHEDULE	YES	PARCEL B PARCEL C PARCEL D PARCEL E PARCEL E-2 PARCEL F SITE 00001 SITE 00007 SITE 00028 SITE 00036 SITE 00039 SITE 00078
AR_N00217_001107 REPORT 34	**07-06-2007**	BARAJAS AND ASSOCIATES, INC.	PROJECT SCHEDULE	YES	PARCEL B PARCEL C PARCEL D PARCEL E PARCEL E-2 PARCEL F SITE 00001 SITE 00002 SITE 00007 SITE 00018 SITE 00028 SITE 00036 SITE 00039 SITE 00078

Wednesday, September 18, 2024

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_001105 CORRESPONDENCE 6	**07-10-2007**	BRAC PMO WEST	TRANSMITTAL OF 1) FEDERAL FACILITY AGREEMENT SCHEDULE, DATED 6 JULY 2007; AND 2) COMPREHENSIVE PROJECT SCHEDULE, DATED 6 JULY 2007	YES	PARCEL B PARCEL C PARCEL D PARCEL E PARCEL E-2 PARCEL F SITE 00001 SITE 00007 SITE 00018 SITE 00028 SITE 00036 SITE 00039 SITE 00078
AR_N00217_001435 MINUTES 47	**07-26-2007**	BARAJAS AND ASSOCIATES, INC.	MEETING MINUTES FOR RESTORATION ADVISORY BOARD (RAB) MEETING HELD ON 26 JULY 2007 - INCLUDES LIST OF ATTENDEES; VARIOUS HANDOUTS; TRANSCRIPT; AND CD COPY	YES	AREA 00017 AREA 00018 AREA 00019 AREA 00027 PARCEL A PARCEL B PARCEL D PARCEL F SITE 00007 SITE 00036
AR_N00217_001140 CORRESPONDENCE 6	**08-20-2007**	BRAC PMO WEST	TRANSMITTAL OF FINAL TECHNICAL MEMORANDUM, PARCEL F FEASIBILITY STUDY DATA GAPS INVESTIGATION, DATED 25 MAY 2007	YES	PARCEL F SITE 00078

Wednesday, September 18, 2024

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_001142 CORRESPONDENCE 3	**08-21-2007**	BRAC PMO WEST	TRANSMITTAL OF REPLACEMENT PAGES CONVERTING FINAL PROJECT WORK PLAN, BASEWIDE STORM DRAIN AND SANITARY SEWER REMOVAL, TO REVISION 1	YES	BASEWIDE PARCEL A PARCEL B PARCEL C PARCEL D PARCEL E PARCEL E-2 PARCEL F SITE 00001 SITE 00007 SITE 00028 SITE 00036 SITE 00039 SITE 00050 SITE 00078
AR_N00217_007022 CORRESPONDENCE 20	**08-24-2007**	DTSC - BERKELEY, CA	COMMENTS FROM DTSC-BERKELEY, HUMAN AND ECOLOGICAL RISK DIVISION, DATED 21 AUGUST 2007 AND DEPARTMENT OF FISH AND GAME, DATED 13 AUGUST 2007 ON REVISED DRAFT FEASIBILITY STUDY REPORT, PARCEL F, DATED 11 MAY 2007	YES	PARCEL F SITE 00078

Wednesday, September 18, 2024

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_004235 REPORT 245	**10-05-2007**	TETRA TECH EC, INC.	BASEWIDE RADIOLOGICAL WORK PLAN, REVISION 1	YES	PARCEL B PARCEL C PARCEL D PARCEL E PARCEL E-2 PARCEL F SITE 00001 SITE 00007 SITE 00028 SITE 00036 SITE 00039 SITE 00078
AR_N00217_004234 CORRESPONDENCE 3	**10-08-2007**	BRAC PMO WEST	TRANSMITTAL OF BASEWIDE RADIOLOGICAL WORK PLAN, REVISION 1, DATED 5 OCTOBER 2007	YES	PARCEL B PARCEL C PARCEL D PARCEL E PARCEL E-2 PARCEL F SITE 00001 SITE 00007 SITE 00028 SITE 00036 SITE 00039 SITE 00078
AR_N00217_001248 CORRESPONDENCE 5	**11-15-2007**	BRAC PMO WEST	TRANSMITTAL OF DRAFT FINAL FEASIBILITY STUDY REPORT FOR PARCEL F, DATED 15 NOVEMBER 2007	YES	PARCEL F SITE 00078

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_007031 CORRESPONDENCE 9	**01-18-2008**	DTSC - BERKELEY, CA	COMMENTS FROM DTSC-BERKELEY AND HUMAN AND ECOLOGICAL RISK DIVISION, DATED 3 JANUARY 2008 ON REVISED DRAFT FINAL FEASIBILITY STUDY REPORT, PARCEL F, DATED 15 NOVEMBER 2007	YES	PARCEL F SITE 00078

Wednesday, September 18, 2024

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_001487 MINUTES 44	**02-05-2008**	BARAJAS AND ASSOCIATES, INC.	MEETING MINUTES AND TRANSCRIPT FOR RESTORATION ADVISORY BOARD (RAB) MEETING HELD ON 24 JANUARY 2008 - INCLUDES AGENDA	YES	BLDG 0000117 BLDG 0000140 BLDG 0000813 BLDG 0000819 PARCEL B PARCEL C PARCEL D PARCEL E PARCEL E-2 PARCEL F SITE 00001 SITE 00007 SITE 00009 SITE 00018 SITE 00026 SITE 00028 SITE 00033 SITE 00036 SITE 00039 SITE 00071 SITE 00078 WELL 00046A WELL 00047A WELL 00048A WELL 00049A

Wednesday, September 18, 2024

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_007034 CORRESPONDENCE 4	**02-22-2008**	CRWQCB - OAKLAND, CA	COMMENTS ON DRAFT FINAL FEASIBILITY STUDY REPORT, PARCEL F, DATED 15 NOVEMBER 2007	YES	PARCEL F SITE 00078
AR_N00217_001361 REPORT 126	**04-11-2008**	TETRA TECH EC, INC.	FINAL SITE HEALTH AND SAFETY PLAN, REVISION 1, RADIOLOGICAL SURVEYING OF BUILDINGS	YES	PARCEL A PARCEL B PARCEL C PARCEL D PARCEL E PARCEL E-2 PARCEL F SITE 00001 SITE 00007 SITE 00028 SITE 00036 SITE 00039 SITE 00078
AR_N00217_001339 CORRESPONDENCE 4	**04-28-2008**	BRAC PMO WEST	TRANSMITTAL OF FINAL FEASIBILITY STUDY REPORT FOR PARCEL F, DATED 30 APRIL 2008	YES	PARCEL F SITE 00078
AR_N00217_001340 REPORT 766	**04-30-2008**	BARAJAS AND ASSOCIATES, INC.	FINAL FEASIBILITY STUDY REPORT FOR PARCEL F	YES	PARCEL F SITE 00078
AR_N00217_007042 CORRESPONDENCE 3	**05-27-2008**	DTSC - BERKELEY, CA	CONCURRENCE WITH FINAL FEASIBILITY STUDY REPORT, PARCEL F, DATED 30 APRIL 2008	YES	PARCEL F SITE 00078

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_001364 CORRESPONDENCE 3	**06-17-2008**	BRAC PMO WEST	TRANSMITTAL OF REPLACEMENT PAGES CONVERTING FINAL PROJECT WORK PLAN, REVISION 1, BASEWIDE STORM DRAIN AND SANITARY SEWER REMOVAL, TO REVISION 2	YES	BASEWIDE PARCEL A PARCEL B PARCEL C PARCEL D PARCEL E PARCEL E-2 PARCEL F SITE 00001 SITE 00007 SITE 00028 SITE 00036 SITE 00039 SITE 00050 SITE 00078
AR_N00217_001341 REPORT 34	**06-20-2008**	TETRA TECH EC, INC.	FINAL TASK-SPECIFIC PLAN FOR THE BUILDING 140 DISCHARGE CHANNEL SCOPING SURVEY	YES	BLDG 0000140 PARCEL F SITE 00078

Wednesday, September 18, 2024

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_000955 REPORT 412	**11-30-2008**	TETRA TECH EC, INC.	FINAL PROJECT WORK PLAN, REVISION 3, BASEWIDE STORM DRAIN AND SANITARY SEWER REMOVAL	YES	PARCEL A PARCEL B PARCEL C PARCEL D PARCEL E PARCEL E-2 PARCEL F SITE 00001 SITE 00007 SITE 00028 SITE 00036 SITE 00039 SITE 00050 SITE 00078

Wednesday, September 18, 2024

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_001476 CORRESPONDENCE 3	**12-05-2008**	BRAC PMO WEST	TRANSMITTAL OF REPLACEMENT PAGES CONVERTING FINAL PROJECT WORK PLAN, REVISION 2, BASEWIDE STORM DRAIN AND SANITARY SEWER REMOVAL, TO REVISION 3	YES	BASEWIDE PARCEL A PARCEL B PARCEL C PARCEL D PARCEL E PARCEL E-2 PARCEL F SITE 00001 SITE 00007 SITE 00028 SITE 00036 SITE 00039 SITE 00050 SITE 00078
AR_N00217_001538 REPORT 5	**02-01-2009**	BATTELLE	SAMPLING DESIGN AND RATIONALE FOR RADIOLOGICAL DATA GAP INVESTIGATION PRE-SCREENING, PARCEL F	YES	PARCEL F SITE 00078
AR_N00217_001539 REPORT 178	**02-09-2009**	BATTELLE	FINAL SAMPLING AND ANALYSIS PLAN (FIELD SAMPLING PLAN AND QUALITY ASSURANCE PROJECT PLAN) FOR RADIOLOGICAL SCREENING AND DATA GAP INVESTIGATION AT PARCEL F	YES	PARCEL F SITE 00078

Wednesday, September 18, 2024

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_001537 CORRESPONDENCE 5	**02-27-2009**	BRAC PMO WEST	TRANSMITTAL OF 1) SAMPLING DESIGN AND RATIONALE FOR RADIOLOGICAL DATA GAP INVESTIGATION PRE-SCREENING, PARCEL F, DATED 1 FEBRUARY 2009; AND 2) FINAL SAMPLING AND ANALYSIS PLAN (FIELD SAMPLING PLAN AND QUALITY ASSURANCE PROJECT PLAN) FOR RADIOLOGICAL SCREENING AND DATA GAP INVESTIGATION AT PARCEL F, DATED 9 FEBRUARY 2009	YES	PARCEL F SITE 00078
AR_N00217_001644 FACT SHEET 9	**08-01-2009**	SES-TECH	FINAL FACT SHEET - A SNAPSHOT OF HUNTERS POINT NAVAL SHIPYARD	YES	PARCEL B PARCEL C PARCEL D-1 PARCEL D-2 PARCEL E PARCEL E-2 PARCEL F PARCEL G PARCEL UC-1 PARCEL UC-2 PARCEL UC-3 SITE 00001 SITE 00007 SITE 00028 SITE 00036 SITE 00039 SITE 00078

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_001760 CORRESPONDENCE 14	**10-01-2009**	PUBLIC CITIZENS	COMMENT POSTCARDS - SAVE BUCK'S BEACH, RARE SANDY BEACH ON THE SOUTHERN WATERFRONT	YES	PARCEL B PARCEL F SITE 00007 SITE 00078
AR_N00217_001674 CORRESPONDENCE 4	**11-30-2009**	BRAC PMO WEST	TRANSMITTAL OF DRAFT MEMORANDUM, APPROACH FOR DEVELOPING SOIL GAS ACTION LEVELS FOR VAPOR INTRUSION EXPOSURE, DATED 30 NOVEMBER 2009	YES	PARCEL B PARCEL C PARCEL D-1 PARCEL D-2 PARCEL E PARCEL E-2 PARCEL F PARCEL G PARCEL UC-1 PARCEL UC-2 SITE 00001 SITE 00007 SITE 00028 SITE 00036 SITE 00039 SITE 00078

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_000884 CORRESPONDENCE 4	**02-26-2010**	BRAC PMO WEST	TRANSMITTAL OF DRAFT FINAL MEMORANDUM, APPROACH FOR DEVELOPING SOIL GAS ACTION LEVELS FOR VAPOR INTRUSION EXPOSURE, DATED 26 FEBRUARY 2010	YES	PARCEL B PARCEL C PARCEL D-1 PARCEL D-2 PARCEL E PARCEL E-2 PARCEL F PARCEL G PARCEL UC-1 PARCEL UC-2 SITE 00001 SITE 00007 SITE 00028 SITE 00036 SITE 00078
AR_N00217_001787 CORRESPONDENCE 5	**03-16-2010**	BRAC PMO WEST	TRANSMITTAL OF DRAFT WORK PLAN FOR RADIOLOGICAL DATA GAP INVESTIGATION AT PARCEL F, DATED 15 MARCH 2010	YES	PARCEL F SITE 00078

Wednesday, September 18, 2024

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_001821 REPORT 55	**04-30-2010**	CHADUX - TT, JOINT VENTURE	FINAL MEMORANDUM, APPROACH FOR DEVELOPING SOIL GAS ACTION LEVELS FOR VAPOR INTRUSION EXPOSURE	YES	PARCEL B PARCEL C PARCEL D-1 PARCEL D-2 PARCEL E PARCEL E-2 PARCEL F PARCEL G PARCEL UC-1 PARCEL UC-2 SITE 00001 SITE 00007 SITE 00028 SITE 00036 SITE 00039 SITE 00078

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_001825 CORRESPONDENCE 5	**04-30-2010**	BRAC PMO WEST	TRANSMITTAL OF FINAL MEMORANDUM, APPROACH FOR DEVELOPING SOIL GAS ACTION LEVELS FOR VAPOR INTRUSION EXPOSURE, DATED 30 APRIL 2010	YES	PARCEL B PARCEL C PARCEL D-1 PARCEL D-2 PARCEL E PARCEL E-2 PARCEL F PARCEL G PARCEL UC-1 PARCEL UC-2 SITE 00001 SITE 00007 SITE 00028 SITE 00036 SITE 00039 SITE 00078
AR_N00217_002398 CORRESPONDENCE 6	**04-30-2010**	BRAC PMO WEST	TRANSMITTAL OF DRAFT SAMPLING AND ANALYSIS PLAN (FIELD SAMPLING PLAN AND QUALITY ASSURANCE PROJECT PLAN) FOR RADIOLOGICAL SCREENING AND DATA GAP INVESTIGATION AT PARCEL F, DATED 27 APRIL 2010	YES	PARCEL F SITE 00078
AR_N00217_002243 CORRESPONDENCE 5	**09-21-2010**	BRAC PMO WEST	TRANSMITTAL OF DRAFT PIER DEMOLITION WORK PLAN, DATED 1 SEPTEMBER 2010	YES	PARCEL F SITE 00078
AR_N00217_002287 CORRESPONDENCE 4	**10-21-2010**	U.S. EPA - SAN FRANCISCO, CA	COMMENTS ON DRAFT PIER DEMOLITION WORK PLAN, DATED 1 SEPTEMBER 2010	YES	PARCEL F SITE 00078

Wednesday, September 18, 2024

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_002289 CORRESPONDENCE 5	**10-22-2010**	DEPARTMENT OF PUBLIC HEALTH - SAN FRANCISCO, CA	COMMENTS ON DRAFT PIER DEMOLITION WORK PLAN, DATED 1 SEPTEMBER 2010	YES	PARCEL F SITE 00078
AR_N00217_002291 CORRESPONDENCE 8	**10-26-2010**	DTSC - BERKELEY, CA	COMMENTS FROM DTSC-BERKELEY; AND CALIFORNIA DEPARTMENT OF PUBLIC HEALTH, DATED 19 OCTOBER 2010 ON DRAFT PIER DEMOLITION WORK PLAN, DATED 1 SEPTEMBER 2010	YES	PARCEL F SITE 00078
AR_N00217_002290 CORRESPONDENCE 3	**11-08-2010**	CRWQCB - SAN FRANCISCO, CA	COMMENTS ON DRAFT PIER DEMOLITION WORK PLAN, DATED 1 SEPTEMBER 2010	YES	PARCEL F SITE 00078
AR_N00217_002294 CORRESPONDENCE 9	**11-16-2010**	PUBLIC CITIZEN	COMMENTS ON DRAFT PIER DEMOLITION WORK PLAN, DATED 1 SEPTEMBER 2010	YES	PARCEL F SITE 00078
AR_N00217_002293 REPORT 487	**12-01-2010**	ERS, JOINT VENTURE	FINAL PIER DEMOLITION WORK PLAN	YES	BLDG 0000129 BLDG 0000132 DRY DOCK 0005 DRY DOCK 0007 PARCEL F SITE 00078

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_005231 FACT SHEET 3	**01-01-2011**	CH2M HILL - KLEINFELDER, JOINT VENTURE	FACT SHEET - COMMUNITY PARTNERING	YES	PARCEL B PARCEL C PARCEL D-1 PARCEL D-2 PARCEL E PARCEL E-2 PARCEL F PARCEL G PARCEL UC-1 PARCEL UC-2 SITE 00001 SITE 00007 SITE 00028 SITE 00036 SITE 00039 SITE 00078
AR_N00217_002292 CORRESPONDENCE 5	**01-07-2011**	BRAC PMO WEST	TRANSMITTAL OF FINAL PIER DEMOLITION WORK PLAN, DATED 1 DECEMBER 2010	YES	BLDG 0000129 BLDG 0000132 DRY DOCK 0005 DRY DOCK 0007 PARCEL F SITE 00078

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_002560 CORRESPONDENCE 5	**03-08-2011**	BRAC PMO WEST	TRANSMITTAL OF DRAFT COMMUNITY INVOLVEMENT PLAN, DATED 1 MARCH 2011	YES	PARCEL A PARCEL B PARCEL C PARCEL D-1 PARCEL D-2 PARCEL E PARCEL E-2 PARCEL F PARCEL G PARCEL UC-1 PARCEL UC-2 SITE 00001 SITE 00007 SITE 00028 SITE 00036 SITE 00039 SITE 00078
AR_N00217_003602 CORRESPONDENCE 5	**08-01-2011**	BRAC PMO WEST	TRANSMITTAL OF FINAL WORK PLAN FOR RADIOLOGICAL DATA GAP INVESTIGATION AT PARCEL F, DATED 1 AUGUST 2011	YES	PARCEL F SITE 00023 SITE 00026 SITE 00078
AR_N00217_003603 REPORT 1295	**08-01-2011**	BATTELLE	FINAL WORK PLAN FOR RADIOLOGICAL DATA GAP INVESTIGATION AT PARCEL F	YES	PARCEL F SITE 00023 SITE 00026 SITE 00078

Wednesday, September 18, 2024

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_004241 REPORT 60	**12-02-2011**	CHADUX - TT, JOINT VENTURE	REVISED FINAL MEMORANDUM - APPROACH FOR DEVELOPING SOIL GAS ACTION LEVELS FOR VAPOR INTRUSION EXPOSURE	YES	PARCEL B PARCEL C PARCEL D-1 PARCEL D-2 PARCEL E PARCEL E-2 PARCEL F PARCEL G PARCEL UC-1 PARCEL UC-2 SITE 00001 SITE 00007 SITE 00028 SITE 00036 SITE 00039 SITE 00078

Wednesday, September 18, 2024

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_005238 MINUTES 8	**12-07-2011**	CH2M HILL - KLEINFELDER, JOINT VENTURE	MEETING SUMMARY FOR COMMUNITY INFORMATIONAL MEETING HELD ON 7 DECEMBER 2011	YES	PARCEL B PARCEL C PARCEL D PARCEL D-1 PARCEL E PARCEL E-2 PARCEL F PARCEL G PARCEL UC-1 PARCEL UC-2 PARCEL UC-3 SITE 00007 SITE 00018 SITE 00028 SITE 00036 SITE 00039 SITE 00078

Wednesday, September 18, 2024

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_004386 CORRESPONDENCE 3	**12-20-2011**	BRAC PMO WEST	TRANSMITTAL OF FINAL EXECUTION PLAN, BASEWIDE RADIOLOGICAL SUPPORT, REVISION 1, DATED 20 DECEMBER 2011	YES	BASEWIDE PARCEL A PARCEL B PARCEL C PARCEL D-1 PARCEL D-2 PARCEL E PARCEL E-2 PARCEL F PARCEL G PARCEL UC-1 PARCEL UC-2 SITE 00001 SITE 00007 SITE 00028 SITE 00036 SITE 00039 SITE 00078

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_004387 REPORT 1853	**12-20-2011**	TETRA TECH EC, INC.	FINAL EXECUTION PLAN, BASEWIDE RADIOLOGICAL SUPPORT, REVISION 1	YES	BASEWIDE PARCEL A PARCEL B PARCEL C PARCEL D-1 PARCEL D-2 PARCEL E PARCEL E-2 PARCEL F PARCEL G PARCEL UC-1 PARCEL UC-2 SITE 00001 SITE 00007 SITE 00028 SITE 00036 SITE 00039 SITE 00078

Wednesday, September 18, 2024

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_004292 CORRESPONDENCE 3	**02-03-2012**	BRAC PMO WEST	TRANSMITTAL OF FINAL BASEWIDE RADIOLOGICAL MANAGEMENT PLAN, DATED 3 FEBRUARY 2012	YES	BASEWIDE PARCEL B PARCEL C PARCEL D-1 PARCEL D-2 PARCEL E PARCEL E-2 PARCEL F PARCEL G PARCEL UC-1 PARCEL UC-2 PARCEL UC-3 SITE 00001 SITE 00007 SITE 00028 SITE 00036 SITE 00039 SITE 00078

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_004293 REPORT 160	**02-03-2012**	TETRA TECH EC, INC.	FINAL BASEWIDE RADIOLOGICAL MANAGEMENT PLAN	YES	BASEWIDE PARCEL B PARCEL C PARCEL D-1 PARCEL D-2 PARCEL E PARCEL E-2 PARCEL F PARCEL G PARCEL UC-1 PARCEL UC-2 PARCEL UC-3 SITE 00001 SITE 00007 SITE 00028 SITE 00036 SITE 00039 SITE 00078

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_004326 REPORT 259	**02-22-2012**	CE2 - KLEINFELDER, JOINT VENTURE	REVISED FINAL ACCIDENT PREVENTION PLAN, BASEWIDE GROUNDWATER MONITORING PROGRAM	YES	BASEWIDE PARCEL B PARCEL C PARCEL D-1 PARCEL D-2 PARCEL E PARCEL E-2 PARCEL F PARCEL G PARCEL UC-1 PARCEL UC-2 SITE 00001 SITE 00007 SITE 00028 SITE 00036 SITE 00039 SITE 00078
AR_N00217_005285 MINUTES 8	**02-22-2012**	CH2M HILL - KLEINFELDER, JOINT VENTURE	FINAL MEETING SUMMARY FOR COMMUNITY INFORMATIONAL MEETING HELD ON 22 FEBRUARY 2012 TO DISCUSS UPDATE ON PARCEL E-2 CLEANUP, HOT SPOT REMOVAL AND SHIP SHIELDING AREA CLEANUP PROJECT	YES	PARCEL B PARCEL E-2 PARCEL F SITE 00001 SITE 00007 SITE 00078

Wednesday, September 18, 2024

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_005242 FACT SHEET 2	**04-02-2012**	CH2M HILL - KLEINFELDER, JOINT VENTURE	FACT SHEET - AN OVERVIEW OF THE FORMER SHIPYARD, PREPARING FOR TOMORROW	YES	PARCEL A PARCEL B PARCEL C PARCEL D-1 PARCEL D-2 PARCEL E PARCEL F PARCEL G PARCEL UC-1 PARCEL UC-2 PARCEL UC-3 SITE 00007 SITE 00028 SITE 00036 SITE 00039 SITE 00078
AR_N00217_005273 CORRESPONDENCE 4	**06-12-2012**	CH2M HILL - KLEINFELDER, JOINT VENTURE	RESPONSE TO COMMENTS FROM EPA-SAN FRANCISCO ON CLARIFICATIONS OF NAVY DATA SET AT SOUTH BASIN	YES	PARCEL F SITE 00078
AR_N00217_004531 CORRESPONDENCE 5	**07-31-2012**	BRAC PMO WEST	TRANSMITTAL OF DRAFT TECHNICAL MEMORANDUM FOR RADIOLOGICAL DATA GAP INVESTIGATION PHASE 2A AT PARCEL F SUBMARINE AREAS, PARCEL B REVETMENT WALL AREAS, AND SAN FRANCISCO BAY REFERENCE SITES, DATED 1 JULY 2012	YES	PARCEL F SITE 00078

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_005277 MINUTES 9	**08-22-2012**	CH2M HILL - KLEINFELDER, JOINT VENTURE	MEETING SUMMARY FOR COMMUNITY MEETING HELD ON 22 AUGUST 2012 TO DISCUSS SHIPYARD FIELD WORK UPDATE, UTILITY CORRIDOR AND RADIOLOGICAL CLEANUP ACTIVITIES	YES	PARCEL C PARCEL D-1 PARCEL D-2 PARCEL E PARCEL E-2 PARCEL F PARCEL G PARCEL UC-1 PARCEL UC-2 SITE 00001 SITE 00028 SITE 00036 SITE 00039 SITE 00078

Wednesday, September 18, 2024

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_005706 REPORT 13	**09-25-2012**	CH2M HILL - KLEINFELDER, JOINT VENTURE	FINAL FEDERAL FACILITY AGREEMENT SCHEDULE FOR FISCAL YEAR 2013	YES	BLDG 0000241 PARCEL B PARCEL C PARCEL D-1 PARCEL E PARCEL E-2 PARCEL F PARCEL G PARCEL UC-1 PARCEL UC-2 SITE 00001 SITE 00007 SITE 00018 SITE 00028 SITE 00036 SITE 00039 SITE 00078

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_005280 FACT SHEET 3	**10-15-2012**	CH2M HILL - KLEINFELDER, JOINT VENTURE	FACT SHEET - AN UPDATE OF CLEANUP ACHIEVEMENTS, PREPARING FOR TOMORROW, PROGRAM OUTREACH ACHIEVEMENTS, JULY-SEPTEMBER 2012	YES	PARCEL B PARCEL E PARCEL E-2 PARCEL F PARCEL G PARCEL UC-2 SITE 00001 SITE 00007 SITE 00028 SITE 00036 SITE 00039 SITE 00078
AR_N00217_004885 CORRESPONDENCE 5	**12-10-2012**	BRAC PMO WEST	TRANSMITTAL OF FINAL AMENDMENT TO FINAL WORK PLAN FOR RADIOLOGICAL DATA GAP INVESTIGATION AT PARCEL F, DATED 10 DECEMBER 2012	YES	PARCEL F SITE 00078
AR_N00217_004886 REPORT 468	**12-10-2012**	ITSI GILBANE COMPANY	FINAL AMENDMENT TO FINAL WORK PLAN FOR RADIOLOGICAL DATA GAP INVESTIGATION AT PARCEL F	YES	PARCEL F SITE 00078

Wednesday, September 18, 2024

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_004926 FACT SHEET 3	**01-01-2013**	CH2M HILL - KLEINFELDER, JOINT VENTURE	PROGRAM OUTREACH ACHIEVEMENTS UPDATE - FOURTH QUARTER 2012 (OCTOBER - DECEMBER 2012)	YES	BLDG 0000241 PARCEL B PARCEL D-1 PARCEL E PARCEL E-2 PARCEL F PARCEL G PARCEL UC-1 PARCEL UC-2 PARCEL UC-3 SITE 00001 SITE 00007 SITE 00028 SITE 00036 SITE 00039 SITE 00078
AR_N00217_005017 CORRESPONDENCE 4	**04-15-2013**	BRAC PMO WEST	TRANSMITTAL OF FINAL TECHNICAL MEMORANDUM FOR RADIOLOGICAL DATA GAP INVESTIGATION PHASE 2A AT PARCEL F SUBMARINE AREAS, PARCEL B REVETMENT WALL AREAS, AND SAN FRANCISCO BAY REFERENCE SITES, DATED 15 APRIL 2013	YES	PARCEL B PARCEL F SITE 00007 SITE 00078
AR_N00217_005018 REPORT 10921	**04-15-2013**	BATTELLE	FINAL TECHNICAL MEMORANDUM FOR RADIOLOGICAL DATA GAP INVESTIGATION PHASE 2A AT PARCEL F SUBMARINE AREAS, PARCEL B REVETMENT WALL AREAS, AND SAN FRANCISCO BAY REFERENCE SITES	NO	PARCEL B PARCEL F SITE 00007 SITE 00078

Wednesday, September 18, 2024

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_006167 REPORT 393	**04-15-2013**	BATTELLE	FINAL TECHNICAL MEMORANDUM FOR RADIOLOGICAL DATA GAP INVESTIGATION PHASE 2A AT PARCEL F SUBMARINE AREAS, PARCEL B REVETMENT WALL AREAS, AND SAN FRANCISCO BAY REFERENCE SITES (MAIN REPORT AND APPENDIX A)	YES	PARCEL B PARCEL F SITE 00007 SITE 00078
AR_N00217_006168 REPORT 291	**04-15-2013**	BATTELLE	FINAL TECHNICAL MEMORANDUM FOR RADIOLOGICAL DATA GAP INVESTIGATION PHASE 2A AT PARCEL F SUBMARINE AREAS, PARCEL B REVETMENT WALL AREAS, AND SAN FRANCISCO BAY REFERENCE SITES (APPENDIX B, PART 1 OF 5)	YES	PARCEL B PARCEL F SITE 00007 SITE 00078
AR_N00217_006169 REPORT 4529	**04-15-2013**	BATTELLE	FINAL TECHNICAL MEMORANDUM FOR RADIOLOGICAL DATA GAP INVESTIGATION PHASE 2A AT PARCEL F SUBMARINE AREAS, PARCEL B REVETMENT WALL AREAS, AND SAN FRANCISCO BAY REFERENCE SITES (APPENDIX B, PART 2 OF 5)	YES	PARCEL B PARCEL F SITE 00007 SITE 00078
AR_N00217_006170 REPORT 1038	**04-15-2013**	BATTELLE	FINAL TECHNICAL MEMORANDUM FOR RADIOLOGICAL DATA GAP INVESTIGATION PHASE 2A AT PARCEL F SUBMARINE AREAS, PARCEL B REVETMENT WALL AREAS, AND SAN FRANCISCO BAY REFERENCE SITES (APPENDIX B, PART 3 OF 5)	YES	PARCEL B PARCEL F SITE 00007 SITE 00078
AR_N00217_006171 REPORT 4410	**04-15-2013**	BATTELLE	FINAL TECHNICAL MEMORANDUM FOR RADIOLOGICAL DATA GAP INVESTIGATION PHASE 2A AT PARCEL F SUBMARINE AREAS, PARCEL B REVETMENT WALL AREAS, AND SAN FRANCISCO BAY REFERENCE SITES (APPENDIX B, PART 4 OF 5)	YES	PARCEL B PARCEL F SITE 00007 SITE 00078
AR_N00217_006172 REPORT 36	**04-15-2013**	BATTELLE	FINAL TECHNICAL MEMORANDUM FOR RADIOLOGICAL DATA GAP INVESTIGATION PHASE 2A AT PARCEL F SUBMARINE AREAS, PARCEL B REVETMENT WALL AREAS, AND SAN FRANCISCO BAY REFERENCE SITES (APPENDIX B, PART 5 OF 5)	YES	PARCEL B PARCEL F SITE 00007 SITE 00078

Wednesday, September 18, 2024

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_006173 REPORT 230	**04-15-2013**	BATTELLE	FINAL TECHNICAL MEMORANDUM FOR RADIOLOGICAL DATA GAP INVESTIGATION PHASE 2A AT PARCEL F SUBMARINE AREAS, PARCEL B REVETMENT WALL AREAS, AND SAN FRANCISCO BAY REFERENCE SITES (APPENDICES C THROUGH G)	YES	PARCEL B PARCEL F SITE 00007 SITE 00078
AR_N00217_004795 CORRESPONDENCE 4	**06-27-2013**	BRAC PMO WEST	TRANSMITTAL OF DRAFT TECHNICAL MEMORANDUM FOR THE RADIOLOGICAL DATA GAP INVESTIGATION PHASE 2B AT PARCEL F, DATED 1 JUNE 2013	YES	PARCEL F SITE 00078
AR_N00217_004997 REPORT 150	**07-01-2013**	ITSI GILBANE COMPANY	FINAL BASEWIDE RADIOLOGICAL MANAGEMENT PLAN	YES	PARCEL A PARCEL B PARCEL C PARCEL D PARCEL D-1 PARCEL D-2 PARCEL E PARCEL E-2 PARCEL F PARCEL G PARCEL UC-1 PARCEL UC-2 PARCEL UC-3 SITE 00001 SITE 00007 SITE 00028 SITE 00036 SITE 00039 SITE 00078

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_004996 CORRESPONDENCE 4	**08-05-2013**	BRAC PMO WEST	TRANSMITTAL OF FINAL BASEWIDE RADIOLOGICAL MANAGEMENT PLAN, DATED 1 JULY 2013	YES	PARCEL A PARCEL B PARCEL C PARCEL D PARCEL D-1 PARCEL D-2 PARCEL E PARCEL E-2 PARCEL F PARCEL G PARCEL UC-1 PARCEL UC-2 PARCEL UC-3 SITE 00001 SITE 00007 SITE 00028 SITE 00036 SITE 00039 SITE 00078
AR_N00217_004972 REPORT 52497	**09-01-2013**	ITSI GILBANE COMPANY	FINAL TECHNICAL MEMORANDUM FOR THE RADIOLOGICAL DATA GAP INVESTIGATION PHASE 2B AT PARCEL F	YES	PARCEL F SITE 00078
AR_N00217_004970 CORRESPONDENCE 4	**09-30-2013**	BRAC PMO WEST	TRANSMITTAL OF FINAL TECHNICAL MEMORANDUM FOR THE RADIOLOGICAL DATA GAP INVESTIGATION PHASE 2B AT PARCEL F, DATED 1 SEPTEMBER 2013	YES	PARCEL F SITE 00078

Wednesday, September 18, 2024

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_004999 REPORT 384	**10-01-2013**	ARCADIS U.S., INC.	FINAL WORK PLAN, LOADING, TRANSPORTATION, AND REMOVAL OF WASTE MATERIAL	YES	PARCEL B PARCEL D-1 PARCEL D-2 PARCEL E PARCEL E-2 PARCEL F PARCEL G PARCEL UC-1 PARCEL UC-2 PARCEL UC-3 SITE 00001 SITE 00007 SITE 00028 SITE 00036 SITE 00039 SITE 00078

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_004998 CORRESPONDENCE 3	**10-11-2013**	BRAC PMO WEST	TRANSMITTAL OF FINAL WORK PLAN, LOADING, TRANSPORTATION, AND REMOVAL OF WASTE MATERIAL, DATED 1 OCTOBER 2013	YES	PARCEL B PARCEL D-1 PARCEL D-2 PARCEL E PARCEL E-2 PARCEL F PARCEL G PARCEL UC-1 PARCEL UC-2 PARCEL UC-3 SITE 00001 SITE 00007 SITE 00028 SITE 00036 SITE 00039 SITE 00078
AR_N00217_004971 CORRESPONDENCE 4	**12-04-2013**	BRAC PMO WEST	TRANSMITTAL OF REPLACEMENT PAGES UPDATING THE FINAL TECHNICAL MEMORANDUM FOR THE RADIOLOGICAL DATA GAP INVESTIGATION PHASE 2B AT PARCEL F, DATED 1 SEPTEMBER 2013	YES	PARCEL F SITE 00078

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_006002 FACT SHEET 5	**08-18-2014**	CH2M HILL - KLEINFELDER, JOINT VENTURE	FINAL FACT SHEET - ANNUAL UPDATE OF CLEANUP ACHIEVEMENTS	YES	PARCEL B PARCEL C PARCEL D-1 PARCEL D-2 PARCEL E PARCEL E-2 PARCEL F PARCEL G PARCEL UC-1 PARCEL UC-2 PARCEL UC-3 SITE 00001 SITE 00007 SITE 00028 SITE 00036 SITE 00039 SITE 00078

Wednesday, September 18, 2024

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_005288 REPORT 211	**10-01-2014**	CH2M HILL - KLEINFELDER, JOINT VENTURE	FINAL COMMUNITY INVOLVEMENT PLAN UPDATE	YES	PARCEL A PARCEL B PARCEL C PARCEL D-1 PARCEL D-2 PARCEL E PARCEL E-2 PARCEL F PARCEL G PARCEL UC-1 PARCEL UC-2 PARCEL UC-3 SITE 00001 SITE 00007 SITE 00028 SITE 00036 SITE 00039 SITE 00078

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_005287 CORRESPONDENCE 4	**10-20-2014**	BRAC PMO WEST	TRANSMITTAL OF FINAL COMMUNITY INVOLVEMENT PLAN UPDATE, DATED 1 OCTOBER 2014	YES	PARCEL A PARCEL B PARCEL C PARCEL D-1 PARCEL D-2 PARCEL E PARCEL E-2 PARCEL F PARCEL G PARCEL UC-1 PARCEL UC-2 PARCEL UC-3 SITE 00001 SITE 00007 SITE 00036 SITE 00039 SITE 00078

Wednesday, September 18, 2024

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_005289 REPORT 407	**12-01-2014**	ARCADIS U.S., INC.	FINAL WORK PLAN, LOADING, TRANSPORTATION, AND REMOVAL OF WASTE MATERIAL	YES	PARCEL B PARCEL C PARCEL D-1 PARCEL D-2 PARCEL E PARCEL E-2 PARCEL F PARCEL G PARCEL UC-1 PARCEL UC-2 PARCEL UC-3 SITE 00001 SITE 00007 SITE 00028 SITE 00036 SITE 00039 SITE 00078
AR_N00217_005143 CORRESPONDENCE 4	**12-23-2014**	BRAC PMO WEST	TRANSMITTAL OF DRAFT SAMPLING AND ANALYSIS PLAN (FIELD SAMPLING PLAN AND QUALITY ASSURANCE PROJECT PLAN) ACTIVATED CARBON AMENDMENTS PILOT STUDY MONITORING AT PARCEL F, DATED 17 NOVEMBER 2014	YES	PARCEL F SITE 00078

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_005300 REPORT 11	**02-01-2015**	CH2M HILL - KLEINFELDER, JOINT VENTURE	FINAL FEDERAL FACILITY AGREEMENT SCHEDULE FOR FISCAL YEAR 2015	YES	PARCEL B PARCEL B-1 PARCEL B-2 PARCEL C PARCEL D-1 PARCEL E PARCEL E-2 PARCEL F PARCEL UC-3 SITE 00001 SITE 00002 SITE 00003 SITE 00007 SITE 00012 SITE 00026 SITE 00028 SITE 00036 SITE 00039 SITE 00078

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_005299 CORRESPONDENCE 3	**02-18-2015**	BRAC PMO WEST	TRANSMITTAL OF FINAL FEDERAL FACILITY AGREEMENT SCHEDULE FOR FISCAL YEAR 2015, DATED 1 FEBRUARY 2015	YES	PARCEL B PARCEL B-1 PARCEL B-2 PARCEL C PARCEL D-1 PARCEL E PARCEL E-2 PARCEL F PARCEL UC-3 SITE 00001 SITE 00002 SITE 00003 SITE 00007 SITE 00012 SITE 00026 SITE 00028 SITE 00036 SITE 00039 SITE 00078

Wednesday, September 18, 2024

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_006018 FACT SHEET 2	**04-01-2015**	CH2M HILL - KLEINFELDER, JOINT VENTURE	FINAL FACT SHEET - RADIOLOGICAL CLEANUP ACHIEVEMENTS	YES	PARCEL B PARCEL C PARCEL D-1 PARCEL D-2 PARCEL E PARCEL E-2 PARCEL F PARCEL G SITE 00001 SITE 00007 SITE 00028 SITE 00036 SITE 00039 SITE 00078
AR_N00217_005355 REPORT 358	**04-24-2015**	CH2M HILL - KLEINFELDER, JOINT VENTURE	FINAL SAMPLING AND ANALYSIS PLAN (FIELD SAMPLING PLAN AND QUALITY ASSURANCE PROJECT PLAN) ACTIVATED CARBON AMENDMENTS PILOT STUDY MONITORING AT PARCEL F	YES	PARCEL F SITE 00078
AR_N00217_005351 REPORT 256	**04-30-2015**	CH2M HILL - KLEINFELDER, JOINT VENTURE	FINAL ACCIDENT PREVENTION PLAN, ACTIVATED CARBON AMENDMENTS PILOT STUDY MONITORING AT PARCEL F	YES	PARCEL F SITE 00078
AR_N00217_005354 CORRESPONDENCE 4	**05-01-2015**	BRAC PMO WEST	TRANSMITTAL OF FINAL SAMPLING AND ANALYSIS PLAN (FIELD SAMPLING PLAN AND QUALITY ASSURANCE PROJECT PLAN) ACTIVATED CARBON AMENDMENTS PILOT STUDY MONITORING AT PARCEL F, DATED 24 APRIL 2015	YES	PARCEL F SITE 00078

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_005382 CORRESPONDENCE 4	**05-01-2015**	BRAC PMO WEST	TRANSMITTAL OF FINAL WORK PLAN FOR THE DEMONSTRATION OF ACTIVATED CARBON AMENDMENTS, DATED 1 MAY 2015	YES	PARCEL F SITE 00078
AR_N00217_005383 REPORT 84	**05-01-2015**	CH2M HILL - KLEINFELDER, JOINT VENTURE	FINAL WORK PLAN FOR THE DEMONSTRATION OF ACTIVATED CARBON AMENDMENTS	YES	PARCEL F SITE 00078
AR_N00217_006027 FACT SHEET 2	**06-01-2015**	CH2M HILL - KLEINFELDER, JOINT VENTURE	FINAL FACT SHEET - ACTIVATED CARBON PILOT STUDY	YES	PARCEL F SITE 00078
AR_N00217_006026 FACT SHEET 5	**09-01-2015**	CH2M HILL - KLEINFELDER, JOINT VENTURE	FINAL FACT SHEET - ANNUAL UPDATE OF CLEANUP ACHIEVEMENTS	YES	PARCEL C PARCEL D-1 PARCEL D-2 PARCEL E PARCEL E-2 PARCEL F PARCEL G PARCEL UC-1 PARCEL UC-2 PARCEL UC-3 SITE 00001 SITE 00028 SITE 00036 SITE 00039 SITE 00078

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_005863 CORRESPONDENCE 5	**01-14-2016**	BRAC PMO WEST	TRANSMITTAL OF DRAFT ADDENDUM TO THE FEASIBILITY STUDY REPORT FOR PARCEL F, DATED 01 JANUARY 2016	YES	PARCEL F SITE 00078
AR_N00217_005731 CORRESPONDENCE 3	**08-10-2016**	BRAC PMO WEST	TRANSMITTAL OF DRAFT FINAL ADDENDUM TO THE FEASIBILITY STUDY REPORT FOR PARCEL F, DATED 1 AUGUST 2016	YES	PARCEL F SITE 00078
AR_N00217_005898 CORRESPONDENCE 3	**08-10-2016**	BRAC PMO WEST	TRANSMITTAL OF TECHNICAL MEMORANDUM DEMONSTRATION OF ACTIVATED CARBON AMENDMENTS, SUMMARY OF FIELD ACTIVITIES, DATED 10 AUGUST 2016	YES	PARCEL E-2 PARCEL F SITE 00001 SITE 00078
AR_N00217_005899 REPORT 867	**08-10-2016**	CH2M HILL - KLEINFELDER, JOINT VENTURE	TECHNICAL MEMORANDUM DEMONSTRATION OF ACTIVATED CARBON AMENDMENTS, SUMMARY OF FIELD ACTIVITIES	YES	PARCEL E-2 PARCEL F SITE 00001 SITE 00078
AR_N00217_005623 REPORT 317	**01-01-2017**	CH2M HILL - KLEINFELDER, JOINT VENTURE	FINAL ADDENDUM TO THE FEASIBILITY STUDY REPORT FOR PARCEL F	YES	PARCEL F SITE 00078
AR_N00217_005622 CORRESPONDENCE 4	**01-19-2017**	BRAC PMO WEST	TRANSMITTAL OF FINAL ADDENDUM TO THE FEASIBILITY STUDY REPORT FOR PARCEL F, DATED 1 JANUARY 2017	YES	PARCEL F SITE 00078

Wednesday, September 18, 2024

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_005740 REPORT 14	**03-15-2017**	NOREAS ENVIRONMENTAL ENGINEERING AND SCIENCE	FINAL FEDERAL FACILITIES AGREEMENT SCHEDULE	YES	PARCEL C PARCEL D-1 PARCEL E PARCEL E-2 PARCEL F PARCEL UC-3 SITE 00001 SITE 00028 SITE 00036 SITE 00039 SITE 00078
AR_N00217_005739 CORRESPONDENCE 2	**03-16-2017**	BRAC PMO WEST	TRANSMITTAL OF FINAL FEDERAL FACILITIES AGREEMENT SCHEDULE, DATED 15 MARCH 2017	YES	PARCEL C PARCEL D-1 PARCEL E PARCEL E-2 PARCEL F PARCEL UC-3 SITE 00001 SITE 00028 SITE 00036 SITE 00039 SITE 00078
AR_N00217_005748 CORRESPONDENCE 4	**05-08-2017**	BRAC PMO WEST	TRANSMITTAL OF DRAFT TECHNICAL MEMORANDUM OPTIMIZED REMEDIAL ALTERNATIVE FOR PARCEL F, DATED 01 MAY 2017	YES	PARCEL F SITE 00078

Wednesday, September 18, 2024

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_007118 CORRESPONDENCE 4	**07-28-2017**	BRAC PMO WEST	TRANSMITTAL OF DRAFT WORK PLAN, SEDIMENT INVESTIGATION AND BATHYMETRIC SURVEY, PARCEL F, DATED 1 JULY 2017	YES	PARCEL F SITE 00078
AR_N00217_005828 REPORT 273	**09-01-2017**	ECC - INSIGHT, LLC	FINAL TECHNICAL MEMORANDUM OPTIMIZED REMEDIAL ALTERNATIVE FOR PARCEL F	YES	PARCEL F SITE 00078
AR_N00217_005827 CORRESPONDENCE 4	**09-07-2017**	BRAC PMO WEST	TRANSMITTAL OF FINAL TECHNICAL MEMORANDUM OPTIMIZED REMEDIAL ALTERNATIVE FOR PARCEL F, DATED 1 SEPTEMBER 2017	YES	PARCEL F SITE 00078
AR_N00217_007121 CORRESPONDENCE 4	**11-06-2017**	BRAC PMO WEST	TRANSMITTAL OF DRAFT PROPOSED PLAN FOR SEDIMENT CLEANUP OF AREAS 3, 9, AND 10, PARCEL F	YES	PARCEL F SITE 00078
AR_N00217_005862 REPORT 457	**11-20-2017**	ECC - INSIGHT, LLC	FINAL WORK PLAN SEDIMENT INVESTIGATION AND BATHYMETRIC SURVEY FOR PARCEL F	YES	PARCEL F SITE 00078

Wednesday, September 18, 2024

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_005884 CORRESPONDENCE 2	**01-23-2018**	BRAC PMO WEST	TRANSMITTAL OF FINAL FEDERAL FACILITIES AGREEMENT SCHEDULE, DATED 25 JANUARY 2018	YES	PARCEL B PARCEL C PARCEL D-1 PARCEL E PARCEL E-2 PARCEL F PARCEL G PARCEL UC-3 SITE 00001 SITE 00007 SITE 00028 SITE 00036 SITE 00039 SITE 00078

Wednesday, September 18, 2024

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_005885 REPORT 21	**01-25-2018**	NOREAS, INC.	FINAL FEDERAL FACILITIES AGREEMENT SCHEDULE	YES	PARCEL B PARCEL C PARCEL D-1 PARCEL E PARCEL E-2 PARCEL F PARCEL G PARCEL UC-3 SITE 00001 SITE 00007 SITE 00028 SITE 00036 SITE 00039 SITE 00078
AR_N00217_006218 CORRESPONDENCE 4	**02-19-2018**	BRAC PMO WEST	TRANSMITTAL OF 1) DRAFT FINAL PROPOSED PLAN FOR OFFSHORE SEDIMENT CLEANUP, PARCEL F; AND 2) RESPONSE TO COMMENTS FROM BASE REALIGNMENT AND CLOSURE (BRAC) CLEANUP TEAM (BCT) ON DRAFT PROPOSED PLAN, DATED 1 NOVEMBER 2017	YES	PARCEL F SITE 00078
AR_N00217_006220 CORRESPONDENCE 4	**02-27-2018**	BRAC PMO WEST	TRANSMITTAL OF DRAFT RADIOLOGICAL CHARACTERIZATION SURVEYS WORK PLAN, PARCEL F STRUCTURES, DATED 27 FEBRUARY 2018	YES	PARCEL F SITE 00078
AR_N00217_005876 REPORT 25	**04-01-2018**	ECC - INSIGHT, LLC	FINAL PARCEL F PROPOSED PLAN FOR OFFSHORE SEDIMENT CLEANUP	YES	PARCEL F SITE 00078

Wednesday, September 18, 2024

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_006065 REPORT 3123	**05-01-2018**	CH2M HILL - KLEINFELDER, JOINT VENTURE	FINAL DEMONSTRATION OF ACTIVATED CARBON, AMENDMENTS TO REDUCE POLYCHLORINATED BIPHENYL (PCB) BIOAVAILABILITY	YES	PARCEL F SITE 00078
AR_N00217_006064 CORRESPONDENCE 4	**05-03-2018**	BRAC PMO WEST	TRANSMITTAL OF FINAL DEMONSTRATION OF ACTIVATED CARBON, AMENDMENTS TO REDUCE POLYCHLORINATED BIPHENYL (PCB) BIOAVAILABILITY, DATED 1 MAY 2018	YES	PARCEL F SITE 00078
AR_N00217_005961 CORRESPONDENCE 4	**07-09-2018**	BRAC PMO WEST	TRANSMITTAL OF FINAL RADIOLOGICAL CHARACTERIZATION SURVEYS WORK PLAN, PARCEL F STRUCTURES, DATED 3 JULY 2018	YES	PARCEL F SITE 00078
AR_N00217_006232 CORRESPONDENCE 4	**07-09-2018**	BRAC PMO WEST	TRANSMITTAL OF DRAFT SEDIMENT INVESTIGATION BENEATH FORMER PARCELS B AND C PIER AND WHARF STRUCTURES AND BATHYMETRIC SURVEY FOR PARCEL F, DATED 1 JULY 2018	YES	PARCEL B PARCEL C PARCEL F SITE 00007 SITE 00028 SITE 00078
AR_N00217_006234 CORRESPONDENCE 4	**08-13-2018**	BRAC PMO WEST	TRANSMITTAL OF DRAFT RECORD OF DECISION, PARCEL F	YES	PARCEL F SITE 00078
AR_N00217_005964 CORRESPONDENCE 4	**10-25-2018**	BRAC PMO WEST	TRANSMITTAL OF FINAL SEDIMENT INVESTIGATION BENEATH FORMER PARCELS B AND C PIER AND WHARF STRUCTURES AND BATHYMETRIC SURVEY FOR PARCEL F, DATED 25 OCTOBER 2018	YES	PARCEL B PARCEL C PARCEL F SITE 00007 SITE 00028 SITE 00078

Wednesday, September 18, 2024

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_005965 REPORT 1576	**10-25-2018**	ECC - INSIGHT, LLC	FINAL SEDIMENT INVESTIGATION BENEATH FORMER PARCELS B AND C PIER AND WHARF STRUCTURES AND BATHYMETRIC SURVEY FOR PARCEL F	YES	PARCEL B PARCEL C PARCEL F SITE 00007 SITE 00028 SITE 00078
AR_N00217_005962 REPORT 470	**11-19-2018**	APTIM FEDERAL SERVICES, LLC	FINAL REVISION 1 RADIOLOGICAL CHARACTERIZATION SURVEYS WORK PLAN, PARCEL F STRUCTURES	YES	PARCEL F SITE 00078
AR_N00217_005971 CORRESPONDENCE 4	**11-23-2018**	BRAC PMO WEST	TRANSMITTAL OF REPLACEMENT PAGES CONVERTING FINAL RADIOLOGICAL CHARACTERIZATION SURVEYS WORK PLAN, TO REVISION 1	YES	PARCEL F SITE 00078

Wednesday, September 18, 2024

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_005966 CORRESPONDENCE 4	**01-03-2019**	BRAC PMO WEST	TRANSMITTAL OF FINAL MONITORING WELL INSTALLATION, DESTRUCTION, REHABILITATION, AND REPAIR WORK PLAN, DATED 3 JANUARY 2019	YES	PARCEL C PARCEL D-1 PARCEL D-2 PARCEL E PARCEL E-2 PARCEL F PARCEL G PARCEL UC-1 PARCEL UC-2 PARCEL UC-3 SITE 00001 SITE 00007 SITE 00018 SITE 00028 SITE 00036 SITE 00039 SITE 00078

Wednesday, September 18, 2024

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_005967 REPORT 113	**01-03-2019**	TREVET, INC.	FINAL MONITORING WELL INSTALLATION, DESTRUCTION, REHABILITATION, AND REPAIR WORK PLAN	YES	PARCEL C PARCEL D-1 PARCEL D-2 PARCEL E PARCEL E-2 PARCEL F PARCEL G PARCEL UC-1 PARCEL UC-2 PARCEL UC-3 SITE 00001 SITE 00007 SITE 00018 SITE 00028 SITE 00036 SITE 00039 SITE 00078

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_005978 CORRESPONDENCE 2	**02-04-2019**	BRAC PMO WEST	TRANSMITTAL OF FINAL FEDERAL FACILITIES AGREEMENT SCHEDULE, DATED 4 FEBRUARY 2019	YES	PARCEL B PARCEL C PARCEL D PARCEL E PARCEL F PARCEL G PARCEL H SITE 00007 SITE 00028 SITE 00036 SITE 00039 SITE 00078
AR_N00217_005979 REPORT 22	**02-04-2019**	NOREAS, INC.	FINAL FEDERAL FACILITIES AGREEMENT SCHEDULE	YES	PARCEL B PARCEL C PARCEL D PARCEL E PARCEL F PARCEL G PARCEL H SITE 00007 SITE 00028 SITE 00036 SITE 00039 SITE 00078
AR_N00217_006059 REPORT 404	**05-24-2019**	APTIM FEDERAL SERVICES, LLC	FINAL REVISION 2, RADIOLOGICAL SCOPING SURVEYS WORK PLAN, PARCEL F STRUCTURES	YES	PARCEL F

Wednesday, September 18, 2024

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_006058 CORRESPONDENCE 4	**05-31-2019**	BRAC PMO WEST	TRANSMITTAL OF FINAL REVISION 2, RADIOLOGICAL SCOPING SURVEYS WORK PLAN, PARCEL F STRUCTURES, DATED 24 MAY 2019	YES	PARCEL F SITE 00078
AR_N00217_006297 REPORT 20	**02-01-2020**	INYA, INC.	FINAL FEDERAL FACILITIES AGREEMENT SCHEDULE	YES	PARCEL B PARCEL C PARCEL D-1 PARCEL D-2 PARCEL E PARCEL E-2 PARCEL F PARCEL G PARCEL UC-1 PARCEL UC-2 PARCEL UC-3 SITE 00001 SITE 00007 SITE 00028 SITE 00036 SITE 00039 SITE 00078

Wednesday, September 18, 2024

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_006296 CORRESPONDENCE 4	**02-14-2020**	BRAC PMO WEST	TRANSMITTAL OF FINAL FACILITIES AGREEMENT SCHEDULE, DATED 1 FEBRUARY 2020	YES	PARCEL B PARCEL C PARCEL D-1 PARCEL D-2 PARCEL E PARCEL E-2 PARCEL F PARCEL G PARCEL UC-1 PARCEL UC-2 PARCEL UC-3 SITE 00001 SITE 00007 SITE 00028 SITE 00036 SITE 00039 SITE 00078

Wednesday, September 18, 2024

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_006298 CORRESPONDENCE 3	**01-22-2021**	BRAC PMO WEST	TRANSMITTAL OF FINAL FEDERAL FACILITIES AGREEMENT SCHEDULE, DATED 22 JANUARY 2021	YES	PARCEL B PARCEL C PARCEL D-1 PARCEL D-2 PARCEL E PARCEL E-2 PARCEL F PARCEL G PARCEL UC-1 PARCEL UC-2 PARCEL UC-3 SITE 00001 SITE 00007 SITE 00028 SITE 00036 SITE 00039 SITE 00078

Wednesday, September 18, 2024

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_006299 REPORT 22	**01-22-2021**	INYA, INC.	FINAL FEDERAL FACILITIES AGREEMENT SCHEDULE	YES	PARCEL B PARCEL C PARCEL D-1 PARCEL D-2 PARCEL E PARCEL E-2 PARCEL F PARCEL G PARCEL UC-1 PARCEL UC-2 PARCEL UC-3 SITE 00001 SITE 00007 SITE 00028 SITE 00036 SITE 00039 SITE 00078
AR_N00217_006324 REPORT 1297	**01-25-2021**	APTIM FEDERAL SERVICES, LLC	FINAL RADIOLOGICAL SCOPING SURVEY REPORT, PARCEL F STRUCTURES, SUBMARINE PENS (MAIN REPORT, TABLES, FIGURES, AND APPENDICES A THROUGH H)	YES	PARCEL F SITE 00078
AR_N00217_006325 REPORT 4603	**01-25-2021**	APTIM FEDERAL SERVICES, LLC	FINAL RADIOLOGICAL SCOPING SURVEY REPORT, PARCEL F STRUCTURES, SUBMARINE PENS (APPENDICES I AND J)	YES	PARCEL F SITE 00078
AR_N00217_006323 CORRESPONDENCE 3	**02-12-2021**	BRAC PMO WEST	TRANSMITTAL OF FINAL RADIOLOGICAL SCOPING SURVEY REPORT, PARCEL F STRUCTURES, SUBMARINE PENS, DATED 25 JANUARY 2021	YES	PARCEL F SITE 00078

Wednesday, September 18, 2024

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_006348 FACT SHEET 5	**04-01-2021**	U.S. EPA - SAN FRANCISCO, CA	FACT SHEET - YOSEMITE SLOUGH SITE UPDATE	YES	PARCEL F SITE 00078
AR_N00217_006328 REPORT 4634	**04-06-2021**	APTIM FEDERAL SERVICES, LLC	FINAL RADIOLOGICAL SCOPING SURVEY REPORT, PARCEL F STRUCTURES, FINGER PIERS	YES	PARCEL F SITE 00078
AR_N00217_006327 CORRESPONDENCE 3	**04-07-2021**	BRAC PMO WEST	TRANSMITTAL OF FINAL RADIOLOGICAL SCOPING SURVEY REPORT, PARCEL F STRUCTURES, FINGER PIERS, DATED 6 APRIL 2021	YES	PARCEL F SITE 00078

Wednesday, September 18, 2024

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_006690 FACT SHEET 5	**09-01-2021**	CH2M HILL, INC.	FINAL QUARTERLY UPDATE OF CLEANUP ACHIEVEMENTS	YES	PARCEL B PARCEL C PARCEL D PARCEL D-1 PARCEL D-2 PARCEL E PARCEL E-2 PARCEL F PARCEL G PARCEL UC-1 PARCEL UC-2 PARCEL UC-3 SITE 00001 SITE 00007 SITE 00028 SITE 00036 SITE 00039 SITE 00078

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_006691 FACT SHEET 7	**01-01-2022**	CH2M HILL, INC.	FINAL 2022 ANNUAL UPDATE OF CLEANUP ACHIEVEMENTS	YES	PARCEL B PARCEL C PARCEL D PARCEL D-1 PARCEL D-2 PARCEL E PARCEL E-2 PARCEL F PARCEL G PARCEL UC-1 PARCEL UC-2 PARCEL UC-3 SITE 00001 SITE 00007 SITE 00028 SITE 00036 SITE 00039 SITE 00078

Wednesday, September 18, 2024

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_006502 REPORT 29	**03-24-2022**	CH2M HILL, INC.	FINAL FEDERAL FACILITIES AGREEMENT SCHEDULE	YES	PARCEL B PARCEL C PARCEL D-1 PARCEL D-2 PARCEL E PARCEL E-2 PARCEL F PARCEL G PARCEL UC-1 PARCEL UC-2 PARCEL UC-3 SITE 00001 SITE 00003 SITE 00007 SITE 00010 SITE 00026 SITE 00028 SITE 00036 SITE 00039 SITE 00078

Wednesday, September 18, 2024

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_006501 CORRESPONDENCE 3	**03-25-2022**	BRAC PMO WEST	TRANSMITTAL OF FINAL FEDERAL FACILITIES AGREEMENT SCHEDULE, DATED 24 MARCH 2022	YES	PARCEL B PARCEL B-1 PARCEL B-2 PARCEL C PARCEL D-1 PARCEL D-2 PARCEL E PARCEL E-2 PARCEL F PARCEL G PARCEL UC-1 PARCEL UC-2 PARCEL UC-3 SITE 00001 SITE 00003 SITE 00007 SITE 00010 SITE 00026 SITE 00028 SITE 00036 SITE 00039 SITE 00078

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_006795 FACT SHEET 5	**04-01-2022**	CH2M HILL, INC.	FINAL UPDATE OF CLEANUP ACHIEVEMENTS	YES	PARCEL B PARCEL C PARCEL D-1 PARCEL E PARCEL E-2 PARCEL F PARCEL G PARCEL UC-3 SITE 00001 SITE 00007 SITE 00026 SITE 00028 SITE 00036 SITE 00039 SITE 00078
AR_N00217_006543 CORRESPONDENCE 4	**06-21-2022**	BRAC PMO WEST	TRANSMITTAL OF FINAL TECHNICAL MEMORANDUM REVISION TO TOTAL POLYCHLORINATED BIPHENYL BACKGROUND CONCENTRATION AND REMEDIAL ACTION OBJECTIVE 3 REMEDIATION GOAL, PARCEL F REMEDY, DATED 21 JUNE 2022	YES	PARCEL F SITE 00078
AR_N00217_006544 REPORT 85	**06-21-2022**	ECC - INSIGHT, LLC	FINAL TECHNICAL MEMORANDUM REVISION TO TOTAL POLYCHLORINATED BIPHENYL BACKGROUND CONCENTRATION AND REMEDIAL ACTION OBJECTIVE 3 REMEDIATION GOAL, PARCEL F REMEDY	YES	PARCEL F SITE 00078

Wednesday, September 18, 2024

HUNTERS POINT_NS

DRAFT ENVIRONMENTAL RESTORATION RECORD PUBLIC / IR INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_007246 REPORT 35	**11-01-2022**	CH2M HILL, INC.	FINAL COMMUNITY INVOLVEMENT PLAN UPDATE	YES	PARCEL B PARCEL C PARCEL D-1 PARCEL D-2 PARCEL E PARCEL E-2 PARCEL F PARCEL G PARCEL UC1 PARCEL UC2 PARCEL UC3 SITE 00010 SITE 00026
AR_N00217_007245 CORRESPONDENCE 3	**11-02-2022**	BRAC PMO WEST	TRANSMITTAL OF FINAL COMMUNITY INVOLVEMENT PLAN UPDATE, DATED 1 NOVEMBER 2022	YES	PARCEL B PARCEL C PARCEL D-1 PARCEL D-2 PARCEL E PARCEL E-2 PARCEL F PARCEL G PARCEL UC1 PARCEL UC2 PARCEL UC3 SITE 00010 SITE 00026

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ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_007196 CORRESPONDENCE 4	**02-14-2023**	BRAC PMO WEST	TRANSMITTAL OF FINAL FEDERAL FACILITIES AGREEMENT SCHEDULE, DATED 22 FEBRUARY 2023	YES	BASEWIDE BLDG 0000123 BLDG 0000351 BLDG 0000351A BLDG 0000366 BLDG 0000401 BLDG 0000408 BLDG 0000411 BLDG 0000439 PARCEL B PARCEL C PARCEL D-1 PARCEL D-2 PARCEL E PARCEL E-2 PARCEL F PARCEL G PARCEL UC-1 PARCEL UC-2 PARCEL UC-3 SITE 00001 SITE 00003 SITE 00007 SITE 00010 SITE 00026 SITE 00028 SITE 00036 SITE 00039

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UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
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ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
AR_N00217_007197 REPORT 23	**02-22-2023**	CH2M HILL, INC.	FINAL FEDERAL FACILITIES AGREEMENT SCHEDULE	YES	BASEWIDE BLDG 0000123 BLDG 0000351 BLDG 0000351A BLDG 0000366 BLDG 0000401 BLDG 0000408 BLDG 0000411 BLDG 0000439 PARCEL B PARCEL C PARCEL D-1 PARCEL D-2 PARCEL E PARCEL E-2 PARCEL F PARCEL G PARCEL UC-1 PARCEL UC-2 PARCEL UC-3 SITE 00001 SITE 00003 SITE 00007 SITE 00010 SITE 00026 SITE 00028 SITE 00036 SITE 00039

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ADMINISTRATIVE RECORD INDEX - PARCEL F

UIC No. _ Rec. No. Record Type Approx. # Pages	Record Date	Author Affiliation	Title	Imaged?	Sites
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Total Estimated Record Page Count: **114,204**

Total Records: **348**

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No Litigation Case Number

Wednesday, September 18, 2024

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ATTACHMENT 2

REFERENCES

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Reference Table

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Attachment 2. Reference Table

Item	Reference or Phrase in ROD	Locations in ROD	Referenced Document and Section/Page Number
1	Erosion	2.2.1 Hydrodynamic Setting	**Source:** Barajas and Associates, Battelle, Neptune & Company, and Sea Engineering, Inc. 2007. *Technical Memorandum, Hunters Point Shipyard Parcel F, Feasibility Study Data Gaps Investigation. Hunters Point Shipyard, San Francisco, CA*. May 25. **DCN:** BAI-5106-0004-0001 **Location:** Section 2.1.3.2, Table 2-3, Figure 2-14, Appendix F
2	Bathymetric Survey	2.2.1 Hydrodynamic Setting	**Source:** Barajas and Associates, Battelle, Neptune & Company, and Sea Engineering, Inc. 2007. *Technical Memorandum, Hunters Point Shipyard Parcel F, Feasibility Study Data Gaps Investigation. Hunters Point Shipyard, San Francisco, CA*. May 25. **DCN:** BAI-5106-0004-0001 **Location:** Section 1.2.2, Figure 1-6
3	Sediment Dynamics Study	2.2.1 Hydrodynamic Setting	**Source:** Barajas and Associates, Battelle, Neptune & Company, and Sea Engineering, Inc. 2007. *Technical Memorandum, Hunters Point Shipyard Parcel F, Feasibility Study Data Gaps Investigation. Hunters Point Shipyard, San Francisco, CA*. May 25. **DCN:** BAI-5106-0004-0001 **Location:** Section 2.2.3
4	Open Water Aquatic Habitat	2.2.2 Ecological Setting	**Source:** Barajas and Associates. 2008. *Final Feasibility Study for Parcel F, Hunters Point Shipyard, San Francisco, California*. April 30. **DCN:** BAI-5106-0004-0003 **Location:** Section 1.4.4.1
5	Intertidal Wetlands and Bay Mudflats Habitat	2.2.2 Ecological Setting	**Source:** Barajas and Associates. 2008. *Final Feasibility Study for Parcel F, Hunters Point Shipyard, San Francisco, California*. April 30. **DCN:** BAI-5106-0004-0003 **Location:** Section 1.4.4.2

Attachment 2. Reference Table

Item	Reference or Phrase in ROD	Locations in ROD	Referenced Document and Section/Page Number
6	**Distribution of Chemicals**	**2.3.2 Nature and Extent of Contamination**	**Source:** Barajas and Associates. 2008. *Final Feasibility Study for Parcel F, Hunters Point Shipyard, San Francisco, California*. April 30. **DCN:** BAI-5106-0004-0003 **Location:** Section 1.5 through Section 1.5.6
7	**Characterize Radionuclides of Concern**	**2.3.2 Nature and Extent of Contamination**	**Source:** KCH. 2017a. *Final Addendum to the Feasibility Study Report for Parcel F, Hunters Point Naval Shipyard San Francisco, California*. January. **DCN:** KCH-2622-0005-0138 **Location:** Section 8
8	**Source of COCs**	**2.3.3 Sources of Contamination and Removal Areas**	**Source:** Barajas and Associates. 2008. *Final Feasibility Study for Parcel F, Hunters Point Shipyard, San Francisco, California*. April 30. **DCN:** BAI-5106-0004-0003 **Location:** Section 1.6.1 through Section 1.6.2.2
9	**Background**	**2.5.1 Conceptual Model**	**Source:** Barajas and Associates. 2008. *Final Feasibility Study for Parcel F, Hunters Point Shipyard, San Francisco, California*. April 30. **DCN:** BAI-5106-0004-0003 **Location:** Section 2.1.2 through Section 2.1.3
10a	**Human Health Risk Assessment**	**2.5.2 Human Health Risk Assessment**	**Source:** KCH. 2017a. *Final Addendum to the Feasibility Study Report for Parcel F, Hunters Point Naval Shipyard San Francisco, California*. January. **DCN:** KCH-2622-0005-0138 **Location:** Appendix A; Point Avisadero Area (Area III): Tables A-12A through A-13C; South Basin Area X: Tables A-14A through A-15C

Attachment 2. Reference Table

Item	Reference or Phrase in ROD	Locations in ROD	Referenced Document and Section/Page Number
10b	**Human Health Risk Assessment**	**2.5.2 Human Health Risk Assessment**	**Source:** ECC-Insight, LLC and CDM Smith. 2017. *Final Technical Memorandum – Optimized Remedial Alternative for Parcel F, Hunters Point Naval Shipyard, San Francisco, CA*. September. **DCN:** INEC-2004-0014-0004 **Location:** Section 2.1
11a	**Ecological Risk Assessment**	**2.5.3 Ecological Risk Assessment**	**Source:** Battelle, Blasland, Bouck & Lee, Inc. (BBL) and Neptune and Company. 2005. *Final Hunters Point Shipyard Parcel F, Validation Study Report, San Francisco Bay, California*. May 2. **Location:** Section 12.1.6
11b	**Ecological Risk Assessment**	**2.5.3 Ecological Risk Assessment**	**Source:** ECC-Insight, LLC and CDM Smith. 2017. *Final Technical Memorandum – Optimized Remedial Alternative for Parcel F, Hunters Point Naval Shipyard, San Francisco, CA*. September. **DCN:** INEC-2004-0014-0004 **Location:** Section 2.1, Table 2-1, Table 2-2, and Table 2-3
12	**RAOs**	**2.8 Remedial Action Objectives**	**Source:** Barajas and Associates. 2008. *Final Feasibility Study for Parcel F, Hunters Point Shipyard, San Francisco, California*. April 30. **DCN:** BAI-5106-0004-0003 **Location:** Section 2 through Section 2.1.4
13	**Pilot Study**	**2.9.1 Summary of Remedial Alternatives - *In Situ* Treatment and links for pilot study**	**Source:** KCH, 2018. *Final Demonstration of Activated Carbon Amendments to Reduce PCB Bioavailability, Hunters Point Naval Shipyard*. May. **DCN:** KCH-2622-0059-0095 **Location:** Sections 5.2.2 through Section 5.2.3, Section 8

Attachment 2. Reference Table

Item	Reference or Phrase in ROD	Locations in ROD	Referenced Document and Section/Page Number
14	**Costs**	**2.9.2 Evaluation Criteria**	**Source:** Barajas and Associates. 2008. *Final Feasibility Study for Parcel F, Hunters Point Shipyard, San Francisco, California*. April 30. **DCN:** BAI-5106-0004-0003 **Location:** Appendix D

Reference Item 1
Erosion

Source:

Barajas and Associates, Battelle, Neptune & Company, and Sea Engineering, Inc. 2007. *Technical Memorandum, Hunters Point Shipyard Parcel F, Feasibility Study Data Gaps Investigation. Hunters Point Shipyard, San Francisco, CA*. May 25.

DCN:

BAI-5106-0004-0001

Excerpt includes the following:

Section 2.1.3.2, Table 2-3, Figure 2-14, Appendix F

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at which the sediments begin to erode) was calculated as a function of depth into the sediment. Figure 2-12 shows the critical shear stress as a function of depth based on basin-wide average erosion rates. Appendix F provides a description of how these calculations were performed. The critical shear stress variations seen in the top 30 cm of the sediment core are typical of natural sediments. Deeper layers of sediment commonly have different composition (i.e. grain size, mineralogy, TOC, etc.) that can be responsible for variations in strength with depth. A very stiff layer of sediments denoted by a higher critical shear stress is reached at a depth of 30-40 cm.

2.1.3.2 Erosion Calculations

Erosion depths during typical and extreme hydrodynamic events were estimated based on the analysis of Sedflume data in conjunction with the hydrodynamic measurements obtained during the Parcel F Validation Study (Battelle et al., 2004). Hydrodynamic measurements of waves and currents were conducted in South Basin during a winter month and summer month to characterize the seasonal hydrodynamic conditions. Figure 2-13 shows data measured during winter 2001.

The hydrodynamic measurements were used to calculate the shear stress exerted on the bottom sediments by waves and currents during each measurement event. A nearly eight-year record of continuous wind measurements from NOAA offshore buoy 46026 located 18 miles west of San Francisco were obtained and used for an extreme wind event analysis. Using the extreme winds from directions between south and east, the maximum wave height possible in South Basin was calculated. This wave height was used in conjunction with the site-specific hydrodynamic measurements to calculate a maximum sustained bottom shear stress exerted on the South Basin sediments. Table 2-3 shows the maximum predicted shear stress for events with various return periods. The maximum return period that was predicted statistically was a 25-year storm (wind records were of insufficient length for reliably predicting 100-year storm conditions). The duration of all extreme events was assumed to be equivalent to the mean event duration of 11.4 hours. Appendix F provides a more detailed discussion of the extreme event calculations.

Using the shear stresses, event duration, and measured sediment data the SEDZLJ model (Jones and Lick, 2001) was used in a simple one-dimensional (1-D) mode to determine the maximum possible erosion for that event. In the model, the predicted shear stress is applied to the South Basin sediments using erosion rate and critical shear stress information from the Sedflume cores. The model then predicted the maximum depth of erosion under those conditions. Appendix F provides a description of the SEDZLJ model and outlines its application for this analysis. During a typical year, up to 4.2 cm of erosion may be expected during a winter storm event (it should be noted that the model does not predict deposition). Potential erosion during the 25-year event was predicted based on the maximum event duration of 18.6 hours. The maximum probable erosion for this event is 6.1 cm. Figure 2-14 shows erosion depth as a function of time for the 25-year event.

An average gross sediment deposition rate of about 5 cm/yr in South Basin would be necessary to account for a net deposition rate of about 1 cm/yr. The majority of gross sediment deposition is material that is locally resuspended and deposited due to the low advective currents in South Basin. Only a small portion of the material is entering South Basin from San Francisco Bay. The measured net deposition rate of about 1 cm/yr is all due to new material entering South Basin from the Bay.

2.1.4 PCB Flux from Sediment Bed

The objective of this task was to estimate the flux of dissolved-phase PCBs from the sediment bed into the water column under non-resuspending conditions due to active and passive mechanisms (e.g., bioturbation, diffusion, and porewater advection). Detailed data on the vertical distribution of PCB congeners in sediment cores were used to estimate vertical PCB gradients and calculate the flux of PCBs through the sediment bed and into the water column over time. In addition, the quantification of PCB flux within the sediment bed can be used to predict the change in PCB concentrations throughout the sediment bed over time.

2.1.4.1 PCB Data

Fine interval core samples were obtained from four stations (SB-081, SB-094, SB-110, and SB-114; Figures 2-1 and 2-2). The vertical sampling scheme is shown in Figure 2-3. Samples were analyzed for 45 PCB congeners. Figure 2-15 shows the total PCB profiles in the four high-resolution cores. Total PCBs were calculated as the sum of the detected concentrations of 45 PCB congeners for the purpose of this analysis.

2.1.4.2 PCB Flux Model Setup and Results

The Lick et al. (2003) contaminant flux model was used to estimate the transport of dissolved-phase PCBs in South Basin sediments over time due to diffusion, bioturbation, and advection. Appendix G contains a detailed discussion of the modeling framework. For application of the model in South Basin, high resolution vertical PCB cores were obtained and analyzed for 45 congeners. To apply these datasets, surface PCB concentrations were contoured throughout South Basin, and regions of relatively similar concentrations were defined and bounded. The model was set up to represent six different regions of surface PCB concentrations in South Basin (Figure 2-16): >700 µg/kg (Area 1), between 500 and 700 µg/kg (Area 2), between 250 and 500 µg/kg (Area 3), between 200 and 250 µg/kg (Area 4), and below 200 µg/kg (Area 6). Area 5 represents the region of PCB concentrations >250 µg/kg at the mouth of Yosemite Creek. Each of the four fine interval cores was assumed to be representative of the first four areas. Fine interval core data are not available for Areas 5 and 6; therefore, PCB RSC data were used to specify the initial total PCB profiles in these areas. Station SB-099 was used to represent Area 5, and Station SB-111 was used to represent Area 6.

The following information was required to model the flux of PCBs in the sediment bed:

- Initial PCB concentrations;
- Sediment-water partition coefficients representative of the PCBs present;
- Rates and depths of bioturbation;
- Total organic carbon; and
- Deposition rates.

The initial PCB concentrations for each area were determined from the core data described above. The congener-specific PCB concentrations from the detailed cores were used to identify the peak PCB composition. Studies previously conducted by Zimmerman et al. (2004) determined site-specific sediment partition coefficients for South Basin sediments. The average partition coefficient for the three highest-concentration PCB congeners observed in the detailed cores was used for Areas 1 through 4. The three congeners selected as representative of the PCB peak in these areas were PCB-153, PCB-138, and PCB-149. The congener distribution in confirmatory samples analyzed to support the RSC data was used to define the partition coefficients for Areas 5 and 6. The Area 5 partition coefficient was defined using PCB-177, PCB-138, and PCB-187, and the Area 6 partition coefficient was defined using PCB-153, PCB-149, and PCB-180.

The average partition coefficient was used to model total PCBs as a single concentration with behavior approximating the bulk of the PCBs present. This assumption has an associated uncertainty because PCB congeners with lower partition coefficient will be released to the water column more readily than congeners with higher partition coefficients, which will tend to persist in the sediments. To address the

Table 2-3. Maximum Predicted Shear Stresses and Erosion Depths

Return Period	Shear Stress (Pa)	Duration (hrs)	Maximum Erosion (cm)
1	0.49	11.40	4.2
5	0.57	11.40	5.0
10	0.59	11.40	5.2
25	0.64	11.40	5.7
25	0.64	18.60	6.1

Table 2-4. Estimated Net Sediment Accumulation Rates

Parameter	SB-094		SB-114		SB-110	
Cs-137 first appearance (range in cm)	38	40	50	55	46	48
Number of years (2003-1954)	49	49	49	49	49	49
Sedimentation rate (cm/yr)	**0.8**	**0.8**	**1.0**	**1.1**	**0.9**	**1.0**
Cs-137 peak (range in cm)	N/A	N/A	38	44	28	34
Number of years (2003-1963)	40	40	40	40	40	40
Sedimentation rate (cm/yr)	**N/A**	**N/A**	**1.0**	**1.1**	**0.7**	**0.9**
Pb-210 regression R^2	0.78		0.61		0.93	
Pb-210 sedimentation rate (cm/yr)	**1.1**		**1.1**		**0.9**	

Table 2-5. Summary of Sediment Trap Results

Station	Total Mass (g wet wt)	% Moisture	Total Mass (g dry wt)	Length of Deployment (days)	Average Mass (g dry wt/day)
T1: 10/28/03 - 2/23/04, Rainfall = 14.9"					
SB-094 (north)	6,119	70.68	1794	118	15.2
SB-104 (west)	4,218	70.02	1265	118	10.7
SB-110 (central)	6,300	69.91	1895	118	16.1
SB-120 (east)	9,146	68.86	2848	118	24.1
T2: 2/24/04 - 5/1/04, Rainfall = 2.5"					
SB-094 (north)	2,834	74.89	712	67	10.6
SB-104 (west)	3,007	76.83	697	67	10.4
SB-110 (central)	2,607	75.60	636	67	9.5
SB-120 (east)	3,205	66.79	1064	67	15.9
T3: 7/1/04 - 8/30/04, Rainfall = 0.05"					
SB-094 (north)	1,561	77.72	348	60	5.8
SB-104 (west)	1,000	81.37	186	60	3.1
SB-110 (central)	2,961	81.61	545	60	9.1
SB-120 (east)	1,224	79.08	256	60	4.3

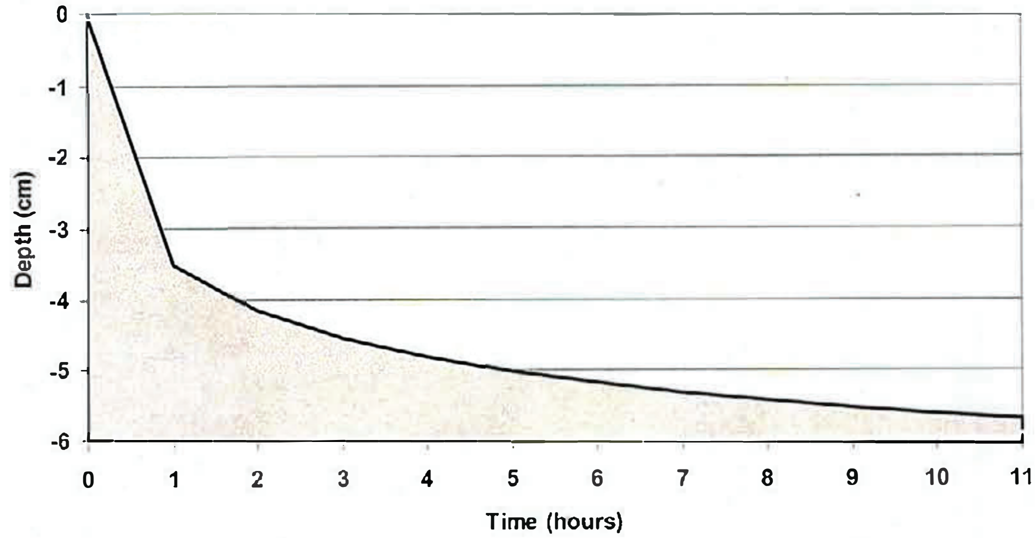

Figure 2-14. Erosion Depth as a Function of Time During a 25-Year Storm

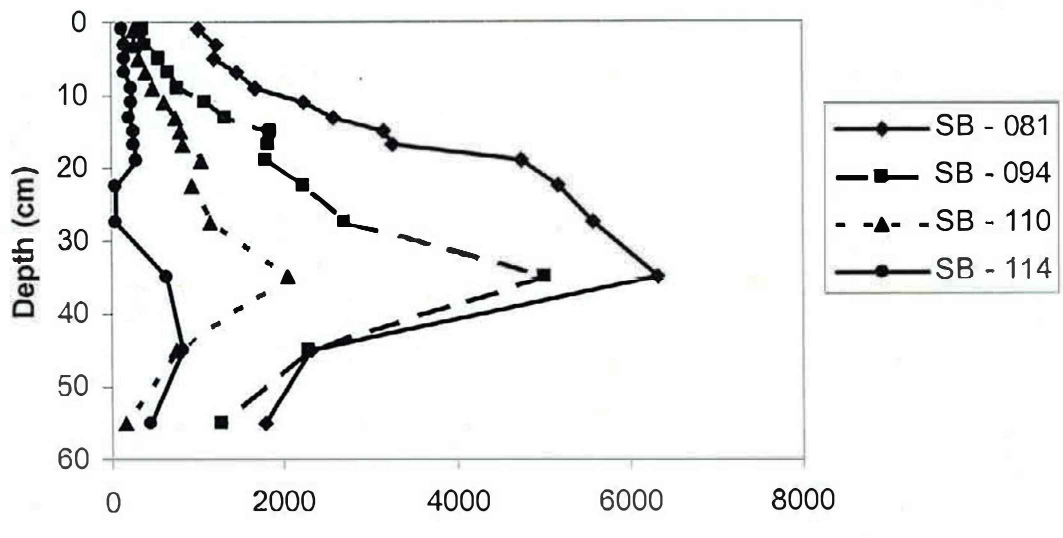

Figure 2-15. Total PCB Profiles in Fine Interval Cores

APPENDIX F

SUPPORTING INFORMATION FOR SEDIMENT TRANSPORT EVALUATION OF SOUTH BASIN

1.0 Sedflume Data Calculations

The critical shear stress of a sediment bed is defined quantitatively as the shear stress at which a very small, but accurately measurable, rate of erosion occurs. For Sedflume studies, this rate of erosion has been practically defined as 10^{-4} cm/s. This represents 1 mm of erosion in approximately 15 minutes. Because it is difficult to measure the critical shear stress exactly at 10^{-4} cm/s, erosion rates are determined above and below 10^{-4} cm/s. The critical shear stress was then determined by linear interpolation (McNeil et al. 1996; Roberts et al., 1998).

2.0 Extreme Event Analysis

A sediment dynamics study of the offshore area (Parcel F) at HPS was conducted as a part of the Validation Study (Battelle et al., 2004). The primary objectives of the sediment dynamics study were to (1) characterize sediment flux at selected locations around HPS under typical summer and winter conditions; and (2) predict regional sediment transport patterns around HPS through modeling. Time-series measurements of currents, waves, suspended sediment concentrations, temperature, and salinity were collected at three stations at HPS in winter and summer 2001 using Sediment Transport Measurement Systems (STMS). Two STMS systems were deployed in South Basin (S1 and S2). The principal objective of the deployments was to collect site-specific hydrodynamic data during winter and summer. During winter in San Francisco Bay, frequent storms typically cause strong southerly winds and local flooding. During summer, persistent northerly to northwesterly winds usually occur, with little to no rainfall. The STMS data also was used in a one-dimensional (1D) bottom boundary layer model to predict hydrodynamic bottom stresses at each site. The model provides predictions of bottom stresses due to the combined influences of waves and currents. This study addressed the significant contrasts in hydrodynamics in the region that might be caused by seasonal differences in physical forcing. The study concluded that the most significant sediment resuspension in South Basin is due to wave generated shear stresses.

Although the data provide valuable quantitative information on shear stresses in South Basin, these data were insufficient for an extreme event analysis. An extreme event analysis based on wind data from a weather buoy located offshore of San Francisco was conducted to determine wind speeds expected for various storm return periods. These results were used to determine expected wave heights in South Basin during storm events. A nearly eight-year record of continuous wind measurements from NOAA offshore buoy 46026 located 18 nm west of San Francisco were obtained and used for this extreme wind event analysis.

South Basin is open to the southeast with a 29 km fetch across South San Francisco Bay. Limiting the analysis to winds which have the potential to generate significant waves at the site, only winds between south and east were used. Long-term measurements of winds are not available for the immediate area; however, significant wind events associated with storms or other weather fronts are large-scale features that show no significant differences between nearby stations.

The wind record was first low-pass filtered and decimated to one-hour sampling intervals. The record was then limited to winds from the southeast. Significant events in the record of southeasterly winds were then identified by selecting those records where the wind speed was greater than 12 m/s and where that speed was maintained for a duration of six hours or more. Care was taken to ensure that identified events were in fact different events so as to maintain statistical independence between values.

Sixty-three wind events were identified in the 8-year record. The peak wind speeds of these events were fit to a Gumbel distribution using maximum likelihood as shown in Figure 1 (Gumbel parameters A = 1.1018 and B = 14.1491).

Figure 2 shows the probability distribution of wind speed by return period for events from the eight-year historical record and as estimated by the fitted Gumbel distribution.

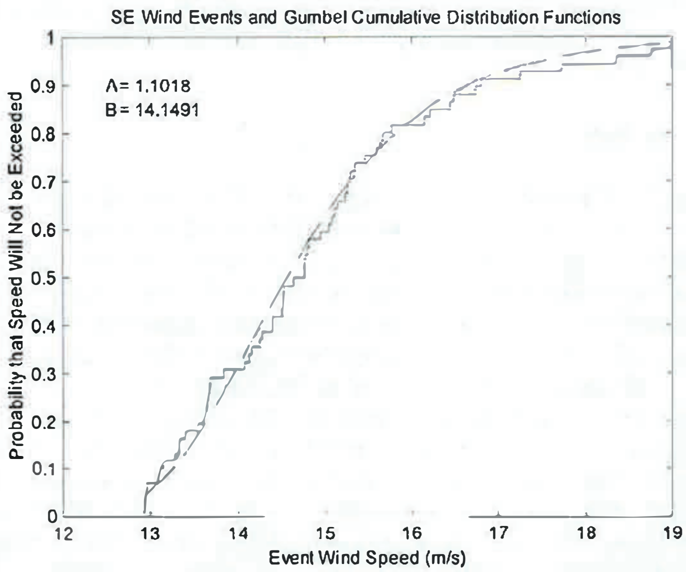

Figure 1. Wind events and Gumbel distribution function.

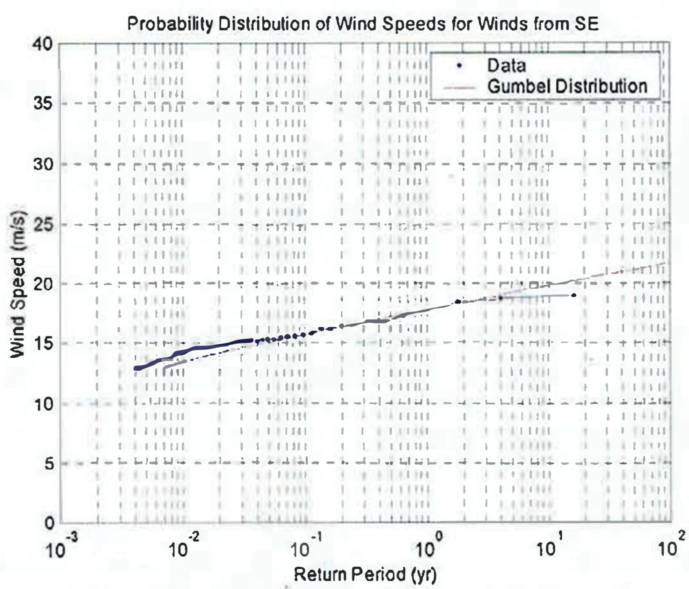

Figure 2. Probability distribution of wind speeds.

Future expected extreme wind speeds are estimated by the distribution function (shown in the figure as a red line) and are summarized in the Table 1.

Table 1. Wind speeds and expected return periods.

Return Period	Wind speed (m/s)
1-year	17.9
5-year	19.3
10-year	19.8
25-year	20.6

To estimate waves it is necessary to know the duration of wind events as well as the wind speeds. The duration of the observed extreme wind events cannot be modeled with a simple extreme probability distribution function because the events with the highest wind speeds do not necessarily have the longest duration. Simple statistics of the duration of strong wind events observed will serve, however, to provide reasonable estimates. Figure 3 shows the distribution of storm event durations based on the 8-year history at stations 46026 for winds from the southeast. The mean duration was 11.4 hours and the standard deviation was 7.2 hours. These values reflect the mean and standard deviation of extreme events only because the analysis was limited to events with durations greater than 6 hours as reflected in Figure 3.

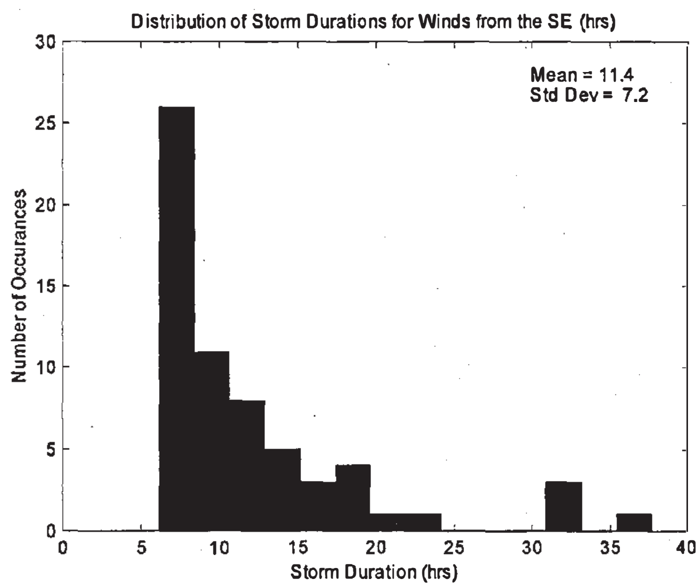

Figure 3. Extreme events and associated durations.

These wind speeds and durations were used to calculate the wave conditions in South Basin during the extreme events. In order to quantify these waves, it is necessary to determine their height and period. Methodology for the prediction of wind driven wave height and period has been presented in the Army Corps of Engineers Coastal Engineering Manual (2004). By determining the maximum fetch into South

Basin (29 km), the maximum wave height, length, and period in South Basin were computed. Table 2 summarizes the significant wave heights (Hs), lengths (L), and periods (Ts) for each event.

Table 2. Wave height, period, length, bottom orbital velocity, wave friction factor, and shear stress for all return periods in South Basin.

Return Period	Hs (m)	Ts (s)	L (m)	Ubm (m/s)	fw	τ
1	0.84	3.92	17.7	0.48	0.004	0.49
5	0.88	4.03	19.04	0.54	0.0037	0.57
10	0.89	4.07	19.5	0.56	0.0036	0.59
25	0.91	4.14	20.4	0.60	0.0034	0.64

To calculate the wave generated shear stress, various wave generated shear stress models are available. The model chosen for the current effort (Christoffersen and Jonsson, 1985) was developed from the Grant and Madsen (1979) work, and has shown to reproduce experimental data well. Table 2 shows a summary of the corresponding wave orbital velocity (Ubm), wave friction factor (fw), and shear stress (τ) for each wave condition.

3.0 Sediment Erosion Model (SEDZLJ)

The SEDZLJ sediment transport model was developed by Jones and Lick (2001) to utilize Sedflume data in order to constrain sediment transport calculations with directly measured erosion rates. SEDZLJ is well suited to assess extreme events because it uses measured data which can be collected under high shear stress conditions. SEDZLJ includes erosion rates as a function of shear stress with depth measurements obtained from Sedflume. It also uses multiple size classes of sediments and adheres to unified treatment of suspended load and bed load. SEDZLJ also accounts for bed armoring and its effect on erosion rates. The bed armoring aspect of the model has been demonstrated for straight channel flow, as shown by a comparison of experimental and calculated transport rates. Please see Jones and Lick (2001) for a detailed description of the treatment of these processes.

The model was applied here in a one-dimensional mode. In this mode, all sediments in the water column are distributed in the vertical water column and the transport of sediments into the volume is assumed to be equal to the transport out of the volume. This allows a steady state depth of erosion to be determined from the Sedflume data. Typically, the cohesive sediments eroding from the bed will not deposit since the shear stress is exceeding the critical shear stress for erosion. Sandy material may transport as bedload and be responsible for armoring the sediment bed over time. The depth of erosion calculated from the model in this mode represents the maximum possible depth of erosion for a given shear stress.

Model Setup

The controlling parameters in the one-dimensional version of SEDZLJ are the sediment bed properties and the applied shear stress. For the South Basin modeling efforts, all of these parameters are determined from direct measurement. The Sedflume analysis provides erosion rates as a function of depth and shear stress, and additional data on bulk density and particle size with depth. For the initial set of calculations presented here, all of these values are averaged site wide and presented in Tables 3 and 4. Three particle size classes were used to approximate the particle size distribution found in South Basin. The average median particle size in South Basin is 13 μm. This distribution was approximated in the model by 85% 5 μm, 13% 20 μm, and 2% 300 μm material. All of the sediment bed properties are tabulated directly into the one-dimensional SEDZLJ model. Since the model is one-dimensional, there is no horizontal variation in bed properties, only variation with depth.

Table 3. Average erosion rates (cm/s) over 5 cm intervals. The final row is the critical shear stress (Pa) for each depth interval.

Shear (Pa)	0-5 cm	5-10 cm	10-15 cm	15-20 cm	20-25 cm	25-30 cm	30-35 cm
0.1	6.9E-06	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.2	5.7E-05	8.3E-05	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.4	2.8E-04	8.3E-05	1.5E-05	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.8	1.6E-03	6.9E-04	6.5E-04	1.8E-04	2.0E-04	7.2E-04	0.0E+00
1.6	6.4E-03	2.1E-03	1.0E-03	2.1E-03	4.2E-03	1.4E-03	0.0E+00
3.2	2.4E-02	9.1E-03	7.2E-03	1.2E-02	1.7E-02	5.2E-03	4.8E-03
6.4	3.6E-02	4.3E-02	4.3E-02	3.1E-02	1.2E-02	3.3E-02	3.6E-02
10	5.5E-02	4.7E-02	6.2E-02	5.0E-02	5.7E-02	1.1E-01	1.0E-01
Critical Shear (Pa)	2.9E-01	4.7E-01	4.6E-01	6.3E-01	6.0E-01	4.6E-01	4.6E-01

Table 4. Average bulk density (g/cm^3) over 5 cm intervals.

Depth (cm)	Bulk Density (g/cm^3)
0 - 5	1.30
5 - 10	1.37
10 - 15	1.41
15 - 20	1.40
20 - 25	1.42
25 - 30	1.41
30 - 35	1.40
35 - 40	1.36

Using these definitions of the sediment bed properties, the one-dimensional SEDZLJ model was run for each shear stress was run for the 11.4 hour average event duration. The maximum scour depths are presented in the main text of this report.

Model Uncertainty

Uncertainty in the determination of maximum scour results from the sediment bed properties utilized and the shear stresses and durations applied to the sediment bed. The extreme event analysis is based on a relatively long 8-year wind record, but uncertainty associated with actual event duration can alter the model results. The 25-year event was simulated for the average event duration of 11.4 hours and the maximum event duration of 18.6 hours. The corresponding depths of erosion are 5.7 cm and 6.1 cm. The 6% difference in erosion depth illustrates that the sediments are very close to the maximum scour depth for the 25-year event after 11.4 hours. Additionally, the maximum wind events in the record do not generally have the maximum duration. Therefore, the assumption of all events occurring for the mean duration of 11.4 hours is considered valid for this application.

The erosion rates contribute to the uncertainty of the model prediction since they are averaged over the entire site. The critical shear stress and bulk density both have a standard deviation of less than 10% of the mean value over the entire site, therefore the uncertainty associated with these parameters has a less than 10% effect on the model results.

To determine the effects of erosion rate variation on the maximum scour depth, the 25-year event was run for 95% confidence intervals on the average erosion rates presented above. Figure 4 shows the model results with the average erosion rates, the -5% confidence interval erosion rate, and the +5% confidence interval erosion rates. The variation in erosion rates produces less than a 0.5 cm variation in maximum eroded depths. This illustrates not only the relative insensitivity to the erosion rate variation seen, but also the dampening effect of bed coarsening on the erosion depth.

The South basin sediments had approximately 2% of sandy material. This was approximated by a 300 μm diameter size class in the model. As the fine sediments wash away the sandy size class begins to armor the sediment bed thereby reducing the erosion rates. Therefore, the presence of the sandy material begins to limit the erosion rate of the material as time progresses.

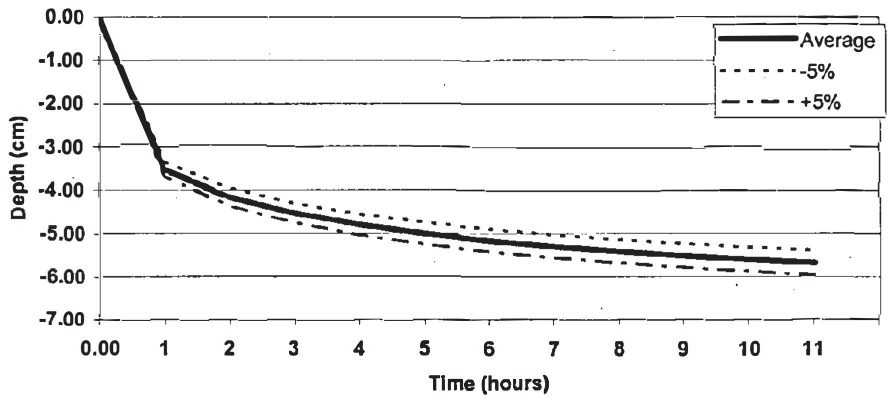

Figure 4. Maximum erosion for 25-year event with confidence intervals.

4.0 References

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Grant, W. and O. Madsen, 1979. Combined wave and current interaction with a rough bottom. J. of Geophysical Res., V. 84: 1797-1808.

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Reference Item 2
Bathymetric Survey

Source:

Barajas and Associates, Battelle, Neptune & Company, and Sea Engineering, Inc. 2007. *Technical Memorandum, Hunters Point Shipyard Parcel F, Feasibility Study Data Gaps Investigation. Hunters Point Shipyard, San Francisco, CA*. May 25.

DCN:

BAI-5106-0004-0001

Excerpt includes the following:

Section 1.2.2, Figure 1-6

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do not appear to currently pose an unacceptable risk due to metals, the slag could act as an ongoing source of contamination to the basin if it remained in place and continued to degrade and erode.

Yosemite Creek enters South Basin at the southwest corner of HPS. Yosemite Creek is listed as a Site of Concern under the Bay Protection and Toxic Cleanup Program (BPTCP) by the RWQCB (1997). Prior to 1965, three hydraulically separate CSOs discharged to this area: one at the head of Yosemite Creek, one on the north side of the creek near Griffith Street, and one on the south side near Fitch Street (Figure 1-3). After 1965 the three overflow structures were hydraulically connected and the CSO at the head of Yosemite Creek was replaced by an overflow weir located adjacent to the head of the creek on the south side. The wet weather overflows were directed to this weir after 1965. Contaminants identified during investigations of Yosemite Creek by the City and County of San Francisco (CCSF) included PCBs, polycyclic aromatic hydrocarbons (PAHs), pesticides and metals (Arthur D. Little, 1999). Sediment investigations were conducted by the CCSF from 1998-2000; some of these data were incorporated into the analyses provided in Section 2.0 of this memorandum.

South Basin was originally a marshy, wetland area. Its current configuration largely reflects filling activities that took place from the 1940s to the 1970s. Figure 1-5 shows the position of the South Basin shoreline in 1946, 1955, 1961, 1965, 1969, and 1975. The shoreline positions were mapped by digitizing historical aerial photographs. The greatest period of land expansion was between 1946 and 1955, in which the northern, western, and southern portions of the basin were filled, forming the areas now occupied by Parcel E-2, Yosemite Creek, and Candlestick Point, respectively.

The second largest period of land expansion occurred between 1965 and 1969, in the northern part of South Basin. This fill event formed a slough, apparent in the 1969 (blue) shoreline contour, through the middle of the waste disposal area now known as the Parcel E-2 landfill. By 1975 (brown), the slough had been filled; today's shoreline is virtually the same as the 1975 contour, and therefore is not shown. Between each recorded shoreline, it is uncertain when exactly each fill event occurred. The sources of material used to fill these areas are not documented. The Navy operated the shipyard during the periods of the major filling events. The property was leased to the Triple A Machine Shop after the current shoreline was established (ca. 1975).

1.2.2 Point Avisadero (Area III)

Point Avisadero is a peninsula of land approximately 3.5 acres in size, located in the northeast portion of HPS. It is bordered on the south by Dry Dock #3, on the west by the rest of HPS, and on the north and east by San Francisco Bay (Figure 1-2). Point Avisadero is flat with a steep armored riprap bank. A large drainage tunnel runs north-south under Point Avisadero (Figure 1-6). During shipyard operations, water from Dry Dock #3 was pumped north into San Francisco Bay through this tunnel. The pump house used to drain Dry Dock #3 remains although the tunnel is not presently in use and is blocked by metal gates about 50 ft from the outfall at the north end (Figure 1-7).

The riprap banks extend well below low tide elevation (Figure 1-7). A high-resolution bathymetric survey conducted during the FS Data Gaps investigation shows a "shelf" of sediment approximately −5 ft mean lower low water (MLLW) deep, located northwest of the drainage tunnel outfall (Figure 1-6). This shelf and the eastern bank of Point Avisadero both slope steeply to the northeast to a depth of about −35 ft MLLW, after which the bottom continues to deepen to −80 ft MLLW in the southeast direction. Strong tidal currents pass Point Avisadero, flowing southeast during flood tides and north-northeast during ebb tides. The sediment dynamics study conducted as part of the Parcel F Validation Study concluded that the net residual circulation in the area was to the southeast (Battelle et al., 2004).

Historical activities that may have contributed to contamination of offshore sediments at Point Avisadero include discharge from the drainage tunnel from Dry Dock #3, historical ship berthing and maintenance activities that occurred outside of the dry dock, discharge from storm sewer outfalls, and surface runoff or groundwater discharge from Site IR26 in Parcel B. However, based on groundwater concentrations of copper and mercury, groundwater discharge does not appear to be a significant source of contamination to Parcel F. Surface runoff and groundwater discharge are discussed further in Section 2.0. The drainage tunnel was used to rapidly convey water from Dry Dock #3 to an outfall on the north side of Point Avisadero (Moffet and Nichols Engineers, 1981). This tunnel may also have been a conduit for waste material from the dry dock, including paint chips, sandblast grit, oils, and other chemicals associated with ship maintenance and repair. The tunnel has not been used in some time (at least since 1986 when Triple A Machine ceased operations, but possibly since Navy activity ceased in 1974).

Currently, there are minimal sediment deposits on the tunnel floor, and a steel door blocks access a short distance into the tunnel (Figure 1-7). Two storm sewers may have conveyed contaminated solids into the offshore area in the past; they were cleaned of residual sediment in 1997 (Figure 1-6). Additionally, historic ship berthing and possible maintenance activities outside the dry dock may have been a potential source of contaminants to sediment. Many pilings and three concrete pads that once supported a pier remain off the east end of Point Avisadero.

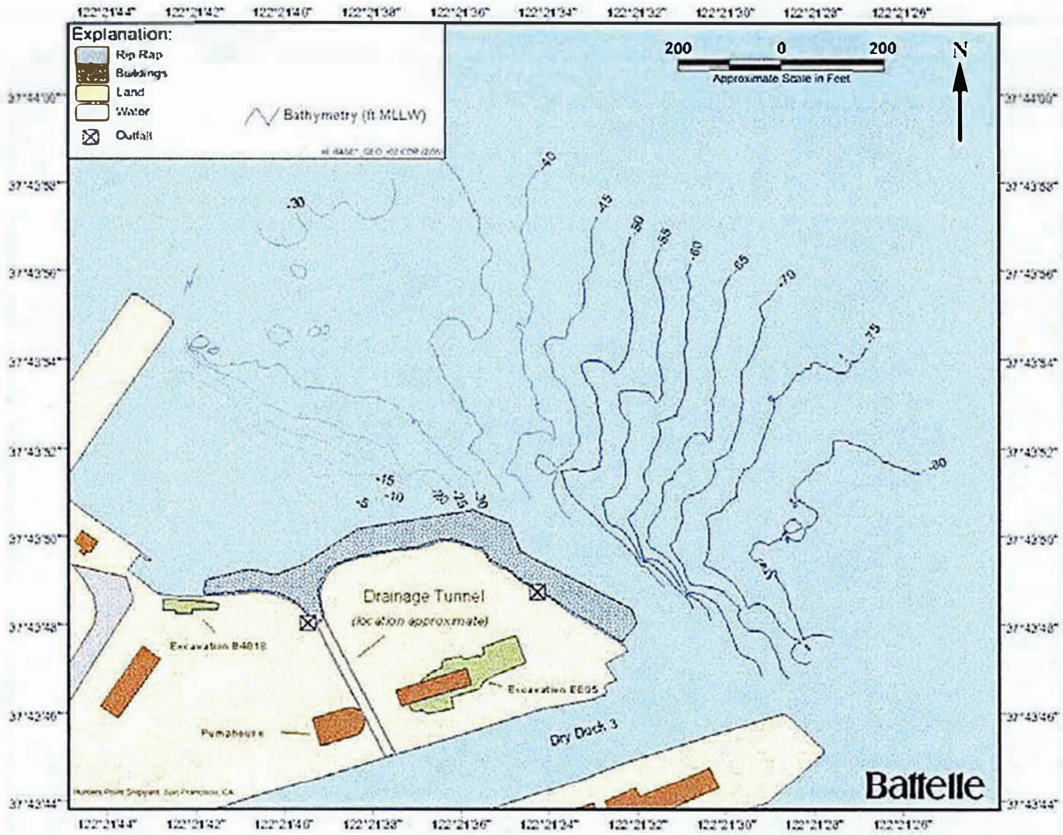

Figure 1-6. Overview of Point Avisadero (Area III) with Offshore Sample Locations

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Reference Item 3
Sediment Dynamics Study

Source:

Barajas and Associates, Battelle, Neptune & Company, and Sea Engineering, Inc. 2007. *Technical Memorandum, Hunters Point Shipyard Parcel F, Feasibility Study Data Gaps Investigation. Hunters Point Shipyard, San Francisco, CA*. May 25.

DCN:

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Excerpt includes the following:

Section 2.2.3

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2.2.2 Source Identification

The variable and patchy distribution of contaminants offshore of Point Avisadero is consistent with an episodic input of contaminants, presumably from the Dry Dock #3 drainage tunnel and possible direct discharge from ships that were berthed outside of the dry dock, east-northeast of Point Avisadero. Storm sewer outfalls do not appear to have been major pathways for historical discharge of contaminants to San Francisco Bay given the absence of observed contaminant concentration gradients away from the outfalls.

Contaminants from Site IR26 in Parcel B may be transported to the offshore area via surface runoff or groundwater discharge. Significant chemicals of concern in at Site IR26 include dieldrin, methoxychlor, PCB, DDT, dibenz(a,h)anthracene, aluminum, copper, lead, and zinc. The topography in IR26 is generally flat and the shoreline is armored; therefore, erosion and surface runoff to the offshore area is expected to be minimal. The shoreline was characterized in 2003 to evaluate whether it is a potential ongoing source of contamination to the offshore area (TtEMI, 2003a). Soil was found at less than half of the planned shoreline stations because of the presence of rip rap. The potential for adverse impacts to the Bay due to residual contamination on the IR26 shoreline is being evaluated as part of the Parcel B ROD Amendment Process. Table 2-9 summarizes maximum concentrations of copper, mercury and Aroclor 1260 detected in groundwater samples from monitoring wells near Point Avisadero, in all sample events from 1990 to 2004. Monitoring well locations are shown in Figure 2-25. Although maximum concentrations of copper and mercury exceed ambient levels for HPS groundwater, concentrations do not appear to be sufficiently high to provide a significant source of contaminants to Parcel F via groundwater discharge.

2.2.3 Contaminant Transport

After contaminants were discharged to the offshore area as a result of historical ship maintenance activities, they appear to have been transported and redistributed to some degree by tidal currents. The sediment dynamics study conducted as part of the Parcel F Validation Study indicated that the direction of net sediment flux at Point Avisadero based on site-specific hydrodynamic measurements collected in 2001 is to the southeast. This sediment dynamics measurement site was located just north of Point Avisadero, near Station PA-138 (Figure 2-21). Subsurface peaks of contamination at many stations also indicate that net deposition has occurred since the time of contaminant release. However, the sediment dynamics measurements showed that surface sediment was resuspended 16% of the time during the winter deployment in 2001, and 4% of the time during the summer deployment. Resuspension was attributed to strong maximum tidal currents and is not likely to result in any net erosion (i.e., deeper sediments are unlikely to be eroded and resuspended). Overall, sediment appears to accumulate on the shelf in the eddy north and west of Point Avisadero, and surface sediments are periodically resuspended and transported to the southeast by tidal currents. Current speeds increase at greater water depths to the east. Elevated levels of contamination are generally not found at water depths of greater than -65 ft MLLW, which suggests that any sediment transported to this depth would be advected away from the site.

2.2.4 Mercury Bioavailability

As previously noted, the Parcel F Validation Study results indicated that mercury appeared to be more biologically available at some locations than at others (Battelle et al., 2004). Methylmercury is the most bioavailable and toxic form of mercury. The conversion of inorganic mercury to methylmercury in the environment is a complex and incompletely understood process. Some of the factors that influence methylation in the marine environment are redox potential and the presence of sulfur-reducing bacteria. In the FS Data Gaps investigation, surface sediment samples were collected from 31 stations and analyzed for total mercury, methylmercury, and sulfide to determine whether any simple relationships between

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Reference Item 4
Open Water Aquatic Habitat

Source:

Barajas and Associates. 2008. *Final Feasibility Study for Parcel F, Hunters Point Shipyard, San Francisco, California*. April 30.

DCN:

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1.4.4.1 Open-Water Habitat

The shallow bay habitat of Parcel F is a feeding area for dozens of species of fishes, many with commercial or recreational value, including the Pacific herring (*Clupea harengus palasii*), northern anchovy (*Engraulis mordax*), lingcod *(Ophiodon elongatus),* starry flounder *(Platichthys stellatus),* jacksmelt (*Catherinops californiensis*), and several surf perches (Family Embiotocidae), as well as at least 40 other species of fish, crabs, and shrimp. Jacksmelt dominated catches in terms of biomass and abundance during sampling for the human health evaluation. A variety of surfperch species (such as shiner surfperch, black surfperch, walleye surfperch, white surfperch, and silver surfperch) were also caught in this area.

Pacific herring spawn on hard substrates and in eelgrass along the shallow margins of the central bay, including Parcel F (URS Corporation 2006). Shallow bay habitat is also a nursery area for juvenile halibut and sand dabs (*Citharichthys stigmaeus*), leopard shark, shiner perch (*Cymatogaster aggregata*), herring, and other fishes.

The abundance of fishes and marine invertebrates in the nearshore shallow waters of Parcel F supports a diversity of birds that feed on them, including double-crested cormorant *(Phalacrocorax auritus*) and several dabbling and diving duck species such as the surf scoter *(Melanitta perspicillata)*. The waters near the wetland habitat are commonly occupied by large numbers of wintering ducks, including bufflehead *(Bucephala albeola),* lesser Scaup *(Aythya affinis),* barrow's Goldeneye *(Bucephala islandica),* and surf scoter (PRC 1996b).

The birds observed at Parcel F are representative of species assemblages known to occur in the bay. Diving ducks consisted of up to 75 percent of the bay's waterfowl, depending on the month, during a bay-wide winter bird survey conducted in 1990 (Accurso 1992). More recent mid-winter surveys (1998 to 2000) reported that Scaup made up about 67 percent of waterfowl in the open water of the central bay. Scoters were the next most abundant birds, representing more than 29 percent of total waterfowl in the central bay (U.S. Fish and Wildlife Service 2005). These diving birds feed on benthic invertebrates such as mollusks and crustaceans.

Marine mammals observed using the bay waters around HPS include the California sea lion *(Zalophus californianus)* and harbor seal *(Phoca vitulina)*. Harbor seals, which are the only marine mammals that are permanent residents in the bay, use rocks or sand flats as resting areas (haul-out sites) (URS Corporation 2006).

The sediments that underlie the open water can be many feet thick; however, only the surface sediments are considered biologically active. The nature and thickness of the biologically active zone was assessed during the FSDG investigation (Battelle, Neptune & Company, and Sea Engineering 2007). Results of a literature review indicated that the depth of the biologically active zone in marine sediments averages about 10 centimeters and rarely exceeds 30 centimeters. A well-mixed zone is usually found above the redox potential discontinuity (RPD). Below the RPD, a mid-depth zone is characterized by decreasing bioturbation with increasing depth. A deep mixing zone can extend from the mid-zone to more than 1 meter into the sediment. Observations of biota in sediment cores collected during the Parcel F Validation

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Reference Item 5
Intertidal Wetlands and Bay Mudflats Habitat

Source:

Barajas and Associates. 2008. *Final Feasibility Study for Parcel F, Hunters Point Shipyard, San Francisco, California*. April 30.

DCN:

BAI-5106-0004-0003

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Study (Battelle, BBL, and Neptune & Company 2005), and the Sedflume cores collected in 2003 are consistent with this pattern (Battelle, Neptune & Company, and Sea Engineering, Inc. 2007). A well-mixed oxidized zone from 2 to 10 centimeters thick was reported. Polychaetes and burrows were observed to depths of 20 to 30 centimeters, although at lower densities than in the surficial layer. In addition, sediment profile images obtained at 20 stations in the South Basin demonstrated that the mean apparent depth of RPD was 2 to 10 centimeters, indicating the approximate depth of active bioturbation and porewater exchange caused by bioturbation. Feeding voids were observed to depths up to 15 centimeters, which possibly indicated the particle mixing depth by head-down feeders (polychaetes) (Germano & Associates, Inc. 2004).

1.4.4.2 Intertidal Wetlands and Mudflats Habitat

About 3 acres of intertidal wetlands are located along the Parcels E and E-2 shoreline (Tetra Tech 2002), which is adjacent to the South Basin Area of Parcel F. The Parcel B shoreline includes about 1.5 acres near the India Basin (Area I) of Parcel F, as well as a small area of tidal marsh (SulTech 2006a). Other areas are heavily riprapped to control erosion. Field observations of both Parcels B and E show similar habitats and species assemblages. Vegetation observed in the tidal wetlands includes halophytic plant species typically associated with tidal salt or nontidal salt marshes. The dominant plant species are common pickleweed (*Salicornia virginica*) and saltgrass (*Distichlis spicata*). Except for the ice plant (*Carpobrotus edulis*), which is a nonnative species, little vegetation was observed along either the Parcel B or E shoreline (Tetra Tech 2002; SulTech 2006a).

The areas of shoreline that are riprapped support species that attach to or use hard substrate for shelter, including crabs, isopods, mussels (mainly *Mytilus edulis*), and barnacles. Barnacles and mussels generally attach to hard structures and filter food from the water column. Crabs and isopods typically find shelter under rocks, where they feed on other small invertebrates. However, clams were not observed along the riprap at Point Avisadero (Area III) (Battelle, BBL, and Neptune & Company 2005).

The soft Bay Mud substrate provides habitat for many benthic invertebrates, including worms (oligochaetes and polychaetes), crustaceans, copepods, isopods, insects, gastropods, and bivalves. The intertidal mudflats in the South Basin are exposed at low tide, making benthic invertebrate prey available to a variety of foraging birds. Birds reported or expected to forage in the intertidal wetlands and mudflats or in adjacent offshore areas include the black-bellied plover (*Pluvialis squatarola*), black turnstone (*Arenaria melanocephala*), sanderling (*Calidris alba*), western sandpiper *(Calidris mauri)*, long-billed curlew (*Numenius americanus*), dunlin (*Calidris alpine*), double-crested cormorant (*Phalacrocorax auritus*), and surf scoter (*Melanitta perspicillata*). Wading birds, such as the willet (*Catoptrophorus semipalmatus*), killdeer (*Charadrius vociferous*), and great blue heron (*Ardea herodias*), may also use the shoreline area. Some carnivorous birds move easily between intertidal and upland habitats; these include the American kestrel (*Falco sparverius*), red-tailed hawk (*Buteo jamaicensis*), and peregrine falcon (*Falco peregrinus*) (Harding Lawson Associates 1991; PRC 1996b; Tetra Tech and LFR 2000).

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Reference Item 6
Distribution of Chemicals

Source:

Barajas and Associates. 2008. *Final Feasibility Study for Parcel F, Hunters Point Shipyard, San Francisco, California*. April 30.

DCN:

BAI-5106-0004-0003

Excerpt includes the following:

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Fish move over the area to feed when high tide covers the bay flats. Nearshore fishes typical of the bay include longfin smelt (*Spirinchus thaleichthys*), staghorn sculpin (*Leptocottus armatus*), starry flounder (*Platichthys stellatus*), and leopard shark (*Triakis semifasciata*) (URS Corporation 2006).

Mammals observed along the shoreline include the California ground squirrel (*Spermophilus beecheyi*), which uses the riprap areas for burrows. In October 2001, an almost-complete skeleton of a large male raccoon (*Procyon lotor*) was found along the shoreline of the Parcel E-2 Panhandle Area. In addition, the house mouse (*Mus musculus*) is expected to use the shoreline for forage and shelter (Tetra Tech and LFR 2000).

1.5 NATURE AND EXTENT OF CONTAMINATION

Sediment is the medium of interest for this FS Report based on the previous investigations at Parcel F. This section describes the evaluation of the nature and extent of chemicals detected in sediment collected from Parcel F. The Final Validation Study Report (Battelle, BBL, and Neptune & Company 2005) and the FSDG Technical Memorandum (Battelle, Neptune & Company, and Sea Engineering, Inc. 2007) describe in detail the chemical distribution in sediments of Parcel F. The nature and extent of chemicals in sediment are described for the following five subareas of Parcel F: Area I (India Basin), Area III (Point Avisadero), Area VIII (Eastern Wetland), Area IX (Former Oil Reclamation Ponds Area), and Area X (South Basin). Only Area III, a portion of Area IX, and Area X are the focus of this FS Report for addressing risks posed by subtidal sediments. Statistical summary tables for Areas III, IX, and X developed as part of the FSDG Technical Memorandum (Battelle, Neptune & Company, and Sea Engineering, Inc. 2007) are presented in Attachment 6. The remaining areas (I, VIII, and IX) are included in this FS Report because source control measures were implemented along the shoreline of these areas to minimize potential contamination of Parcel F.

1.5.1 Area I

Analytical results for surface sediment samples (0 to 5 centimeters) indicated that chemical concentrations generally were less than San Francisco Bay ambient threshold levels and ER-M values in Area I (Battelle, BBL, and Neptune & Company 2005). Similar to the analytical results for surface sediments, the lowest chemical concentrations in subsurface sediments in Parcel F were found in Area I, as well as Area VIII. Concentrations of mercury in one subsurface sediment core sample collected from 2 to 4 feet bgs in Area I slightly exceeded the ER-M value of 0.71 milligram per kilogram (mg/kg). Otherwise, all concentrations of metals from subsurface sediment cores collected in Area I were below ER-M values, as were all organic chemical concentrations (Battelle, BBL, and Neptune & Company 2005).

1.5.2 Area III

Copper was detected at elevated concentrations relative to San Francisco Bay ambient threshold and ER-M values in surface sediment samples collected in Area III during the Validation Study and the FSDG Investigation (Battelle, BBL, and Neptune & Company 2005; Battelle, Neptune & Company, and Sea Engineering, Inc. 2007). The highest concentration of copper (6,550 mg/kg) was found in the sample (0 to 5 centimeters) collected at a sampling location immediately offshore of the northeast point of land at Point Avisadero. Concentrations of lead also exceeded its ER-M value in a surface sediment sample from one sampling location in Area III from samples collected during the Validation Study. Concentrations of mercury in surface sediment collected during the Validation Study (Battelle, BBL, and Neptune & Company 2005) and the FSDG investigation (Battelle, Neptune & Company, and Sea Engineering, Inc. 2007) exceeded the San Francisco Bay ambient threshold level and exceeded the ER-M values.

Metals concentrations also exceeded ER-M values in subsurface sediment samples although the distribution of the exceedances was localized and discontinuous. Concentrations of copper in subsurface sediments were highest (more than 500 mg/kg) within about 200 feet from the shoreline, to a water depth of approximately minus 65 feet MLLW, and extending to a depth of at least 60 to 90 centimeters (2 to 3 feet) in subsurface sediments from some locations. Although the general spatial distribution of copper is similar to mercury, the two metals do not appear to co-occur (Battelle, BBL, and Neptune & Company 2005).

Concentrations of mercury in subsurface sediment were highest (more than 2 mg/kg) in subsurface sediment samples from locations north and northeast of Point Avisadero, within about 200 feet of the shoreline (Battelle, Neptune & Company, and Sea Engineering, Inc. 2007). The highest concentrations of mercury were detected in subsurface samples from the 5- to 15-centimeter (0.16- to 0.5-foot) depth interval, although concentrations above 2 mg/kg were also detected in subsurface sediment samples from the 60- to 90-centimeter (2- to 3-foot) depth interval (Battelle, Neptune & Company, and Sea Engineering, Inc. 2007). The highest concentration of 252 mg/kg was detected in the sample collected from the 30- to 45-centimeter (1- to 1.5-foot) depth interval at a location (PA-165) east to northeast of Point Avisadero (Battelle, Neptune & Company, and Sea Engineering, Inc. 2007) (see Figure 2-21 in Attachment 1). High concentrations of mercury in sediment in localized sampling locations with large differences in concentration between adjacent sampling locations were commonly observed.

PCB concentrations exceeded the ER-M value in surface sediment samples collected from Area III during both the Validation Study (Battelle, BBL, and Neptune & Company 2005) and the FSDG investigation (Battelle, Neptune & Company, and Sea Engineering, Inc. 2007). Figures 2-24a through 2-24f in Attachment 1 show the distribution of PCBs based on rapid sediment characterization data in Area III sediments with increasing depth as measured in the FSDG investigation. The extent of high total PCB concentrations (above 1,000 micrograms per kilogram [µg/kg]) is not as widespread as the area affected by high concentrations of copper and mercury (Battelle, Neptune & Company, and Sea Engineering, Inc. 2007). High total PCB concentrations (approximately 2,000 to 6,000 µg/kg) were detected in subsurface sediment samples from the 45- to 60-centimeter (1.5- to 2.0-foot) and 60- to 90-centimeter (2- to 3-foot) depth intervals at two locations east to northeast of Point Avisadero (Battelle, Neptune & Company, and Sea Engineering, Inc. 2007) (see Figures 2-24e and 2-24f in Attachment 1).

1.5.3 Area VIII

Area VIII surface sediment samples (0 to 5 centimeters) had chemical concentrations generally less than San Francisco Bay ambient threshold levels and ER-M values (Battelle, BBL, and Neptune & Company 2005). Similar to the analytical results for surface sediments in Area I, the lowest chemical concentrations in subsurface sediments were found in Area VIII.

1.5.4 Area IX

Concentrations of mercury in surface sediment collected during the Validation Study exceeded the San Francisco Bay ambient threshold level but did not exceed the ER-M values (Battelle, BBL, and Neptune & Company 2005). Similarly, PCB concentrations exceeded the ER-M value in surface sediment samples collected from Area IX during both the Validation Study (Battelle, BBL, and Neptune & Company 2005) and the FSDG investigation (Battelle, Neptune & Company, and Sea Engineering, Inc. 2007).

1.5.5 Area X

Copper was detected at concentrations that exceeded the San Francisco Bay ambient thresholds in sediment surface samples collected in Area X during the Validation Study (Battelle, BBL, and Neptune & Company 2005). Concentrations of mercury in surface sediment collected during the Validation Study exceeded the San Francisco Bay ambient threshold level and ER-M value. The highest subsurface concentrations of metals in Area X were found in the top 0- to 60-centimeter (0- to 2-foot) core interval in the Validation Study and were generally found in the samples collected along the eastern shore of Area X and near the mouth of Yosemite Creek. Concentrations of metals in sediment did not exceed the ER-M value in any of the 4- to 6-foot cores during the Validation Study (Battelle, BBL, and Neptune & Company 2005).

Pesticides detected in surface sediment samples collected during the Validation Study were primarily found in Area X (Battelle, BBL, and Neptune & Company 2005). The detected pesticides were 4,4’-dichlorodiphenyldichloroethane (DDD); 4,4’-dichlorodiphenyl-dichloroethene (DDE); 4,4’-DDT; gamma-chlordane; alpha-chlordane; and dieldrin. The distribution of total DDx (sum of 4,4’-DDT; 4,4’-DDE; and 4,4’-DDD) in surface sediments was highest in Area X but remained within the range observed in San Francisco Bay ambient (Battelle, BBL, and Neptune & Company 2005). The highest concentrations of total DDx were found in samples collected along the eastern shore of South Basin and near the mouth of Yosemite Creek.

PCB concentrations exceeded the ER-M value in surface sediment samples collected from Area X during both the Validation Study (Battelle, BBL, and Neptune & Company 2005) and the FSDG investigation (Battelle, Neptune & Company, and Sea Engineering, Inc. 2007). The highest total PCB concentration found in surface sediment was approximately 7,000 µg/kg in a sample from the northeast shoreline of South Basin as part of the FSDG investigation. Total PCB concentrations decreased in samples collected farther from the eastern shoreline of the Area X and increased again in samples collected near the mouth of Yosemite Creek (see Figures 2-4a through 2-4f in Attachment 1). The PCB concentrations in surface sediments in South Basin are generally highest (>2,000 µg/kg) at the north end of South Basin, near the area where the former slough connects with South Basin.

Overall, PCB concentrations are higher 1 foot below the surface than at the surface in Area X. Attachment 1 includes plan view maps (see Figures 2-4a through 2-f) of PCB concentrations with increasing depth below the mudline based on the 2003 FSDG investigation data (Battelle, Neptune & Company, and Sea Engineering, Inc. 2007). The plan view maps represent horizontal slices at 0.5-foot intervals through the three-dimensional model. At a depth of 1 foot below the mud line, the area with PCB concentrations greater than 2,000 µg/kg is more extensive, both at the north end of South Basin and at the mouth of Yosemite Creek. At 1.5 feet below the mud line, the area of highest PCB concentrations decreases in vertical extent at the north end of South Basin and increases in vertical extent at the mouth of Yosemite Creek. At 2.5 feet below the mud line, PCB concentrations greater than 2,000 µg/kg at the northern end of South Basin are limited to the vicinity of Station SB-076, whereas the affected area at the head of Yosemite Creek has not diminished substantially with depth. The vertical extent limit of PCB concentrations above 2,000 µg/kg at the head of Yosemite Creek was not delineated that investigation. The highest surface concentrations are found along the northeastern shoreline of the South Basin, south of the Parcel E-2 landfill (Tetra Tech 2003a; Navy 2005).

1.5.6 Nature and Extent of Contamination Summary

Chemistry results for sediment in the five study areas in Parcel F indicated that chemical concentrations were generally not elevated above ambient threshold levels and ER-M values in Areas I, VIII, and IX. The highest chemical concentrations were found in Areas III and X. The horizontal and vertical distribution of chemicals in Area III sediments is localized and discontinuous rather than exhibiting a gradient away from a well-defined source. Chemicals of potential concern did not tend to co–occur in Area III, which suggests an episodic input of contamination.

In Area X, the highest concentrations of metals (copper, lead, and mercury) and PCBs in surface sediment are found along the eastern shoreline of Area X. Chemical concentrations in this area decrease with increasing distance from this eastern shoreline. The highest concentrations of metals and PCBs generally were found in the 0- to 2-foot interval. Concentrations were significantly lower in the 2- to 4-foot and the 4- to 6-foot depth intervals. The highest PCB concentrations in South Basin were found in subsurface sediment samples from the mouth of Yosemite Creek. Concentrations of metals and some pesticides also were elevated in samples collected near the mouth of Yosemite Creek.

Reference Item 7
Characterize Radionuclides of Concern

Source:

KCH. 2017a. *Final Addendum to the Feasibility Study Report for Parcel F, Hunters Point Naval Shipyard San Francisco, California*. January.

DCN:

KCH-2622-0005-0138

Excerpt includes the following:

Section 8

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8.0 Findings for Institutional Controls for Parcel F Sediment

The HRA identified the Underwater Areas and All Ships' Berths as radiologically impacted and required scoping surveys in the areas of OPERATION CROSSROADS decontamination activities and site outfall discharges, a review of the final status survey reports for completed berths, and scoping surveys for the remainder of the berths. OPERATION CROSSROADS areas and outfall discharge locations were identified in Parcel F and investigated in phased investigations—Phase 1, Phase 2a, and Phase 2b. These investigations are described in Section 3.0 and meet the requirement of the required HRA scoping surveys.

The recommendations from the HRA have been implemented. Parcel F sediments have been adequately characterized and reasonable effort has been made to investigate the site. The Phase 1, 2a, and 2b radiological investigations conducted within Parcel F included advancement of more than 300 sediment cores, which generated more than 800 sediment samples for radionuclide analysis.

Cs-137, Co-60, Pu-230/240, Ra-226, Sr-90, and U-235 are the six ROCs in Parcel F. Through statistical evaluations, including the WRS test inspection of box plots, and comparisons of maximum concentrations to the PAL, the following conclusions were made:

1. The Parcel F median radionuclide sediment concentrations were equal to or less than the median background concentrations for all six ROCs.
2. There is a highly statistically significant rejection of the null hypothesis that the median ROC concentration in Parcel F exceeds the median ROC concentration in the San Francisco Bay reference areas for the intertidal and subtidal exposure scenarios.
3. No individual sample had ROC concentrations exceeding the PAL + background.
4. Parcel F radionuclide concentrations are not attributable to site-specific conditions and are not expected to be toxic.
5. The clam tissue results suggest that ROC uptake by clams in Parcel F sediment was essentially negligible.

The Navy has made reasonable effort to characterize Parcel F, and the results indicate that no radioactivity in excess of naturally occurring background levels has been identified. Therefore, the Navy has concluded that there is no risk to human health and the environment because of ROCs at HPNS.

During extensive investigations performed throughout Parcel F, the Navy has not recovered any radioluminescent items such as dials, gauges, and deck markers from Parcel F sediments. However, based on the CSM for HPNS activities, which include the potential for inadvertent disposal of radioluminescent items, the potential remains for these radioluminescent items to be present in Parcel F sediments where ships docked during

HPNS operations. Therefore, the Navy has decided that it is appropriate to place ICs on Parcel F sediments. ICs will allow for management of future dredging activities in light of the potential that low-level radiological objects could be encountered in dredge spoils, and will ensure the proper assessment of sediments and disposal of potential radiological devices.

Reference Item 8
Source of COCs

Source:

Barajas and Associates. 2008. *Final Feasibility Study for Parcel F, Hunters Point Shipyard, San Francisco, California*. April 30.

DCN:

BAI-5106-0004-0003

Excerpt includes the following:

Section 1.6.1 through Section 1.6.2.2

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1.6 FATE AND TRANSPORT OF CHEMICALS TO PARCEL F SEDIMENTS

This section summarizes the potential fate and transport of chemicals of concern at Parcel F and identifies potential historical and ongoing sources of chemicals to the offshore areas. The chemicals of concern at Parcel F exhibit similar behavior by adsorbing to sediments. Therefore, the primary transport mechanism for chemicals is the movement of sediment via overland flow or erosion. The Navy evaluated the fate and transport mechanisms of contamination reaching Parcel F using multiple lines of evidence from data collected primarily during four field investigations: Parcel F Validation Study (Battelle, BBL, and Neptune & Company 2005), Parcel E Standard Data Gaps Investigation (Tetra Tech 2003a), Parcel B Shoreline Characterization (Tetra Tech 2003b; Tetra Tech and Innovative Technical Solutions, Inc. 2004), and the FSDG Investigation (Battelle, Neptune & Company, and Sea Engineering, Inc. 2007). Identifying the major transport mechanisms of chemicals reaching Parcel F sediments was necessary to develop remedial alternatives for Parcel F and to address the potential of recontamination once a remedy is in place. Additionally, understanding the time frame and relative magnitude of chemical transport pathways is necessary for adequate consideration of how effective remedial alternatives will be in meeting the RAOs. According to Navy policy and EPA guidance, site managers should identify all direct and indirect continuing sources of significant contamination to sediments as early as possible and before the implementation of a remedial action (Navy 2002; EPA 2002, 2005). This assessment should be followed by an evaluation of the continuing sources that can be controlled. The Navy has used the information gained from these investigations to prioritize source control and removal activities along the Parcels B, E, and E-2 shorelines. The description is organized with respect to each shoreline of HPS. Section 1.6.1 describes the potential sources of contamination to the Parcel F areas: Area I (India Basin) and Area III (Point Avisadero), which are adjacent to Parcel B, and the potential sources along the Parcels E and E-2 shoreline, which is adjacent to Areas VIII, IX, and X in Parcel F. Section 1.6.2 describes the source control measures implemented in onshore areas adjacent to the Parcel F areas.

1.6.1 Potential Sources and Transport Mechanisms of Contamination to Sediments in Parcel F

Area I (India Basin) and Area III (Point Avisadero): IR Sites 07 and 26 (IR-07 and IR-26) at Parcel B were identified during the Validation Study conducted in 2000 as potential historic source areas that could have resulted in the transport of contaminated soil to Areas I and III by overland flow and through the storm drains that empty along the Parcel B shoreline. IR-07 comprises approximately 9.5 acres in the northwestern portion of Parcel B (Tetra Tech and Innovative Technical Solutions, Inc. 2004). IR-07 is also known as the submarine base area. IR-07 was used for sandblasting and painting submarines. After 1948, IR-07 was filled with soil, rock and construction debris and by 1963 was completely filled (Tetra Tech and Innovative Technical Solutions, Inc. 2004). IR-26 is located on the eastern portion of Parcel B and located adjacent to Area III (Point Avisadero). The shoreline of IR-26 consists of heavy riprap that was placed for erosion control. In addition, the drainage tunnel at Dry Dock 3 may have acted as a conduit for contaminated material reaching Parcel F during the dewatering operations of the dry dock. Waste material from the dry docks including paint chips, sandblast waste, oils, and other chemicals associated with ship maintenance and repair may have been carried to the offshore area.

The Navy also evaluated the shoreline soils and sediments along Parcel B (upland to Areas I and III) in 2002 and 2003 to investigate the possible presence of contamination along the shoreline. The results of this investigation are described in the Parcel B Shoreline Characterization Technical Memorandum (Tetra Tech and Innovative Technical Solutions, Inc. 2004). These data indicated that nine metals (antimony, arsenic, barium, cadmium, copper, lead, manganese, thallium, and zinc) were present at concentrations above HPS ambient levels at IR-07. Polynuclear aromatic hydrocarbons (PAH), several pesticides, PCBs, and total petroleum hydrocarbons also were detected. IR-26 contained soils contaminated with metals (chromium, copper, lead, and mercury) and PAHs (Tetra Tech and Innovative Technical Solutions, Inc. 2004). Two sandy shoreline areas adjacent to Area I were identified as having the potential for contaminating the offshore areas in Parcel F. These two areas are being addressed as part of the evaluation of remedial alternatives for Parcel B in the Technical Memorandum in Support of a Record of Decision Amendment (TMSRA) (SulTech 2007).

The sediment chemistry results from Validation Study and FSDG investigation provided further evidence that the contamination in Area III was likely a result of episodic input (Battelle, BBL, Neptune & Company 2005; Battelle, Neptune & Company, and Sea Engineering, Inc. 2007). The distribution of copper, mercury, and PCBs in sediment is localized, not continuous, and occurs at varying depths. It is possible that waste material was delivered to the area from the Navy ships during berthing operations and maintenance.

Areas VIII, IX, and X (Parcels E and E-2 Shoreline): The Navy suspected that metals and PCBs along the Parcel E and E-2 shoreline were a source of contamination to Parcel F sediments and conducted a Validation Study at Parcel F in 2000 in part to investigate potential chemical transport mechanisms (Battelle, BBL, and Neptune & Company 2005). Potential historical sources of contamination to offshore sediments were identified and included stormwater outfalls and two metal reefs, which were composed of metal and other debris annealed into a slag type of material. One area was located along the southeastern tip of the shoreline referred to as the "metal reef" and the second was located along the opposite end of the shoreline known as the Panhandle Area and referred to as the "metal slag area." Leaching and runoff of this material was a potential source of metals to the offshore area. Debris along the entire Parcels E and E-2 shoreline such metal waste, kiln bricks, and sandblast waste may also have been another source of contamination to the offshore area.

A former small arms firing range is located adjacent to Area IX (Former Oil Reclamation Area). Historical activities that may also have contributed to contamination of sediments in Area X of the South Basin include filling and disposal, residual onshore contamination, and surface runoff. The former landfill in Parcel E-2 was used from 1958 to 1974 for the disposal of materials such as construction and industrial debris and waste, domestic refuse, sandblast waste, paint sludge, solvents, waste oils, transformers and electrical equipment, and other potentially contaminated materials. No records to document the contents of the landfill or the disposal practices are available. A former drum storage area previously operated by Triple A Machine Shop, Inc., is also located on the eastern shoreline of Area X. No records exist about the types and quantities of materials stored in this area. In addition, oily wastes, sandblast grit, and asphalt were allegedly disposed of in 5 acres along the Parcel E-2 shoreline operated by Triple A Machine

Shop, Inc. (San Francisco District Attorney 1986). If chemicals formerly stored in this area were released to the environment, then they could have been transported to the offshore area via drainage of surface water. The Validation Study recommended that contamination in the shoreline in all areas should be evaluated and addressed as part of the Parcels B and E activities (Battelle, BBL, and Neptune & Company 2005).

Based in part on the Validation Study recommendation, the Navy decided to evaluate the shoreline along Parcels E, E-2, and B as a potential sources of contamination to Parcel F. The Navy conducted the Parcel E Standard Data Gaps Investigation in 2002 (Tetra Tech 2003a). Upon review of the chemical results from the onshore and shoreline investigation of Parcels E and E-2, the Navy began prioritizing the source control activities. A TCRA was initiated to address the most significant potential sources of contamination. The TCRAs were implemented along four areas along the Parcels E and E-2 shoreline: (1) the metal slag area along the Panhandle Area, (2) the PCB hotspot area near the landfill, (3) IR-02 Northwest, and (4) the metal debris reef near located in IR-02 near the tip of the Parcel E shoreline. The metal slag reef and IR-02 were identified as being a potential future source of contamination of metals to the Parcel F sediments but were undertaken as a TCRA due to the radiological component of these two sites. The TCRA of the PCB hotspot area was implemented because of its close proximity to in the Area X (South Basin) (Navy 2005). Further excavation southwest and west of the PCB hotspot area is pending and will occur prior to or at the same time as any remedial activity in Parcel F. The Shoreline Technical Memorandum documented the results of the shoreline portion of the standard data gaps investigation and built upon the previous work conducted during the Parcel F Validation Study to confirm and refine the conceptual site model for the Area X (South Basin) as developed in the Validation Study. The technical memorandum concluded that most of the Parcels E and E-2 shoreline is a potential source of contamination and that the influx of metals from the shoreline to the offshore is likely from suspended materials transported into the bay by overland flow (SulTech 2005). Shoreline erosion was evaluated by considering the topographic elevation data for Parcels E and E-2. Although the erosion potential is low, erosion can still occur in localized areas emanating from the terrestrial parcels along the shoreline as evidenced by the black sand area near the PCB hotspot area.

Analysis conducted as part of the FSDG investigation (Battelle, Neptune & Company, and Sea Engineering, Inc. 2007) used the vertical core profiles in the South Basin (Area X), the radioisotope core data, and historical aerial photographs to better delineate how contamination in Parcel F occurred in the South Basin. The distribution of PCBs in the South Basin showed a peak of contamination at about 1 foot below the sediment mud line. This well-defined subsurface PCB concentration peak suggests that the *primary* release occurred over a specific period of time. The radioisotope cores, which indicated a net sedimentation rate of approximately 0.5 centimeters (0.2 inches) per year indicated that the primary release occurred during periods when Parcel E-2 was being filled. This conclusion further suggested that the fill material itself, or waste materials disposed with the fill, served as the primary sources of PCBs to the South Basin. The report concluded that PCBs may have gradually migrated alongshore and offshore into the South Basin from the mouth of the historical slough (see Figure 1-3) by sediment resuspension and transport.

Yosemite Creek is located in the South Basin at the southwestern corner of HPS. Yosemite Creek is listed as a Site of Concern under the Bay Protection and Toxic Cleanup Program by the San Francisco Bay Regional Water Quality Control Board (1997). Before 1965, three hydraulically separate combined sewer outfalls (CSO) discharged to this area: one at the head of Yosemite Creek, one on the north side of the creek near Griffith Street, and one on the south side near Fitch Street. After 1965, the three overflow structures were hydraulically connected, and the CSO at the head of Yosemite Creek was replaced by an overflow weir located adjacent to the head of the creek on the south side. The wet weather overflows were directed to this weir after 1965. Chemicals identified during investigations of Yosemite Creek by the City and County of San Francisco (CCSF) included metals, PAHs, pesticides, and PCBs (Little 1999). CCSF conducted sediment investigations from 1998 to 2000; some of these data are included in Attachment 1.

Groundwater discharge was evaluated as a potential pathway for migration of metals and PCBs to Parcel F (Battelle, Neptune & Company, and Sea Engineering, Inc. 2007; SulTech 2005). Under atmospheric (oxidizing) conditions and a normal range of pH (6 to 9), copper, lead, zinc, and other metals will not be dissolved in groundwater at more than a few tens of micrograms per liter, based on the mineral phases that control solubility (SulTech 2005). The dissolved concentration for copper in groundwater is maintained at about 10 micrograms per liter (µg/L) by copper hydroxy carbonates. Likewise, the dissolved concentration of lead in oxygenated groundwater is also maintained at low levels (less than 10 µg/L) by the low solubility of lead hydroxy carbonates. Therefore, groundwater in contact with contaminated soils at depth in Parcels E and E-2 is unlikely to contribute to metals contamination in offshore sediments (SulTech 2006a). Data for groundwater samples from four nearshore wells in Parcel E-2 and showed that concentrations of dissolved copper ranged from 1.7 to 4.2 µg/L and concentrations of dissolved lead ranged from 0.9 to 9.3 µg/L in samples collected from 1992 through 2004 (SulTech 2006a). Although mercury has a generally more complex chemistry, transport of mercury by groundwater to Parcel F sediments is also expected to be relatively minor in comparison with other transport mechanisms.

Likewise, due to the hydrophobic nature of PCBs, the groundwater pathway for PCBs has been considered to be insignificant in comparison with shoreline erosion (SulTech 2006a). PCBs are highly immobile in groundwater because of the low aqueous solubility of PCBs under normal pH and Eh conditions. The very low concentration of PCBs in groundwater in comparison with the PCB concentrations found in sediment is further evidence that groundwater is not serving as a transport mechanism for PCBs to the offshore sediments. However, PCBs are more soluble in oils and organic solvents and therefore concern was raised when field observations at the TCRA sites along the Parcel E-2 shoreline adjacent to Area X indicated free hydrocarbon product was present in soil and as sheen on groundwater in areas that groundwater was exposed. Although the occurrence of free product alone does not necessarily equate to it being a transport mechanism to Parcel F, the full extent of contamination in the PCB hotspot area is still under investigation. The relative contribution and magnitude of contamination transported by groundwater versus erosion will continue to be investigated while the TCRA at the PCB hotspot area is being completed.

1.6.2 Source Control Measures

Although Areas III and X are the primary focus in this FS Report, all areas of Parcel F are being addressed for source control measures. The subsections below describe the major source control measures implemented along the HPS shoreline to protect against releases to each subarea of Parcel F.

1.6.2.1 Area I (India Basin) and Area III (Point Avisadero)

Excavations at Parcel B at IR-07 and IR-26. Excavations at IR-07 and IR-26 were implemented in 1998 to 1999 and 2000 to 2002. More than 40,000 cubic yards (yd^3) of waste was removed to a depth of 10 feet. The excavations were eventually stopped because of the concern of potential loss of stability of the riprap (Tetra Tech and Innovative Technical Solutions, Inc. 2004). These areas are currently being evaluated for the feasibility of placing a shoreline revetment as part of the Parcel B TMSRA (SulTech 2007). The Navy intends to maintain these revetment walls at IR-07 and IR-26 as part of a permanent containment remedy.

Storm Drain Cleaning Program and Dry Dock 3 Tunnel. A program to clean the storm drains was initiated in 1997 because of concerns that contaminated sediment could migrate to Parcel F. Each cleaning event was following by videotaping to ensure the cleaning event was successful. Storm drains were cleaned using a high-pressure jetting truck and vactor truck. The storm drains in this area ranged in diameter from 6 to 74 inches. All storm drains were cleaned except those that had inaccessible laterals or when the lines were submerged in water. A description of the storm drain cleaning program is included in the Draft Field Summary Report (IT Corporation 1997). The tunnel at Dry Dock 3 used for dewatering was cleaned in 1997, and the doors were sealed.

1.6.2.2 Areas VIII, IX, and X (Parcels E and E-2 Shoreline)

Parcels E and E-2 Shoreline Cleanup. During summer 2004, the Navy cleaned up the entire length of the Parcels E and E-2 shoreline. Tires, kiln bricks, and concrete blocks were removed and disposed of off site.

Metal Debris Reef Removal. About 11,200 yd^3 of material was excavated during the removal action over a period of 5 months. The area was backfilled to achieve the original grade.

Before Removal Action

After Removal Action

IR-2 Northwest and Central. A total of 50,000 yd^3 of material was removed as part of the removal action to address radiologically affected soils. Imported clean backfill was placed and is ongoing. Over 9,000 yd^3 of soil failed the radiological screening and was disposed of off site, along with approximately 2,000 yd^3 of debris and 1,952 radiological devices. Soil that was visibly contaminated with petroleum or that contained elevated metals concentrations was also disposed of off site (SulTech 2006b).

PCB Hotspot Removal. A total of 44,500 yd^3 of material was excavated and removed. During the removal action, 110 drums and 540 other assorted waste containers were removed. In some areas excavation depths reached to a depth of 20 feet. A geotextile liner was placed prior to placement of imported clean fill. The area was ultimately hydroseeded and spread with hay. The Navy intends to continue the removal action of the PCB contaminated sediments along the PCB hotspot area in the intertidal area of Parcel E-2.

Excavation up to 20 feet

Hydroseeding and Spreading Hay for Protection

Metal Slag Removal. Excavation activities at the metal slag area took place from May 2005 to January 2006. A total of 8,500 yd^3 of material was excavated and disposed of off site. The Navy is in the process of planning the wetland restoration of this area.

Soil Excavated for Off-Site Disposal

Metal Slag Area after Removal Action

Former Industrial Landfill. In the 1990s, a sheet-pile wall was installed and riprap was placed along the shoreline at Parcel E-2 to control the movement of chemicals into Area X. A cap was placed over most of the landfill after a fire in 2000 (Tetra Tech 2001). This cap was expected to control infiltration of surface water. Further monitoring and investigation were initiated in 2002, including delineating the lateral extent of the landfill, monitoring landfill gas, evaluating liquefaction potential, and delineating and assessing wetlands (Tetra Tech 2002).

Former Oil Reclamation Ponds. A former small arms firing range is located adjacent to Area IX (Former Oil Reclamation Ponds Area). Two oil reclamation ponds were constructed in IR-03, approximately 30 feet from the shoreline within bay fill. The ponds were used from 1944 to 1974 as part of a waste oil reclamation system. Together, the ponds had a capacity of 430,000 gallons. In 1974, the ponds were emptied and filled with soil (Naval Energy and Support Activity 1984). In 1996, an 800-foot-long sheet-pile wall that was keyed into the Bay Mud was placed adjacent to the shoreline, the ponds were closed, and the shoreline was stabilized in this area by placing a 6-inch clay layer covered by a 1-foot topsoil layer as part of onshore remediation activities (PRC 1996a; Battelle, Neptune & Company, and Sea Engineering, Inc. 2007).

Storm Drain Cleaning Program. The program to clean storm drains in Parcel B was initiated based on concerns that contaminated sediment could migrate to Parcel F. Videotaping after the storm drains were cleaned was performed to ensure the cleaning activities were successful. The storm drains were cleaned using high-pressure jetting and vactor trucks. A description of the storm drain cleaning program is included in the Draft Field Summary Report (IT Corporation 1997).

1.7 SUMMARY OF HUMAN HEALTH AND ECOLOGICAL RISK ASSESSMENT RESULTS

This section summarizes the results of the baseline risk assessments conducted for Parcel F.

1.7.1 Human Health Risk Assessment Results

The HHRA for Parcel F was presented in the Final Hunters Point Shipyard Parcel F Validation Study (Battelle, BBL, and Neptune & Company 2005). This study was conducted in accordance with risk assessment guidance from EPA (1989, 1992). The objective of the HHRA was to calculate potential cancer risks and noncancer hazards associated with exposures to sediment from collection and ingestion of shellfish from HPS. Future adult residents were assumed to collect and consume shellfish from the intertidal areas of HPS. Shellfish have been observed along the shoreline of Parcels E and E-2; however, none were observed during the Validation Study along Parcel B in Area III (Battelle, BBL, and Neptune & Company 2005). The direct contact exposure scenario represented an individual wading in the intertidal area and incidentally exposed to sediment during harvesting and cleaning the shellfish. Most of the shellfish collected and consumed by humans is likely to be mussels present along the shoreline and attached to piers (Battelle, BBL, and Neptune & Company 2005).

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Reference Item 9
Background

Source:

Barajas and Associates. 2008. *Final Feasibility Study for Parcel F, Hunters Point Shipyard, San Francisco, California*. April 30.

DCN:

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Excerpt includes the following:

Section 2.1.2 through Section 2.1.3

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2.1.2 Background Concentration for Each Chemical of Ecological Concern

Background concentrations or ambient concentrations are chemical concentrations that occur naturally in the environment and from human activities. Data for copper and mercury were compared with San Francisco Bay ambient sediment concentrations (68.1 mg/kg for copper and 0.43 mg/kg for mercury) (Water Board 1998). The estimated nearshore PCB ambient sediment concentration of 200 µg/kg was used as the ambient threshold value for total PCBs (Water Board 2003). The results of the sediment trap data collected in 2004 were also used in this Feasibility Study (FS) Report. Sediment traps were placed in Area X at four stations during three periods to characterize sediment deposition during winter, spring, and summer conditions. The data were used to estimate the concentration of sediment entering the South Basin, since the sediment traps capture suspended sediment that advects into South Basin from San Francisco Bay, as well as suspended sediment derived from runoff and local resuspension. Based on sediment trap data averaged over three deployment periods from the mouth of the South Basin, a PCB concentration of 121 µg/kg for incoming sediments was used for the ambient concentration of PCBs in sediment in the sediment transport model (Battelle, BBL, and Neptune & Company 2005). This result is consistent with the nearshore ambient concentration for PCBs in sediment (200 µg/kg), which is considered the upper bound value (Water Board 2003).

2.1.3 Range of Preliminary Remediation Goals for Sediment at Parcel F

As described in Section 2.1.1, the range of preliminary remediation goals for ecological receptors was calculated using results from 28-day bioaccumulation tests. Regulatory agency concerns remained that the field-collected tissue data should be incorporated into the development of the remediation goals. Preliminary remediation goals using the field-collected tissue data were not used alone because of the insufficient data set. Therefore, a risk management approach was taken by using the field-collected tissue data results to bound the range (or SUF to be considered) of preliminary remediation goals derived using the laboratory bioaccumulation. This resulted in a range of preliminary remediation goals that corresponded to a range of SUFs between 0.5 and 1.0. Similarly, the preliminary remediation goals for human consumption of shellfish were calculated based on EPA's acceptable target risk range between 10^{-4} and 10^{-6}. The NCP preamble explains that preliminary remediation goals for carcinogens are set at a 10^{-6} excess cancer risk as a point of departure, but they may be revised to a different risk level within the risk range based on the consideration of site-specific and remedy-specific factors. The range of preliminary remediation goals for Parcel F sediments is shown in Table 2-2.

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Reference Item 10a
Human Health Risk Assessment

Source:

KCH. 2017a. *Final Addendum to the Feasibility Study Report for Parcel F, Hunters Point Naval Shipyard San Francisco, Californi*a. January.

DCN:

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Excerpt includes the following:

Appendix A; Point Avisadero Area (Area III): Tables A-12A through A-13C;
South Basin Area X: Tables A-14A through A-15C

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Acronyms and Abbreviations

95UCL	95 percent upper confidence limit of the mean
ABS	dermal absorption
ADAF	age-dependent adjustment factor
Cal/EPA	California Environmental Protection Agency
COPC	chemical of potential concern
CTE	central tendency exposure
DTSC	(California) Department of Toxic Substances Control
EPC	exposure point concentration
FS	feasibility study
GI	gastrointestinal
HEAST	Health Effects Assessment Summary Tables
HHRA	human health risk assessment
HI	hazard index
IRIS	Integrated Risk Information System
kg/day	kilograms per day
mg/kg	milligrams per kilogram
OEHHA	Office of Environmental and Health Hazard Assessment
PCB	polychlorinated biphenyl
PPRTV	Provisional Peer-Reviewed Toxicity Values
PRG	preliminary remediation goal
RBA	relative bioavailability
RME	reasonable maximum exposure
RSL	regional screening level
TCDD	2,3,7,8-tetrachlorodibenzo-p-dioxin
TEF	toxicity equivalency factor
TEQ	toxicity equivalent
USEPA	United States Environmental Protection Agency

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1.0 Introduction

This appendix presents the methods used to update the human health risk assessment (HHRA) for chemical exposures at Parcel F. Chemical risks for Parcel F were previously assessed as part of the HHRA completed for the Parcel F Validation Study (Battelle, Blasland, Bouck & Lee, Inc. and Neptune & Company, 2005), hereafter referred to as the 2005 HHRA. The 2005 HHRA estimated chemical risks for a recreational shellfish harvesting scenario and for a construction worker scenario for the following five exposure areas at Parcel F:

- Eastern Wetland Area
- India Basin Area I
- Oil Reclamation Area
- Point Avisadero Area
- South Basin Area X

In addition, risks were estimated based on exposure to reference station (i.e., background) concentrations. Risks to adult recreational users were based on exposure from shellfish consumption and direct contact with sediment (incidental ingestion and dermal contact). Risks to child recreational users and construction workers were based on direct contact with sediment. Further information regarding the potential human receptors, chemical transport mechanisms, and potentially complete exposure pathways for Parcel F is provided in the 2005 HHRA (Battelle, Blasland, Bouck & Lee, Inc. and Neptune & Company, 2005).

In this feasibility study (FS) addendum report, chemical risks are summed with radiological risks for Parcel F to estimate the overall potential for excess lifetime cancer risks from exposure to contaminated media. In the intervening years since the 2005 HHRA was completed, however, toxicity criteria for many of the chemicals of potential concern (COPC) at Parcel F have evolved based on additional scientific research. Toxicity criteria form the basis for evaluating risk and developing appropriate remedial goals to protect human health and the environment in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act. In addition, methods and assumptions recommended by the United States Environmental Protection Agency (USEPA) and California Department of Toxic Substances Control (DTSC) for estimating health risks have been updated.

Before they were summed with radiological risks, chemical risks for Parcel F were updated for the each of the five exposure areas and the reference stations to reflect updated USEPA and DTSC methodology for HHRAs. Both reasonable maximum exposure (RME) and central tendency exposure (CTE) risks were estimated in the 2005 HHRA; the updated HHRA was limited to estimation of RME risks. The maximum updated RME chemical risk for the five exposure areas was then used to estimate combined chemical and radiological risks for Parcel F (see Section 5.4 of the FS addendum report).

This appendix discusses the methods used to update the chemical HHRA for Parcel F. Approaches used to calculate risks that were unchanged from the 2005 HHRA completed for Parcel F are not described; details for these methods are provided in Section 9 and Appendices J and Q of the 2005 Parcel F Validation Study (Battelle, Blasland, Bouck & Lee, Inc., and Neptune & Company, 2005).

The updated chemical HHRA for Parcel F reflects revised methods for estimating exposure point concentrations (EPC), revised assumptions for estimating exposure and chemical intake, changes to toxicity criteria, and updated risk characterization methods. These revisions are discussed Sections 2.0 through 5.0. Results of the updated HHRA are provided in Section 6.0. References are listed in Section 7.0.

2.0 Exposure Point Concentrations

EPCs for each COPC identified in sediment and clam (*Macoma nasuta*) samples collected from the five exposure areas and the reference stations were revised to incorporate updated toxicity equivalency factors (TEFs) for dioxin/furan congeners and to incorporate updated methods for calculating 95 percent upper confidence limit of the mean (95UCL) concentrations. The updated EPCs are provided in Tables A-1 and A-2.

2.1 Toxicity Equivalency Factors

TEFs used in the updated HHRA to estimate 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) toxicity equivalent (TEQ) concentrations were revised based on TEFs provided by the USEPA (2010). The revised TCDD TEQ concentrations are referred to as total TEQ for dioxin/furan-like congeners, or "Total TEQ – TCDD DLC," in the updated HHRA.

Total TEQ concentrations for the four coplanar polychlorinated biphenyl (PCBs) congeners (i.e., PCB-77, PCB 105, PCB 118, and PCB 126) were also calculated in the updated HHRA because of the availability of TEFs for these congeners. Evaluation of these PCB congeners was limited to total PCBs in the 2005 HHRA; however, these coplanar PCB congeners are also associated with dioxin-like toxicity. TEQ concentrations for the coplanar PCB congeners are referred to as total TEQ for dioxin-like PCB congeners, or "Total TEQ – PCB DLC" in the updated HHRA.

The chart below summarizes the dioxin/furan and PCB congener TEFs that were revised in the updated HHRA. Updated TEFs for congeners that were not analyzed in Parcel F samples are not listed.

Compound	2005 HHRA TEF (Van den Berg et al., 1998)	Updated HHRA TEF (USEPA, 2010)
1,2,3,7,8-Pentachlorinated dibenzofuran (1,2,3,7,8-PeCDF)	0.05	0.03
2,3,4,7,8-Pentachlorinated dibenzofuran (2,3,4,7,8-PeCDF)	0.5	0.3
PCB-105	0.0001	0.00003
PCB-118	0.0001	0.00003

2.2 95 Percent Upper Confidence Limit Concentrations

Although goodness-of-fit tests did not conclusively indicate a normal or lognormal distribution for exposure area-specific sampling results for COPCs, graphical analysis of the combined exposure area and reference data sets during the 2005 HHRA indicated a normal distribution (Battelle, Blasland, Bouck & Lee, Inc. and Neptune & Company, 2005).

Therefore, the 2005 HHRA calculated 95UCL concentrations for all COPCs using the Student's t-statistic and the USEPA (1992) method for normally distributed data.

95UCLs were recalculated for the updated HHRA using the stochastic methods in USEPA's ProUCL software (version 5.0.00) and technical guidance (USEPA, 2013). The procedures in ProUCL identify the COPC-specific statistical distribution type (e.g., normal, lognormal, gamma, or nonparametric) and compute the corresponding 95UCL for the identified distribution type. The 95UCL was used in the updated HHRA as the EPC unless the calculated 95UCL is greater than the maximum detected concentration or when the number of samples or number of detected results in the data grouping is too small (fewer than five total results or fewer than four detected results) to permit estimation of a 95UCL. If this occurs, then the maximum detected concentration was used as the EPC.

3.0 Exposure and Chemical Intake

The updated HHRA incorporates revised exposure assumptions, updated dermal absorption factors, and bioavailability for arsenic to estimate exposure and chemical intake.

3.1 Exposure Assumptions

Values used in the 2005 HHRA to estimate exposure were largely based on assumptions used by USEPA in 2002 to develop preliminary remediation goals (PRGs) for Region 9. The USEPA regional screening levels (RSLs) have replaced the USEPA Region 9 PRGs. The 2014 RSLs (USEPA, 2014a) incorporate revisions made in 2014 by USEPA (2014b) for several key exposure parameters, such as adult body weight, exposure skin surface area available for contact with soil and sediment, and residential exposure duration. In addition, DTSC (2014) has developed exposure assumption recommendations for soil and sediment contact. The updated HHRA uses the most conservative values between exposure assumptions used for the RSLs (USEPA, 2014a) and DTSC (2014) recommendations for exposure assumptions. For some exposure parameters (i.e., body weight and exposure duration) the DTSC (2014) recommendations are based on historical USEPA values that have since been replaced by newer USEPA (2014) values; the newer USEPA (2014) values are used for these parameters.

The site-specific ingestion rate for shellfish consumption of 0.048 kilograms per day (kg/day) used in the 2005 HHRA was revised in the updated HHRA to 0.00213 kg/day. The revised shellfish consumption rate reflects the approach established in the 2008 FS report for Parcel F to develop remediation goals for Parcel F (Barajas & Associates, Inc. 2008).

Table A-3 presents the updated exposure assumptions for direct contact with sediment and Table A-4 presents the updated exposure assumptions for shellfish consumption. The 2005 HHRA exposure assumptions are provided in these tables for comparison purposes; the tables also indicate which values were revised for the updated HHRA.

3.2 Dermal Absorption Factors

Dermal absorption (ABS) factors used in the 2005 HHRA to estimate chemical intake from exposure to COPCs in sediment were based on values used by USEPA in 2002 to develop the PRGs. The updated HHRA uses the most conservative ABS factor between those used by USEPA to develop the 2014 RSLs (USEPA, 2014a) and those recommended by DTSC in its 2013 preliminary endangerment assessment guidance (DTSC, 2013).

Table A-5 presents the ABS factors used in the updated HHRA. The 2005 HHRA ABS factors are provided in this table for comparison purposes; the table also indicates which factors were revised for the updated HHRA.

3.3 Arsenic Bioavailability

The 2005 HHRA assumed 100 percent relative bioavailability (RBA) of arsenic when exposure results from sediment ingestion. Recent guidance from USEPA (2012) recommends a default RBA value of 60 percent be used to adjust intake estimates for ingestion of arsenic in soil; this value is also incorporated in the derivation of the 2014 RSLs (USEPA, 2014a). Intake estimates for ingestion of arsenic were likewise adjusted in the updated HHRA to incorporate the default arsenic RBA of 60 percent.

4.0 Toxicity Criteria

The updated HHRA incorporates updated toxicity criteria, adjusts toxicity criteria for evaluating dermal exposures, uses toxicity criteria based on surrogate chemicals when chemical-specific toxicity criteria are not available, and makes changes to the assumed form of chromium present in sediment and clam tissue at Parcel F.

4.1 Toxicity Criteria

The 2005 HHRA used the following hierarchy as sources for toxicity criteria: (1) California Environmental Protection Agency's (Cal/EPA) Office of Health Hazard Assessment (OEHHA) criteria for carcinogens, (2) USEPA's Integrated Risk Information System (IRIS), and (3) USEPA's Health Effects Assessment Summary Tables (HEAST).

USEPA revised its recommendations for the hierarchy of toxicity criteria sources in 2003 (USEPA, 2003), and further refined its recommendations for the hierarchy of sources during subsequent development of the RSLs (USEPA, 2014a). USEPA (2014a) currently recommends the following three-tiered hierarchy of sources:

Tier 1: USEPA's IRIS

Tier 2: USEPA's Provisional Peer-Reviewed Toxicity Values (PPRTV) database.

Tier 3: Other toxicity values, from the following sources in the order in which they are listed:

a. Agency for Toxic Substances and Disease Registry minimal risk levels
b. Cal/EPA's OEHHA online database
c. USEPA PPRTV appendix screening toxicity values
d. USEPA's HEAST

The updated HHRA used this current (USEPA, 2014a) hierarchy to identify and update toxicity criteria, with one exception. The USEPA (2014a) hierarchy includes Cal/EPA-established criteria as third-tier sources. If the Cal/EPA toxicity criterion for carcinogens was more conservative than toxicity criterion for carcinogens from first- and second-tier sources, then the Cal/EPA criterion was used preferentially over the first- and second-tier source criterion. This approach provides a conservative estimate of health risks for carcinogens because Cal/EPA criteria for some chemicals are more conservative than toxicity criteria established by the other sources. This exception to the hierarchy was used to evaluate cancer effects only, as the Cal/EPA criteria for evaluation of noncancer effects have not undergone the same level of peer review as criteria for evaluation of cancer effects.

Table A-5 presents the toxicity criteria used in the updated HHRA. The 2005 HHRA toxicity criteria are provided in this table for comparison purposes; the table also indicates which factors were revised for the updated HHRA.

4.2 Toxicity Criteria – Dermal Exposure

Toxicity criteria are not available for the dermal exposure route. The 2005 HHRA used route-to-route extrapolations of oral toxicity criteria to evaluate dermal exposures. The gastrointestinal (GI) absorption fraction was assumed to be 100 percent for all COPCs; that is, oral toxicity criteria were not adjusted for GI absorption fraction in the 2005 HHRA to evaluate dermal exposures.

Current USEPA (2004) guidance recommends that oral toxicity criteria be adjusted for evaluation of dermal exposures so that criteria are based on an absorbed dose. Toxicity value adjustments are only needed when the GI absorption fraction is less than 50 percent (USEPA, 2004).

USEPA (2004)-recommended GI absorption fractions are summarized in Table A-5. These fractions were used in the updated HHRA to adjust oral toxicity criteria for evaluation of dermal exposures; the resulting dermal toxicity criteria are also shown on Table A-5. GI absorption fractions are not available for all COPCs. In the absence of information; the GI absorption fraction was assumed to be 1 (i.e., 100 percent) and oral toxicity criteria were not adjusted to evaluate dermal exposures.

4.3 Surrogate Chemicals

The 2005 HHRA did not estimate health risks for COPCs that did not have USEPA- or Cal/EPA-established toxicity criteria. The updated HHRA used chemical surrogates to address data gaps in the risk estimates resulting from lack of toxicity criteria for some COPCs. Chemical surrogates were selected based on structural similarity to the COPCs that lack toxicity criteria. The chemical surrogates used to identify toxicity criteria in the updated HHRA are listed in Table A-5.

4.4 Chromium

Chromium is a COPC in sediment and clam (*Macoma nasuta*) tissue. In the absence of speciation data, the 2005 HHRA assumed all chromium in sediment and clam tissue was present as hexavalent chromium for estimating health risks. Hexavalent chromium is considered a carcinogen (USEPA, 2014a). However, chromium in reducing or even mildly oxidizing conditions in aquatic environments is present primarily as trivalent chromium because these conditions do not provide stability for chromium in the hexavalent state (Rifkin, et. al., 2004). Under the anoxic conditions present in most sediments, hexavalent chromium is readily reduced to the trivalent form by a number of naturally-occurring chemical and microbial species. Natural chemical reductants include reduced iron and sulfur species as well as organic sediment constituents. Once formed, trivalent chromium has very low solubility at mid-range pH values due to the formation of $Cr(OH)_3$. Oxidation of trivalent to hexavalent chromium does not readily occur, even in the presence of possible oxidants such as oxygen or MnO_2, due to the general reductive capacity of the sediments (Sorensen, et al., 2010; Truex, et al., 2015). For this reason, the updated HHRA based toxicity criteria for chromium on trivalent chromium. Trivalent chromium is only associated with noncancer effects (USEPA, 2014a).

5.0 Risk Characterization

The updated HHRA incorporates mutagenic mode of action to estimate cancer risks, revises the methodology used to estimate cumulative cancer risks and noncancer hazards for recreational user contact with sediment, and confirms the approach for characterizing health effects for lead.

5.1 Mutagenic Mode of Action

Seven carcinogenic PAHs—benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, chrysene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene—were identified as COPCs. These cancer-causing chemicals operate by a mutagenic mode of action. It is believed that chemicals with a mutagenic mode of action may exhibit a greater effect in early life versus later-life exposure. Cancer risk to children from exposure includes early life exposures that may result in the occurrence of cancer during childhood or that may contribute to cancers later in life (USEPA, 2005). The following USEPA (2005) default age-dependent adjustment factors (ADAFs) are used to estimate cancer risks in the updated HHRA for mutagenic COPCs. USEPA (2005) equations for incorporating these ADAFs to estimate intake of mutagenic COPCs are shown in Table A-3.

- A 10-fold adjustment for ages 0 to less than 2 years
- A 3-fold adjustment for ages 2 to less than 16 years
- No adjustment for ages 16 years and older

Adjustment to cancer risks for mutagenic COPCs using ADAFs was not done in the 2005 HHRA.

5.2 Cumulative Cancer Risk Estimates

Cumulative cancer risks for direct contact with sediment for recreational users were estimated in the 2005 HHRA solely based on cancer risks for the adult recreational user. For the updated HHRA, cumulative cancer risks for recreational user direct contact with sediment were calculated by summing direct contact cancer risks for both the adult and child recreational users. This approach was used because cancer risks are cumulative over a lifetime of exposure (USEPA, 1989). This approach is also consistent with the method USEPA uses to develop residential RSLs, which include evaluation of adult and child exposures, for chemicals with cancer effects (USEPA, 2014a). Evaluation of construction worker exposure to sediment from direct contact was not affected by this change.

5.3 Cumulative Noncancer Hazard Estimates

The cumulative noncancer hazard for direct contact with sediment for recreational users was estimated in the 2005 HHRA based on the total noncancer hazard index (HI) for the adult recreational user. For the updated HHRA, the cumulative noncancer hazard for recreational users was based on the total HI for the child recreational user. This approach was used because intake of sediment from incidental ingestion and dermal contact per unit body mass is higher for children than for adults; thus, noncancer HIs for a child recreational user are always higher than noncancer HIs for an adult recreational user. This approach is also consistent with the method USEPA uses to develop residential RSLs, which is limited to evaluation of child exposures for chemicals with noncancer effects (USEPA, 2014a). Evaluation of construction worker exposure to sediment from direct contact was not affected by this change.

5.4 Lead

The 2005 HHRA evaluated the potential for health effects from exposure to lead in sediment and clam (*Macoma nasuta*) tissue by comparing the range of detected concentrations for lead with the USEPA 2002 residential PRG for lead in soil of 400 milligrams per kilogram (mg/kg). As discussed in Section 3.1, the USEPA PRGs have been replaced by USEPA RSLs; the current USEPA (2014) residential RSL for lead is the same as the 2002 PRG (400 mg/kg). However, as indicated in the 2005 HHRA, this screening concentration for lead is based on a target blood lead level concentration and lead uptake modeling for exposure to lead in soil, drinking water, homegrown produce, and respirable dust and air. The uptake modeling was not designed to predict blood lead levels associated with seafood consumption or from contact with sediment (Battelle, Blasland, Bouck & Lee, Inc. and Neptune & Company, 2005). Despite this difference, the 2005 HHRA found that concentrations of lead at Parcel F were lower than the health-protective concentration of 400 mg/kg and further evaluation of lead was therefore not warranted. For this reason, health effects from exposure to lead were not re-evaluated in the updated HHRA.

6.0 Risk Results

The updated cancer risk and noncancer HI results for the recreational user (direct contact with sediment, shellfish consumption) and construction worker (direct contact with sediment) scenarios are presented in the following tables:

- Eastern Wetland Area: Tables A-6A through A-7C
- India Basin Area I: Tables A-8A through A-9C
- Oil Reclamation Area: Tables A-10A through A-11C
- Point Avisadero Area: Tables A-12A through A-13C
- South Basin Area X: Tables A-14A through A-15C
- Reference Stations: Tables A-16A through A-17C

Table A-18 provides an overall summary of the updated cumulative cancer risk and noncancer HI results. Table A-19 compares the updated HHRA results with the results for the 2005 HHRA. The same format used for the summary tables in the 2005 HHRA was used for the comparison summary in Table A-19 for comparability.

Cumulative cancer risk and noncancer HI estimates in Table A-18 are presented to one significant figure in accordance with USEPA (1989) guidance. However, Tables A-6A through A-17C show chemical-specific risk and HI results to two significant figures to aid review of the risk calculations. Table A-19 shows both cumulative and chemical-specific risk and HI results to two significant figures for comparability with the results provided in the 2005 HHRA.

7.0 References

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Tables

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TABLE A-1
Exposure Point Concentration Summary for Sediment
Appendix A - Updated Human Health Risk Assessment for Chemical Exposures

Scenario Timeframe:	Current and Future
Medium:	Sediment
Exposure Medium:	Sediment

Exposure Point	Area	Chemical of Potential Concern	CAS Number	Units	Detection Frequency	Number of High Censored Results (a)	Minimum Concentration	Arithmetic Mean (b)	95 UCL Distribution (c)		Maximum Detected Concentration	Exposure Point Concentration			
												Value	Units	Statistic (d)	Method (e)
Sediment	Eastern Wetland Area	**Metals**													
		Aluminum	7429-90-5	mg/kg	8 / 8	0	4.20E+04	5.51E+04	6.40E+04	N	7.49E+04	6.40E+04	mg/kg	95UCL	(2)
		Antimony	7440-36-0	mg/kg	8 / 8	0	6.42E-01	1.21E+00	2.77E+00	NP	3.64E+00	2.77E+00	mg/kg	95UCL	(4)
		Arsenic	7440-38-2	mg/kg	8 / 8	0	5.18E+00	8.12E+00	9.69E+00	N	1.11E+01	9.69E+00	mg/kg	95UCL	(2)
		Barium	7440-39-3	mg/kg	8 / 8	0	3.32E+02	3.92E+02	4.24E+02	N	4.58E+02	4.24E+02	mg/kg	95UCL	(2)
		Cadmium	7440-43-9	mg/kg	8 / 8	0	1.84E-01	2.34E-01	2.59E-01	N	2.71E-01	2.59E-01	mg/kg	95UCL	(2)
		Chromium	7440-47-3	mg/kg	8 / 8	0	1.58E+02	2.36E+02	2.90E+02	N	4.00E+02	2.90E+02	mg/kg	95UCL	(2)
		Cobalt	7440-48-4	mg/kg	8 / 8	0	1.27E+01	1.55E+01	1.74E+01	N	1.88E+01	1.74E+01	mg/kg	95UCL	(2)
		Copper	7440-50-8	mg/kg	8 / 8	0	1.20E+01	3.11E+01	4.11E+01	N	5.28E+01	4.11E+01	mg/kg	95UCL	(2)
		Iron	7439-89-6	mg/kg	8 / 8	0	2.21E+04	3.34E+04	3.94E+04	N	4.65E+04	3.94E+04	mg/kg	95UCL	(2)
		Lead	7439-92-1	mg/kg	8 / 8	0	1.57E+01	2.14E+01	2.47E+01	N	2.98E+01	2.47E+01	mg/kg	95UCL	(2)
		Manganese	7439-96-5	mg/kg	8 / 8	0	4.28E+02	4.95E+02	5.35E+02	N	5.79E+02	5.35E+02	mg/kg	95UCL	(2)
		Mercury	7439-97-6	mg/kg	8 / 8	0	8.08E-02	1.61E-01	2.18E-01	N	2.86E-01	2.18E-01	mg/kg	95UCL	(2)
		Molybdenum	7439-98-7	mg/kg	8 / 8	0	3.81E-01	7.38E-01	9.47E-01	N	1.17E+00	9.47E-01	mg/kg	95UCL	(2)
		Nickel	7440-02-0	mg/kg	8 / 8	0	5.96E+01	7.41E+01	8.53E+01	N	9.75E+01	8.53E+01	mg/kg	95UCL	(19)
		Selenium	7782-49-2	mg/kg	3 / 8	0	3.05E-01	3.94E-01	3.39E-01	NP	4.71E-01	3.39E-01	mg/kg	95UCL	(12)
		Silver	7440-22-4	mg/kg	7 / 8	0	7.32E-02	2.09E-01	2.81E-01	NP	3.97E-01	2.81E-01	mg/kg	95UCL	(12)
		Vanadium	7440-62-2	mg/kg	8 / 8	0	8.14E+01	1.15E+02	1.38E+02	N	1.62E+02	1.38E+02	mg/kg	95UCL	(2)
		Zinc	7440-66-6	mg/kg	8 / 8	0	4.70E+01	9.05E+01	1.09E+02	N	1.27E+02	1.09E+02	mg/kg	95UCL	(2)
		Pesticides													
		4,4'-DDD	72-54-8	mg/kg	6 / 8	0	2.10E-04	6.03E-04	7.43E-04	NP	1.03E-03	7.43E-04	mg/kg	95UCL	(12)
		4,4'-DDE	72-55-9	mg/kg	8 / 8	0	2.00E-04	5.89E-04	8.73E-04	N	1.19E-03	8.73E-04	mg/kg	95UCL	(2)
		4,4'-DDT	50-29-3	mg/kg	3 / 8	0	1.20E-04	3.23E-04	2.93E-04	NP	5.30E-04	2.93E-04	mg/kg	95UCL	(12)
		alpha-Chlordane	5103-71-9	mg/kg	3 / 8	0	1.10E-04	1.37E-04	1.18E-04	NP	1.50E-04	1.18E-04	mg/kg	95UCL	(12)
		gamma-Chlordane	5566-34-7	mg/kg	1 / 1	7	2.00E-05	2.00E-05	N/A	--	2.00E-05	2.00E-05	mg/kg	Max	(1)
		PAHs													
		2-Methylnaphthalene	91-57-6	mg/kg	8 / 8	0	1.59E-03	3.59E-03	4.89E-03	N	6.39E-03	4.89E-03	mg/kg	95UCL	(2)
		Acenaphthene	83-32-9	mg/kg	8 / 8	0	6.80E-04	2.77E-03	4.38E-03	N	6.24E-03	4.38E-03	mg/kg	95UCL	(2)
		Acenaphthylene	208-96-8	mg/kg	8 / 8	0	1.09E-03	4.57E-03	6.57E-03	N	8.54E-03	6.57E-03	mg/kg	95UCL	(2)
		Anthracene	120-12-7	mg/kg	8 / 8	0	2.91E-03	2.05E-02	3.19E-02	N	4.32E-02	3.19E-02	mg/kg	95UCL	(2)
		Fluorene	86-73-7	mg/kg	8 / 8	0	1.29E-03	4.32E-03	6.36E-03	N	8.61E-03	6.36E-03	mg/kg	95UCL	(2)
		Naphthalene	91-20-3	mg/kg	6 / 8	0	4.63E-03	1.01E-02	1.18E-02	NP	1.60E-02	1.18E-02	mg/kg	95UCL	(12)
		Phenanthrene	85-01-8	mg/kg	8 / 8	0	1.18E-02	5.77E-02	8.86E-02	N	1.33E-01	8.86E-02	mg/kg	95UCL	(2)
		Benzo(a)anthracene	56-55-3	mg/kg	8 / 8	0	1.09E-02	6.12E-02	9.32E-02	N	1.28E-01	9.32E-02	mg/kg	95UCL	(2)
		Benzo(a)pyrene	50-32-8	mg/kg	8 / 8	0	2.16E-02	9.64E-02	1.43E-01	N	1.97E-01	1.43E-01	mg/kg	95UCL	(2)
		Benzo(b)fluoranthene	205-99-2	mg/kg	8 / 8	0	1.36E-02	5.90E-02	8.84E-02	N	1.18E-01	8.84E-02	mg/kg	95UCL	(2)
		Benzo(g,h,i)perylene	191-24-2	mg/kg	8 / 8	0	2.11E-02	8.35E-02	1.24E-01	N	1.66E-01	1.24E-01	mg/kg	95UCL	(2)
		Benzo(k)fluoranthene	207-08-9	mg/kg	8 / 8	0	1.56E-02	6.30E-02	9.31E-02	N	1.29E-01	9.31E-02	mg/kg	95UCL	(2)
		Chrysene	218-01-9	mg/kg	8 / 8	0	1.64E-02	7.47E-02	1.13E-01	N	1.56E-01	1.13E-01	mg/kg	95UCL	(2)
		Dibenz(a,h)anthracene	53-70-3	mg/kg	8 / 8	0	1.49E-03	8.09E-03	1.22E-02	N	1.56E-02	1.22E-02	mg/kg	95UCL	(2)
		Fluoranthene	206-44-0	mg/kg	8 / 8	0	3.71E-02	1.35E-01	1.99E-01	N	2.76E-01	1.99E-01	mg/kg	95UCL	(2)
		Indeno(1,2,3-cd)pyrene	193-39-5	mg/kg	8 / 8	0	1.72E-02	7.45E-02	1.12E-01	N	1.50E-01	1.12E-01	mg/kg	95UCL	(2)
		Pyrene	129-00-0	mg/kg	8 / 8	0	4.64E-02	1.79E-01	2.62E-01	N	3.59E-01	2.62E-01	mg/kg	95UCL	(2)
		Butyltins													
		Dibutyltin	1002-53-5	mg/kg	3 / 8	0	3.80E-03	4.66E-03	3.91E-03	NP	5.36E-03	3.91E-03	mg/kg	95UCL	(12)
		Tributyltin	688-73-3	mg/kg	3 / 8	0	4.52E-03	5.87E-03	4.79E-03	NP	6.82E-03	4.79E-03	mg/kg	95UCL	(12)
		PCBs													
		Total PCB Congeners	1336-36-3	mg/kg	8 / 8	0	1.25E-02	2.32E-02	2.82E-02	N	3.31E-02	2.82E-02	mg/kg	95UCL	(2)
		Total TEQ – PCB DLC	--	mg/kg	8 / 8	0	4.51E-06	6.09E-06	7.52E-06	N	9.04E-06	7.52E-06	mg/kg	95UCL	(19)

TABLE A-1
Exposure Point Concentration Summary for Sediment
Appendix A - Updated Human Health Risk Assessment for Chemical Exposures

Scenario Timeframe:	Current and Future
Medium:	Sediment
Exposure Medium:	Sediment

Exposure Point	Area	Chemical of Potential Concern	CAS Number	Units	Detection Frequency	Number of High Censored Results (a)	Minimum Concentration	Arithmetic Mean (b)	95 UCL Distribution (c)		Maximum Detected Concentration	Exposure Point Concentration			
												Value	Units	Statistic (d)	Method (e)
	India Basin Area I	**Metals**													
		Aluminum	7429-90-5	mg/kg	6 / 6	0	6.35E+04	6.92E+04	7.21E+04	N	7.25E+04	7.21E+04	mg/kg	95UCL	(2)
		Antimony	7440-36-0	mg/kg	6 / 6	0	7.00E-01	9.09E-01	1.08E+00	N	1.24E+00	1.08E+00	mg/kg	95UCL	(2)
		Arsenic	7440-38-2	mg/kg	6 / 6	0	9.69E+00	1.05E+01	1.10E+01	N	1.14E+01	1.10E+01	mg/kg	95UCL	(2)
		Barium	7440-39-3	mg/kg	6 / 6	0	4.38E+02	4.69E+02	4.96E+02	N	5.33E+02	4.96E+02	mg/kg	95UCL	(2)
		Cadmium	7440-43-9	mg/kg	6 / 6	0	2.00E-01	2.25E-01	2.45E-01	N	2.64E-01	2.45E-01	mg/kg	95UCL	(2)
		Chromium	7440-47-3	mg/kg	6 / 6	0	1.56E+02	2.06E+02	2.66E+02	N	3.19E+02	2.66E+02	mg/kg	95UCL	(19)
		Cobalt	7440-48-4	mg/kg	6 / 6	0	1.53E+01	1.68E+01	1.87E+01	N	2.14E+01	1.87E+01	mg/kg	95UCL	(2)
		Copper	7440-50-8	mg/kg	6 / 6	0	4.00E+01	5.89E+01	8.35E+01	N	1.17E+02	8.35E+01	mg/kg	95UCL	(2)
		Iron	7439-89-6	mg/kg	6 / 6	0	3.98E+04	4.18E+04	4.30E+04	N	4.37E+04	4.30E+04	mg/kg	95UCL	(2)
		Lead	7439-92-1	mg/kg	6 / 6	0	2.16E+01	4.11E+01	1.15E+02	NP	1.26E+02	1.15E+02	mg/kg	95UCL	(4)
		Manganese	7439-96-5	mg/kg	6 / 6	0	4.11E+02	4.28E+02	4.40E+02	N	4.50E+02	4.40E+02	mg/kg	95UCL	(2)
		Mercury	7439-97-6	mg/kg	6 / 6	0	2.41E-01	3.12E-01	3.62E-01	N	4.07E-01	3.62E-01	mg/kg	95UCL	(2)
		Molybdenum	7439-98-7	mg/kg	6 / 6	0	7.63E-01	1.03E+00	1.29E+00	N	1.63E+00	1.29E+00	mg/kg	95UCL	(2)
		Nickel	7440-02-0	mg/kg	6 / 6	0	8.36E+01	1.26E+02	1.79E+02	N	2.32E+02	1.79E+02	mg/kg	95UCL	(19)
		Selenium	7782-49-2	mg/kg	6 / 6	0	2.73E-01	3.37E-01	3.87E-01	N	4.30E-01	3.87E-01	mg/kg	95UCL	(2)
		Silver	7440-22-4	mg/kg	6 / 6	0	2.53E-01	2.79E-01	3.00E-01	N	3.21E-01	3.00E-01	mg/kg	95UCL	(2)
		Vanadium	7440-62-2	mg/kg	6 / 6	0	1.21E+02	1.36E+02	1.43E+02	--	1.41E+02	1.41E+02	mg/kg	Max	(1)
		Zinc	7440-66-6	mg/kg	6 / 6	0	1.11E+02	1.22E+02	1.30E+02	N	1.36E+02	1.30E+02	mg/kg	95UCL	(2)
		Pesticides													
		4,4'-DDD	72-54-8	mg/kg	6 / 6	0	6.60E-04	1.19E-03	1.55E-03	N	1.92E-03	1.55E-03	mg/kg	95UCL	(2)
		4,4'-DDE	72-55-9	mg/kg	6 / 6	0	8.90E-04	1.27E-03	1.54E-03	N	1.84E-03	1.54E-03	mg/kg	95UCL	(2)
		4,4'-DDT	50-29-3	mg/kg	5 / 6	0	2.80E-04	5.56E-04	7.12E-04	NP	8.30E-04	7.12E-04	mg/kg	95UCL	(12)
		alpha-Chlordane	5103-71-9	mg/kg	6 / 6	0	7.00E-05	1.82E-04	3.23E-04	N	5.00E-04	3.23E-04	mg/kg	95UCL	(2)
		gamma-Chlordane	5566-34-7	mg/kg	1 / 6	0	1.40E-04	1.40E-04	N/A	--	1.40E-04	1.40E-04	mg/kg	Max	(1)
		PAHs													
		2-Methylnaphthalene	91-57-6	mg/kg	6 / 6	0	6.17E-03	8.00E-03	1.02E-02	N	1.30E-02	1.02E-02	mg/kg	95UCL	(2)
		Acenaphthene	83-32-9	mg/kg	6 / 6	0	4.92E-03	7.68E-03	9.72E-03	N	1.18E-02	9.72E-03	mg/kg	95UCL	(2)
		Acenaphthylene	208-96-8	mg/kg	6 / 6	0	7.36E-03	1.03E-02	1.22E-02	N	1.32E-02	1.22E-02	mg/kg	95UCL	(2)
		Anthracene	120-12-7	mg/kg	6 / 6	0	3.45E-02	7.79E-02	2.10E-01	NP	2.28E-01	2.10E-01	mg/kg	95UCL	(4)
		Fluorene	86-73-7	mg/kg	6 / 6	0	8.45E-03	1.46E-02	2.95E-02	G	3.27E-02	2.95E-02	mg/kg	95UCL	(11)
		Naphthalene	91-20-3	mg/kg	6 / 6	0	1.22E-02	1.42E-02	1.65E-02	N	1.93E-02	1.65E-02	mg/kg	95UCL	(2)
		Phenanthrene	85-01-8	mg/kg	6 / 6	0	7.88E-02	1.11E-01	1.37E-01	N	1.67E-01	1.37E-01	mg/kg	95UCL	(2)
		Benzo(a)anthracene	56-55-3	mg/kg	6 / 6	0	9.78E-02	1.34E-01	1.78E-01	N	2.36E-01	1.78E-01	mg/kg	95UCL	(2)
		Benzo(a)pyrene	50-32-8	mg/kg	6 / 6	0	1.70E-01	2.04E-01	2.45E-01	N	2.99E-01	2.45E-01	mg/kg	95UCL	(2)
		Benzo(b)fluoranthene	205-99-2	mg/kg	6 / 6	0	1.14E-01	1.52E-01	1.99E-01	N	2.65E-01	1.99E-01	mg/kg	95UCL	(2)
		Benzo(g,h,i)perylene	191-24-2	mg/kg	6 / 6	0	1.50E-01	1.70E-01	1.93E-01	N	2.21E-01	1.93E-01	mg/kg	95UCL	(2)
		Benzo(k)fluoranthene	207-08-9	mg/kg	6 / 6	0	1.05E-01	1.44E-01	1.91E-01	N	2.55E-01	1.91E-01	mg/kg	95UCL	(2)
		Chrysene	218-01-9	mg/kg	6 / 6	0	1.26E-01	1.87E-01	2.66E-01	N	3.75E-01	2.66E-01	mg/kg	95UCL	(2)
		Dibenz(a,h)anthracene	53-70-3	mg/kg	6 / 6	0	1.67E-02	2.41E-02	3.27E-02	N	4.28E-02	3.27E-02	mg/kg	95UCL	(2)
		Fluoranthene	206-44-0	mg/kg	6 / 6	0	2.18E-01	2.72E-01	3.34E-01	N	4.19E-01	3.34E-01	mg/kg	95UCL	(2)
		Indeno(1,2,3-cd)pyrene	193-39-5	mg/kg	6 / 6	0	1.36E-01	1.60E-01	1.88E-01	N	2.24E-01	1.88E-01	mg/kg	95UCL	(2)
		Pyrene	129-00-0	mg/kg	6 / 6	0	2.89E-01	3.32E-01	3.78E-01	N	4.37E-01	3.78E-01	mg/kg	95UCL	(2)
		Butyltins													
		Dibutyltin	1002-53-5	mg/kg	1 / 6	0	1.09E-02	1.09E-02	N/A	--	1.09E-02	1.09E-02	mg/kg	Max	(1)
		Tributyltin	688-73-3	mg/kg	1 / 6	0	1.77E-02	1.77E-02	N/A	--	1.77E-02	1.77E-02	mg/kg	Max	(1)
		PCBs													
		Total PCB Congeners	1336-36-3	mg/kg	6 / 6	0	1.32E-02	3.87E-02	1.01E-01	--	8.98E-02	8.98E-02	mg/kg	Max	(1)
		Total TEQ – PCB DLC	--	mg/kg	6 / 6	0	7.53E-06	7.96E-06	8.28E-06	N	8.57E-06	8.28E-06	mg/kg	95UCL	(2)

TABLE A-1
Exposure Point Concentration Summary for Sediment
Appendix A - Updated Human Health Risk Assessment for Chemical Exposures

Scenario Timeframe:	Current and Future
Medium:	Sediment
Exposure Medium:	Sediment

Exposure Point	Area	Chemical of Potential Concern	CAS Number	Units	Detection Frequency	Number of High Censored Results (a)	Minimum Concentration	Arithmetic Mean (b)	95 UCL Distribution (c)		Maximum Detected Concentration	Exposure Point Concentration			
												Value	Units	Statistic (d)	Method (e)
	Oil Reclamation Area	**Metals**													
		Aluminum	7429-90-5	mg/kg	6 / 6	0	5.20E+04	6.48E+04	7.17E+04	N	7.30E+04	7.17E+04	mg/kg	95UCL	(2)
		Antimony	7440-36-0	mg/kg	6 / 6	0	5.87E-01	2.02E+00	2.76E+00	N	3.17E+00	2.76E+00	mg/kg	95UCL	(2)
		Arsenic	7440-38-2	mg/kg	6 / 6	0	8.90E+00	1.13E+01	1.27E+01	N	1.36E+01	1.27E+01	mg/kg	95UCL	(2)
		Barium	7440-39-3	mg/kg	6 / 6	0	2.93E+02	3.92E+02	4.42E+02	N	4.58E+02	4.42E+02	mg/kg	95UCL	(2)
		Cadmium	7440-43-9	mg/kg	6 / 6	0	2.23E-01	3.34E-01	3.87E-01	N	3.99E-01	3.87E-01	mg/kg	95UCL	(2)
		Chromium	7440-47-3	mg/kg	6 / 6	0	1.67E+02	3.20E+02	4.29E+02	N	4.64E+02	4.29E+02	mg/kg	95UCL	(2)
		Cobalt	7440-48-4	mg/kg	6 / 6	0	1.75E+01	1.93E+01	2.08E+01	N	2.26E+01	2.08E+01	mg/kg	95UCL	(2)
		Copper	7440-50-8	mg/kg	6 / 6	0	5.51E+01	6.94E+01	8.43E+01	N	9.75E+01	8.43E+01	mg/kg	95UCL	(2)
		Iron	7439-89-6	mg/kg	6 / 6	0	4.12E+04	4.49E+04	4.73E+04	N	4.87E+04	4.73E+04	mg/kg	95UCL	(2)
		Lead	7439-92-1	mg/kg	6 / 6	0	1.19E+01	4.05E+01	5.45E+01	N	6.01E+01	5.45E+01	mg/kg	95UCL	(2)
		Manganese	7439-96-5	mg/kg	6 / 6	0	3.86E+02	4.95E+02	5.71E+02	N	6.24E+02	5.71E+02	mg/kg	95UCL	(2)
		Mercury	7439-97-6	mg/kg	6 / 6	0	3.03E-01	4.32E-01	5.18E-01	N	6.02E-01	5.18E-01	mg/kg	95UCL	(2)
		Molybdenum	7439-98-7	mg/kg	6 / 6	0	8.30E-01	1.35E+00	1.63E+00	N	1.71E+00	1.63E+00	mg/kg	95UCL	(2)
		Nickel	7440-02-0	mg/kg	6 / 6	0	9.49E+01	1.15E+02	1.35E+02	N	1.60E+02	1.35E+02	mg/kg	95UCL	(2)
		Selenium	7782-49-2	mg/kg	6 / 6	0	2.33E-01	3.21E-01	3.78E-01	N	4.06E-01	3.78E-01	mg/kg	95UCL	(2)
		Silver	7440-22-4	mg/kg	6 / 6	0	1.20E-01	3.25E-01	4.28E-01	N	4.35E-01	4.28E-01	mg/kg	95UCL	(2)
		Vanadium	7440-62-2	mg/kg	6 / 6	0	1.34E+02	1.52E+02	1.63E+02	N	1.71E+02	1.63E+02	mg/kg	95UCL	(2)
		Zinc	7440-66-6	mg/kg	6 / 6	0	1.14E+02	1.43E+02	1.62E+02	N	1.79E+02	1.62E+02	mg/kg	95UCL	(2)
		Pesticides													
		4,4'-DDD	72-54-8	mg/kg	6 / 6	0	9.10E-04	1.89E-03	2.66E-03	N	3.08E-03	2.66E-03	mg/kg	95UCL	(2)
		4,4'-DDE	72-55-9	mg/kg	6 / 6	0	3.30E-04	9.82E-04	1.31E-03	N	1.50E-03	1.31E-03	mg/kg	95UCL	(2)
		4,4'-DDT	50-29-3	mg/kg	5 / 6	0	1.20E-04	4.62E-04	6.58E-04	NP	7.80E-04	6.58E-04	mg/kg	95UCL	(12)
		alpha-Chlordane	5103-71-9	mg/kg	6 / 6	0	1.40E-04	2.70E-04	3.62E-04	N	4.10E-04	3.62E-04	mg/kg	95UCL	(2)
		Dieldrin	60-57-1	mg/kg	1 / 6	0	4.40E-04	4.40E-04	N/A	--	4.40E-04	4.40E-04	mg/kg	Max	(1)
		gamma-Chlordane	5566-34-7	mg/kg	5 / 6	0	8.00E-05	2.70E-04	3.80E-04	NP	4.20E-04	3.80E-04	mg/kg	95UCL	(12)
		PAHs													
		2-Methylnaphthalene	91-57-6	mg/kg	6 / 6	0	5.23E-03	7.32E-03	8.65E-03	N	9.85E-03	8.65E-03	mg/kg	95UCL	(2)
		Acenaphthene	83-32-9	mg/kg	6 / 6	0	2.13E-03	4.06E-03	5.76E-03	N	7.62E-03	5.76E-03	mg/kg	95UCL	(2)
		Acenaphthylene	208-96-8	mg/kg	6 / 6	0	4.71E-03	7.28E-03	9.07E-03	N	1.02E-02	9.07E-03	mg/kg	95UCL	(2)
		Anthracene	120-12-7	mg/kg	6 / 6	0	1.14E-02	2.81E-02	4.24E-02	N	6.09E-02	4.24E-02	mg/kg	95UCL	(2)
		Fluorene	86-73-7	mg/kg	6 / 6	0	3.27E-03	6.65E-03	8.93E-03	N	1.13E-02	8.93E-03	mg/kg	95UCL	(2)
		Naphthalene	91-20-3	mg/kg	6 / 6	0	1.04E-02	1.34E-02	1.52E-02	N	1.59E-02	1.52E-02	mg/kg	95UCL	(2)
		Phenanthrene	85-01-8	mg/kg	6 / 6	0	4.04E-02	7.54E-02	1.03E-01	N	1.35E-01	1.03E-01	mg/kg	95UCL	(2)
		Benzo(a)anthracene	56-55-3	mg/kg	6 / 6	0	5.13E-02	9.10E-02	1.20E-01	N	1.51E-01	1.20E-01	mg/kg	95UCL	(2)
		Benzo(a)pyrene	50-32-8	mg/kg	6 / 6	0	1.09E-01	1.58E-01	1.96E-01	N	2.04E-01	1.96E-01	mg/kg	95UCL	(2)
		Benzo(b)fluoranthene	205-99-2	mg/kg	6 / 6	0	6.83E-02	1.07E-01	1.34E-01	N	1.49E-01	1.34E-01	mg/kg	95UCL	(2)
		Benzo(g,h,i)perylene	191-24-2	mg/kg	6 / 6	0	1.13E-01	1.50E-01	1.80E-01	N	1.93E-01	1.80E-01	mg/kg	95UCL	(2)
		Benzo(k)fluoranthene	207-08-9	mg/kg	6 / 6	0	7.30E-02	1.12E-01	1.41E-01	N	1.69E-01	1.41E-01	mg/kg	95UCL	(2)
		Chrysene	218-01-9	mg/kg	6 / 6	0	7.07E-02	1.39E-01	1.95E-01	N	2.62E-01	1.95E-01	mg/kg	95UCL	(2)
		Dibenz(a,h)anthracene	53-70-3	mg/kg	6 / 6	0	8.82E-03	1.61E-02	2.10E-02	N	2.48E-02	2.10E-02	mg/kg	95UCL	(2)
		Fluoranthene	206-44-0	mg/kg	6 / 6	0	1.32E-01	1.89E-01	2.39E-01	N	2.91E-01	2.39E-01	mg/kg	95UCL	(2)
		Indeno(1,2,3-cd)pyrene	193-39-5	mg/kg	6 / 6	0	8.99E-02	1.30E-01	1.63E-01	N	1.81E-01	1.63E-01	mg/kg	95UCL	(2)
		Pyrene	129-00-0	mg/kg	6 / 6	0	1.71E-01	2.41E-01	2.99E-01	N	3.28E-01	2.99E-01	mg/kg	95UCL	(2)
		Butyltins													
		Monobutyltin	78763-54-9	mg/kg	1 / 6	0	2.69E-03	2.69E-03	N/A	--	2.69E-03	2.69E-03	mg/kg	Max	(1)
		Dibutyltin	1002-53-5	mg/kg	6 / 6	0	2.69E-03	1.03E-02	1.61E-02	N	2.08E-02	1.61E-02	mg/kg	95UCL	(2)
		Tributyltin	688-73-3	mg/kg	6 / 6	0	3.30E-03	2.16E-02	4.07E-02	N	6.59E-02	4.07E-02	mg/kg	95UCL	(2)
		PCBs													
		Total PCB Congeners	1336-36-3	mg/kg	6 / 6	0	8.78E-02	2.27E-01	3.39E-01	N	4.25E-01	3.39E-01	mg/kg	95UCL	(2)
		Total TEQ – PCB DLC	--	mg/kg	6 / 6	0	6.09E-06	7.63E-06	8.49E-06	N	8.59E-06	8.49E-06	mg/kg	95UCL	(2)

TABLE A-1
Exposure Point Concentration Summary for Sediment
Appendix A - Updated Human Health Risk Assessment for Chemical Exposures

Scenario Timeframe:	Current and Future
Medium:	Sediment
Exposure Medium:	Sediment

Exposure Point	Area	Chemical of Potential Concern	CAS Number	Units	Detection Frequency	Number of High Censored Results (a)	Minimum Concentration	Arithmetic Mean (b)	95 UCL Distribution (c)		Maximum Detected Concentration	Exposure Point Concentration Value	Units	Statistic (d)	Method (e)
	Point Avisadero Area	**Metals**													
		Aluminum	7429-90-5	mg/kg	19 / 19	0	5.91E+04	6.69E+04	6.85E+04	N	7.20E+04	6.85E+04	mg/kg	95UCL	(2)
		Antimony	7440-36-0	mg/kg	19 / 19	0	5.54E-01	1.78E+00	5.44E+00	NP	1.68E+01	5.44E+00	mg/kg	95UCL	(4)
		Arsenic	7440-38-2	mg/kg	19 / 19	0	8.74E+00	1.17E+01	1.25E+01	N	1.82E+01	1.25E+01	mg/kg	95UCL	(2)
		Barium	7440-39-3	mg/kg	19 / 19	0	4.04E+02	4.63E+02	4.78E+02	N	5.68E+02	4.78E+02	mg/kg	95UCL	(2)
		Cadmium	7440-43-9	mg/kg	19 / 19	0	1.85E-01	2.76E-01	3.23E-01	G	7.60E-01	3.23E-01	mg/kg	95UCL	(11)
		Chromium	7440-47-3	mg/kg	19 / 19	0	1.62E+02	2.26E+02	2.57E+02	N	3.91E+02	2.57E+02	mg/kg	95UCL	(19)
		Cobalt	7440-48-4	mg/kg	19 / 19	0	1.40E+01	1.74E+01	1.81E+01	N	2.16E+01	1.81E+01	mg/kg	95UCL	(2)
		Copper	7440-50-8	mg/kg	19 / 19	0	3.27E+01	1.72E+02	4.25E+02	NP	1.05E+03	4.25E+02	mg/kg	95UCL	(4)
		Iron	7439-89-6	mg/kg	19 / 19	0	3.87E+04	4.12E+04	4.19E+04	N	4.65E+04	4.19E+04	mg/kg	95UCL	(2)
		Lead	7439-92-1	mg/kg	19 / 19	0	1.81E+01	4.38E+01	1.04E+02	NP	2.75E+02	1.04E+02	mg/kg	95UCL	(4)
		Manganese	7439-96-5	mg/kg	19 / 19	0	4.23E+02	4.99E+02	5.17E+02	N	6.15E+02	5.17E+02	mg/kg	95UCL	(2)
		Mercury	7439-97-6	mg/kg	19 / 19	0	1.45E-01	9.04E-01	2.53E+00	NP	7.47E+00	2.53E+00	mg/kg	95UCL	(4)
		Molybdenum	7439-98-7	mg/kg	19 / 19	0	6.11E-01	9.50E-01	1.03E+00	N	1.47E+00	1.03E+00	mg/kg	95UCL	(2)
		Nickel	7440-02-0	mg/kg	19 / 19	0	8.40E+01	1.09E+02	1.30E+02	N	2.50E+02	1.30E+02	mg/kg	95UCL	(19)
		Selenium	7782-49-2	mg/kg	19 / 19	0	2.22E-01	3.70E-01	4.29E-01	N	8.55E-01	4.29E-01	mg/kg	95UCL	(19)
		Silver	7440-22-4	mg/kg	19 / 19	0	1.77E-01	2.74E-01	2.95E-01	N	4.34E-01	2.95E-01	mg/kg	95UCL	(2)
		Vanadium	7440-62-2	mg/kg	19 / 19	0	1.08E+02	1.33E+02	1.38E+02	N	1.57E+02	1.38E+02	mg/kg	95UCL	(2)
		Zinc	7440-66-6	mg/kg	19 / 19	0	9.08E+01	1.25E+02	1.48E+02	N	3.22E+02	1.48E+02	mg/kg	95UCL	(19)
		Pesticides													
		2,4'-DDD	53-19-0	mg/kg	1 / 19	0	8.40E-04	8.40E-04	N/A	--	8.40E-04	8.40E-04	mg/kg	Max	(1)
		4,4'-DDD	72-54-8	mg/kg	19 / 19	0	5.70E-04	1.13E-03	1.27E-03	N	1.74E-03	1.27E-03	mg/kg	95UCL	(2)
		4,4'-DDE	72-55-9	mg/kg	19 / 19	0	4.80E-04	1.07E-03	1.20E-03	N	1.54E-03	1.20E-03	mg/kg	95UCL	(2)
		4,4'-DDT	50-29-3	mg/kg	11 / 19	0	1.40E-04	3.93E-04	3.55E-04	NP	8.40E-04	3.55E-04	mg/kg	95UCL	(12)
		alpha-Chlordane	5103-71-9	mg/kg	13 / 19	0	3.00E-05	1.49E-04	1.49E-04	LN	3.70E-04	1.49E-04	mg/kg	95UCL	(16)
		PAHs													
		2-Methylnaphthalene	91-57-6	mg/kg	19 / 19	0	4.13E-03	1.02E-02	1.21E-02	N	2.04E-02	1.21E-02	mg/kg	95UCL	(2)
		Acenaphthene	83-32-9	mg/kg	19 / 19	0	4.44E-03	2.95E-02	4.52E-02	G	1.82E-01	4.52E-02	mg/kg	95UCL	(11)
		Acenaphthylene	208-96-8	mg/kg	19 / 19	0	6.98E-03	2.23E-02	3.12E-02	LN	5.81E-02	3.12E-02	mg/kg	95UCL	(3)
		Anthracene	120-12-7	mg/kg	19 / 19	0	3.63E-02	1.32E-01	1.79E-01	G	4.89E-01	1.79E-01	mg/kg	95UCL	(11)
		Fluorene	86-73-7	mg/kg	19 / 19	0	8.20E-03	3.09E-02	3.98E-02	N	9.24E-02	3.98E-02	mg/kg	95UCL	(2)
		Naphthalene	91-20-3	mg/kg	19 / 19	0	7.72E-03	2.11E-02	2.51E-02	N	4.57E-02	2.51E-02	mg/kg	95UCL	(2)
		Phenanthrene	85-01-8	mg/kg	19 / 19	0	7.28E-02	3.25E-01	4.11E-01	N	7.63E-01	4.11E-01	mg/kg	95UCL	(2)
		Benzo(a)anthracene	56-55-3	mg/kg	19 / 19	0	8.13E-02	3.00E-01	3.64E-01	N	6.01E-01	3.64E-01	mg/kg	95UCL	(2)
		Benzo(a)pyrene	50-32-8	mg/kg	19 / 19	0	1.24E-01	4.03E-01	4.82E-01	N	7.54E-01	4.82E-01	mg/kg	95UCL	(2)
		Benzo(b)fluoranthene	205-99-2	mg/kg	19 / 19	0	8.58E-02	2.73E-01	3.26E-01	N	5.50E-01	3.26E-01	mg/kg	95UCL	(2)
		Benzo(g,h,i)perylene	191-24-2	mg/kg	19 / 19	0	1.07E-01	3.01E-01	3.58E-01	N	5.52E-01	3.58E-01	mg/kg	95UCL	(2)
		Benzo(k)fluoranthene	207-08-9	mg/kg	19 / 19	0	8.34E-02	2.75E-01	3.28E-01	N	5.46E-01	3.28E-01	mg/kg	95UCL	(2)
		Chrysene	218-01-9	mg/kg	19 / 19	0	1.04E-01	3.51E-01	4.24E-01	N	7.15E-01	4.24E-01	mg/kg	95UCL	(2)
		Dibenz(a,h)anthracene	53-70-3	mg/kg	19 / 19	0	1.22E-02	4.71E-02	5.72E-02	N	9.48E-02	5.72E-02	mg/kg	95UCL	(2)
		Fluoranthene	206-44-0	mg/kg	19 / 19	0	1.86E-01	6.27E-01	7.50E-01	N	1.21E+00	7.50E-01	mg/kg	95UCL	(2)
		Indeno(1,2,3-cd)pyrene	193-39-5	mg/kg	19 / 19	0	9.98E-02	2.96E-01	3.52E-01	N	5.36E-01	3.52E-01	mg/kg	95UCL	(2)
		Pyrene	129-00-0	mg/kg	19 / 19	0	2.25E-01	7.39E-01	8.90E-01	N	1.47E+00	8.90E-01	mg/kg	95UCL	(2)
		Butyltins													
		Dibutyltin	1002-53-5	mg/kg	11 / 19	0	1.30E-02	2.86E-02	2.40E-02	NP	5.74E-02	2.40E-02	mg/kg	95UCL	(12)
		Tributyltin	688-73-3	mg/kg	12 / 19	0	1.47E-02	9.11E-02	8.24E-02	NP	2.08E-01	8.24E-02	mg/kg	95UCL	(12)
		PCBs													
		Total PCB Congeners	1336-36-3	mg/kg	19 / 19	0	1.20E-02	3.23E-01	1.70E+00	NP	2.46E+00	1.70E+00	mg/kg	95UCL	(4)
		Total TEQ – PCB DLC	1336-36-3	mg/kg	19 / 19	0	6.52E-06	7.19E-06	7.43E-06	N	8.52E-06	7.43E-06	mg/kg	95UCL	(2)

TABLE A-1
Exposure Point Concentration Summary for Sediment
Appendix A - Updated Human Health Risk Assessment for Chemical Exposures

Scenario Timeframe:	Current and Future
Medium:	Sediment
Exposure Medium:	Sediment

Exposure Point	Area	Chemical of Potential Concern	CAS Number	Units	Detection Frequency	Number of High Censored Results (a)	Minimum Concentration	Arithmetic Mean (b)	95 UCL Distribution (c)		Maximum Detected Concentration	Exposure Point Concentration			
												Value	Units	Statistic (d)	Method (e)
	South Basin Area X	**Metals**													
		Aluminum	7429-90-5	mg/kg	23 / 23	0	3.91E+04	6.44E+04	6.82E+04	N	7.41E+04	6.82E+04	mg/kg	95UCL	(2)
		Antimony	7440-36-0	mg/kg	23 / 23	0	4.85E-01	3.16E+00	4.28E+00	G	1.06E+01	4.28E+00	mg/kg	95UCL	(11)
		Arsenic	7440-38-2	mg/kg	23 / 23	0	5.86E+00	1.07E+01	1.14E+01	N	1.43E+01	1.14E+01	mg/kg	95UCL	(2)
		Barium	7440-39-3	mg/kg	23 / 23	0	4.00E+02	5.12E+02	5.57E+02	N	8.93E+02	5.57E+02	mg/kg	95UCL	(19)
		Cadmium	7440-43-9	mg/kg	23 / 23	0	2.19E-01	4.55E-01	5.15E-01	N	8.45E-01	5.15E-01	mg/kg	95UCL	(2)
		Chromium	7440-47-3	mg/kg	23 / 23	0	1.67E+02	2.28E+02	2.52E+02	N	4.51E+02	2.52E+02	mg/kg	95UCL	(19)
		Cobalt	7440-48-4	mg/kg	23 / 23	0	1.05E+01	1.69E+01	1.80E+01	N	2.19E+01	1.80E+01	mg/kg	95UCL	(2)
		Copper	7440-50-8	mg/kg	23 / 23	0	6.61E+01	1.21E+02	1.49E+02	N	3.19E+02	1.49E+02	mg/kg	95UCL	(19)
		Iron	7439-89-6	mg/kg	23 / 23	0	1.57E+04	4.02E+04	4.34E+04	N	4.78E+04	4.34E+04	mg/kg	95UCL	(2)
		Lead	7439-92-1	mg/kg	23 / 23	0	1.10E+01	8.52E+01	9.80E+01	N	1.42E+02	9.80E+01	mg/kg	95UCL	(2)
		Manganese	7439-96-5	mg/kg	23 / 23	0	2.71E+02	4.32E+02	4.53E+02	N	5.80E+02	4.53E+02	mg/kg	95UCL	(2)
		Mercury	7439-97-6	mg/kg	23 / 23	0	2.32E-01	7.07E-01	8.21E-01	N	1.47E+00	8.21E-01	mg/kg	95UCL	(2)
		Molybdenum	7439-98-7	mg/kg	23 / 23	0	7.04E-01	1.14E+00	1.23E+00	N	1.83E+00	1.23E+00	mg/kg	95UCL	(2)
		Nickel	7440-02-0	mg/kg	23 / 23	0	7.25E+01	1.13E+02	1.24E+02	N	1.99E+02	1.24E+02	mg/kg	95UCL	(19)
		Selenium	7782-49-2	mg/kg	22 / 23	0	1.51E-01	3.34E-01	3.59E-01	NP	4.57E-01	3.59E-01	mg/kg	95UCL	(12)
		Silver	7440-22-4	mg/kg	23 / 23	0	1.39E-01	5.80E-01	1.04E+00	NP	2.80E+00	1.04E+00	mg/kg	95UCL	(4)
		Vanadium	7440-62-2	mg/kg	23 / 23	0	5.09E+01	1.32E+02	1.42E+02	N	1.72E+02	1.42E+02	mg/kg	95UCL	(2)
		Zinc	7440-66-6	mg/kg	23 / 23	0	1.64E+02	2.02E+02	2.13E+02	N	2.97E+02	2.13E+02	mg/kg	95UCL	(2)
		Pesticides													
		2,4'-DDD	53-19-0	mg/kg	1 / 16	6	1.20E-04	1.20E-04	N/A	--	1.20E-04	1.20E-04	mg/kg	Max	(1)
		4,4'-DDD	72-54-8	mg/kg	23 / 23	0	9.70E-04	8.16E-03	1.81E-02	NP	4.36E-02	1.81E-02	mg/kg	95UCL	(4)
		4,4'-DDE	72-55-9	mg/kg	21 / 22	0	1.06E-03	6.10E-03	7.39E-03	NP	1.84E-02	7.39E-03	mg/kg	95UCL	(12)
		4,4'-DDT	50-29-3	mg/kg	20 / 23	0	2.60E-04	1.13E-03	3.59E-03	G	3.60E-03	3.59E-03	mg/kg	95UCL	(11)
		alpha-Chlordane	5103-71-9	mg/kg	23 / 23	0	2.00E-04	1.43E-03	2.12E-03	LN	5.47E-03	2.12E-03	mg/kg	95UCL	(3)
		Dieldrin	60-57-1	mg/kg	15 / 22	0	7.50E-04	2.47E-03	7.18E-03	G	1.04E-02	7.18E-03	mg/kg	95UCL	(11)
		gamma-Chlordane	5566-34-7	mg/kg	23 / 23	0	1.70E-04	2.27E-03	3.33E-03	G	1.05E-02	3.33E-03	mg/kg	95UCL	(11)
		Heptachlor	76-44-8	mg/kg	1 / 22	0	2.13E-03	2.13E-03	N/A	--	2.13E-03	2.13E-03	mg/kg	Max	(1)
		PAHs													
		2-Methylnaphthalene	91-57-6	mg/kg	23 / 23	0	3.70E-03	1.82E-02	2.15E-02	N	4.90E-02	2.15E-02	mg/kg	95UCL	(2)
		Acenaphthene	83-32-9	mg/kg	23 / 23	0	1.08E-03	7.59E-03	9.10E-03	N	2.13E-02	9.10E-03	mg/kg	95UCL	(2)
		Acenaphthylene	208-96-8	mg/kg	23 / 23	0	2.26E-03	1.19E-02	1.99E-02	NP	4.37E-02	1.99E-02	mg/kg	95UCL	(4)
		Anthracene	120-12-7	mg/kg	23 / 23	0	6.99E-03	5.18E-02	1.01E-01	NP	2.34E-01	1.01E-01	mg/kg	95UCL	(4)
		Fluorene	86-73-7	mg/kg	23 / 23	0	2.02E-03	1.47E-02	3.03E-02	NP	8.15E-02	3.03E-02	mg/kg	95UCL	(4)
		Naphthalene	91-20-3	mg/kg	22 / 23	0	8.27E-03	3.07E-02	3.45E-02	NP	5.87E-02	3.45E-02	mg/kg	95UCL	(12)
		Phenanthrene	85-01-8	mg/kg	23 / 23	0	2.20E-02	1.49E-01	2.78E-01	NP	6.68E-01	2.78E-01	mg/kg	95UCL	(4)
		Benzo(a)anthracene	56-55-3	mg/kg	23 / 23	0	2.58E-02	1.81E-01	2.36E-01	G	6.29E-01	2.36E-01	mg/kg	95UCL	(11)
		Benzo(a)pyrene	50-32-8	mg/kg	23 / 23	0	5.32E-02	2.69E-01	3.14E-01	N	6.32E-01	3.14E-01	mg/kg	95UCL	(2)
		Benzo(b)fluoranthene	205-99-2	mg/kg	23 / 23	0	3.47E-02	2.01E-01	2.36E-01	N	4.84E-01	2.36E-01	mg/kg	95UCL	(2)
		Benzo(g,h,i)perylene	191-24-2	mg/kg	23 / 23	0	5.54E-02	2.39E-01	2.69E-01	N	3.84E-01	2.69E-01	mg/kg	95UCL	(2)
		Benzo(k)fluoranthene	207-08-9	mg/kg	23 / 23	0	4.08E-02	2.07E-01	2.44E-01	N	5.00E-01	2.44E-01	mg/kg	95UCL	(2)
		Chrysene	218-01-9	mg/kg	23 / 23	0	3.94E-02	2.45E-01	3.15E-01	G	7.44E-01	3.15E-01	mg/kg	95UCL	(11)
		Dibenz(a,h)anthracene	53-70-3	mg/kg	23 / 23	0	4.03E-03	3.62E-02	4.41E-02	N	1.04E-01	4.41E-02	mg/kg	95UCL	(2)
		Fluoranthene	206-44-0	mg/kg	23 / 23	0	5.97E-02	3.25E-01	3.94E-01	N	9.53E-01	3.94E-01	mg/kg	95UCL	(2)
		Indeno(1,2,3-cd)pyrene	193-39-5	mg/kg	23 / 23	0	4.39E-02	2.17E-01	2.47E-01	N	4.13E-01	2.47E-01	mg/kg	95UCL	(2)
		Pyrene	129-00-0	mg/kg	23 / 23	0	7.98E-02	3.90E-01	4.63E-01	N	1.07E+00	4.63E-01	mg/kg	95UCL	(2)
		Butyltins													
		Monobutyltin	78763-54-9	mg/kg	3 / 22	0	1.17E-03	2.18E-03	1.16E-03	NP	3.30E-03	1.16E-03	mg/kg	95UCL	(12)
		Dibutyltin	1002-53-5	mg/kg	23 / 23	0	2.72E-03	1.63E-02	2.15E-02	G	5.12E-02	2.15E-02	mg/kg	95UCL	(11)
		Tributyltin	688-73-3	mg/kg	23 / 23	0	3.08E-03	2.38E-02	4.85E-02	NP	1.29E-01	4.85E-02	mg/kg	95UCL	(4)
		PCBs													
		Total PCB Congeners	1336-36-3	mg/kg	23 / 23	0	1.13E-01	1.16E+00	1.70E+00	G	5.19E+00	1.70E+00	mg/kg	95UCL	(11)
		Total TEQ – PCB DLC	--	mg/kg	23 / 23	0	4.92E-06	1.21E-05	2.98E-05	NP	1.01E-04	2.98E-05	mg/kg	95UCL	(4)

TABLE A-1
Exposure Point Concentration Summary for Sediment
Appendix A - Updated Human Health Risk Assessment for Chemical Exposures

Scenario Timeframe:	Current and Future
Medium:	Sediment
Exposure Medium:	Sediment

Exposure Point	Area	Chemical of Potential Concern	CAS Number	Units	Detection Frequency	Number of High Censored Results (a)	Minimum Concentration	Arithmetic Mean (b)	95 UCL	Distribution (c)	Maximum Detected Concentration	Exposure Point Concentration Value	Units	Statistic (d)	Method (e)
	Reference Sediment Area	**Metals**													
		Aluminum	7429-90-5	mg/kg	5 / 5	0	4.43E+04	6.43E+04	7.65E+04	N	7.59E+04	7.59E+04	mg/kg	Max	(1)
		Antimony	7440-36-0	mg/kg	5 / 5	0	3.61E-01	6.63E-01	9.16E-01	N	9.29E-01	9.16E-01	mg/kg	95UCL	(2)
		Arsenic	7440-38-2	mg/kg	5 / 5	0	6.69E+00	1.02E+01	1.22E+01	N	1.21E+01	1.21E+01	mg/kg	Max	(1)
		Barium	7440-39-3	mg/kg	5 / 5	0	4.05E+02	4.45E+02	4.83E+02	N	5.01E+02	4.83E+02	mg/kg	95UCL	(2)
		Cadmium	7440-43-9	mg/kg	5 / 5	0	1.56E-01	3.63E-01	6.42E-01	N	8.41E-01	6.42E-01	mg/kg	95UCL	(2)
		Chromium	7440-47-3	mg/kg	5 / 5	0	1.03E+02	1.54E+02	1.82E+02	N	1.76E+02	1.76E+02	mg/kg	Max	(1)
		Cobalt	7440-48-4	mg/kg	5 / 5	0	1.03E+01	1.73E+01	2.15E+01	N	2.26E+01	2.15E+01	mg/kg	95UCL	(2)
		Copper	7440-50-8	mg/kg	5 / 5	0	1.65E+01	3.33E+01	4.70E+01	N	4.79E+01	4.70E+01	mg/kg	95UCL	(2)
		Iron	7439-89-6	mg/kg	5 / 5	0	2.06E+04	3.89E+04	4.92E+04	N	4.95E+04	4.92E+04	mg/kg	95UCL	(2)
		Lead	7439-92-1	mg/kg	5 / 5	0	1.23E+01	2.15E+01	2.86E+01	N	2.97E+01	2.86E+01	mg/kg	95UCL	(2)
		Manganese	7439-96-5	mg/kg	5 / 5	0	3.90E+02	5.21E+02	6.15E+02	N	6.34E+02	6.15E+02	mg/kg	95UCL	(2)
		Mercury	7439-97-6	mg/kg	5 / 5	0	2.52E-02	2.15E-01	3.64E-01	N	3.84E-01	3.64E-01	mg/kg	95UCL	(2)
		Molybdenum	7439-98-7	mg/kg	5 / 5	0	2.93E-01	6.42E-01	8.80E-01	--	8.51E-01	8.51E-01	mg/kg	Max	(1)
		Nickel	7440-02-0	mg/kg	5 / 5	0	3.98E+01	7.84E+01	1.00E+02	N	1.01E+02	1.00E+02	mg/kg	95UCL	(2)
		Selenium	7782-49-2	mg/kg	4 / 5	0	1.24E-01	3.32E-01	4.56E-01	NP	4.98E-01	4.56E-01	mg/kg	95UCL	(12)
		Silver	7440-22-4	mg/kg	4 / 5	0	1.23E-01	3.11E-01	4.47E-01	NP	5.38E-01	4.47E-01	mg/kg	95UCL	(12)
		Vanadium	7440-62-2	mg/kg	5 / 5	0	6.27E+01	1.30E+02	1.67E+02	N	1.59E+02	1.59E+02	mg/kg	Max	(1)
		Zinc	7440-66-6	mg/kg	5 / 5	0	4.25E+01	9.48E+01	1.27E+02	N	1.30E+02	1.27E+02	mg/kg	95UCL	(2)
		Pesticides													
		4,4'-DDD	72-54-8	mg/kg	4 / 5	0	4.10E-04	1.51E-03	2.41E-03	NP	3.11E-03	2.41E-03	mg/kg	95UCL	(12)
		4,4'-DDE	72-55-9	mg/kg	4 / 5	0	3.10E-04	6.83E-04	9.13E-04	NP	9.30E-04	9.13E-04	mg/kg	95UCL	(12)
		4,4'-DDT	50-29-3	mg/kg	1 / 5	0	1.65E-03	1.65E-03	N/A	--	1.65E-03	1.65E-03	mg/kg	Max	(1)
		alpha-Chlordane	5103-71-9	mg/kg	2 / 5	0	2.00E-05	7.00E-05	N/A	--	1.20E-04	1.20E-04	mg/kg	Max	(1)
		PAHs													
		2-Methylnaphthalene	91-57-6	mg/kg	5 / 5	0	1.17E-03	3.85E-03	6.43E-03	N	7.15E-03	6.43E-03	mg/kg	95UCL	(2)
		Acenaphthene	83-32-9	mg/kg	5 / 5	0	1.04E-03	4.04E-03	2.53E-02	G	1.24E-02	1.24E-02	mg/kg	Max	(1)
		Acenaphthylene	208-96-8	mg/kg	5 / 5	0	1.02E-03	5.49E-03	9.31E-03	N	1.20E-02	9.31E-03	mg/kg	95UCL	(2)
		Anthracene	120-12-7	mg/kg	5 / 5	0	2.73E-03	1.70E-02	3.13E-02	N	4.25E-02	3.13E-02	mg/kg	95UCL	(2)
		Fluorene	86-73-7	mg/kg	5 / 5	0	1.06E-03	4.76E-03	8.36E-03	N	1.09E-02	8.36E-03	mg/kg	95UCL	(2)
		Naphthalene	91-20-3	mg/kg	4 / 5	0	3.68E-03	1.01E-02	1.43E-02	NP	1.65E-02	1.43E-02	mg/kg	95UCL	(12)
		Phenanthrene	85-01-8	mg/kg	5 / 5	0	1.42E-02	5.74E-02	1.05E-01	N	1.42E-01	1.05E-01	mg/kg	95UCL	(2)
		Benzo(a)anthracene	56-55-3	mg/kg	5 / 5	0	1.25E-02	5.48E-02	9.49E-02	N	1.25E-01	9.49E-02	mg/kg	95UCL	(2)
		Benzo(a)pyrene	50-32-8	mg/kg	5 / 5	0	2.33E-02	1.07E-01	1.86E-01	N	2.40E-01	1.86E-01	mg/kg	95UCL	(2)
		Benzo(b)fluoranthene	205-99-2	mg/kg	5 / 5	0	1.67E-02	6.78E-02	1.17E-01	N	1.47E-01	1.17E-01	mg/kg	95UCL	(2)
		Benzo(g,h,i)perylene	191-24-2	mg/kg	5 / 5	0	2.09E-02	1.01E-01	1.78E-01	N	2.21E-01	1.78E-01	mg/kg	95UCL	(2)
		Benzo(k)fluoranthene	207-08-9	mg/kg	5 / 5	0	1.45E-02	6.60E-02	1.13E-01	N	1.45E-01	1.13E-01	mg/kg	95UCL	(2)
		Chrysene	218-01-9	mg/kg	5 / 5	0	1.54E-02	6.93E-02	1.12E-01	N	1.40E-01	1.12E-01	mg/kg	95UCL	(2)
		Dibenz(a,h)anthracene	53-70-3	mg/kg	5 / 5	0	2.06E-03	1.03E-02	1.87E-02	N	2.45E-02	1.87E-02	mg/kg	95UCL	(2)
		Fluoranthene	206-44-0	mg/kg	5 / 5	0	3.42E-02	1.35E-01	2.33E-01	N	3.06E-01	2.33E-01	mg/kg	95UCL	(2)
		Indeno(1,2,3-cd)pyrene	193-39-5	mg/kg	5 / 5	0	2.10E-02	9.05E-02	1.59E-01	N	2.00E-01	1.59E-01	mg/kg	95UCL	(2)
		Pyrene	129-00-0	mg/kg	5 / 5	0	4.49E-02	1.75E-01	2.94E-01	N	3.83E-01	2.94E-01	mg/kg	95UCL	(2)
		Butyltins													
		Dibutyltin	1002-53-5	mg/kg	1 / 1	4	1.32E-03	1.32E-03	N/A	--	1.32E-03	1.32E-03	mg/kg	Max	(1)
		Tributyltin	688-73-3	mg/kg	1 / 5	0	4.04E-03	4.04E-03	N/A	--	4.04E-03	4.04E-03	mg/kg	Max	(1)
		PCBs													
		Total PCB Congeners	1336-36-3	mg/kg	5 / 5	0	1.54E-03	1.42E-02	3.04E-02	N	4.32E-02	3.04E-02	mg/kg	95UCL	(2)
		Total TEQ – PCB DLC	--	mg/kg	5 / 5	0	4.51E-06	6.73E-06	8.66E-06	N	9.53E-06	8.66E-06	mg/kg	95UCL	(2)

TABLE A-1
Exposure Point Concentration Summary for Sediment
Appendix A - Updated Human Health Risk Assessment for Chemical Exposures

Scenario Timeframe:	Current and Future
Medium:	Sediment
Exposure Medium:	Sediment

Exposure Point	Area	Chemical of Potential Concern	CAS Number	Units	Detection Frequency	Number of High Censored Results (a)	Minimum Concentration	Arithmetic Mean (b)	95 UCL Distribution (c)	Maximum Detected Concentration	Exposure Point Concentration			
											Value	Units	Statistic (d)	Method (e)

Notes:

--	Not applicable
95UCL	A 95% upper confidence limit, the upper boundary (or limit) of a confidence interval of a parameter of interest such as the population mean
DDD	Dichlorodiphenyldichloroethane
DDE	Dichlorodiphenyldichloroethylene
DDT	Dichlorodiphenyltrichloroethane
DLC	Dioxin-like Congeners
EPC	Exposure point concentration
KM	Kaplan-Meier product limit estimator
Max	Maximum detected concentration
mg/kg	Milligram per kilogram
N/A	Not applicable, no estimate provided because there were fewer than five total results and four distinct detected results.
PAH	Polycyclic Aromatic Hydrocarbons
PCB	Polychlorinated biphenyl
TCDD	Tetrachlorodibenzo-p-dioxin
TEQ	Toxic Equivalents
USEPA	United States Environmental Protection Agency
a	Number of censored (nondetect) results that exceeded the maximum detected concentration. The nondetected results are based on the sample-specific detection limits. These results were excluded from the statistical calculations.
b	Arithmetic mean based on detected data only.
c	The three data distributions considered in ProUCL 5.0.00 include the normal, lognormal, and the gamma distributions. Shapiro-Wilk (n 50) and Lilliefors (n > 50) test statistics are used to test for normality or lognormality of a data set. A five percent level of significance was used in all tests. Distribution tests were only conducted for samples with at least 4 detected results. Distributions not confirmed as normal, lognormal, or gamma, or not tested, were treated as nonparametric in all statistical calculations.
	Distribution Codes: G= gamma, LN= lognormal, N= normal, NP= nonparametric
d	The EPC is the lesser of the UCL and the maximum detected result. The maximum detected result is the default when there are fewer than 5 total results or fewer than 4 detected results.
e	All methods follow USEPA (2002, 2013).

Method (Statistic) Codes are defined as follows:

(1)	Maximum detected concentration
(2)	95 percent UCL calculated using Student's t distribution
(3)	95 percent UCL calculated using Land's H statistic
(4), (5), (6)	95, 97.5, or 99 percent UCL, respectively, calculated using the nonparametric Chebyshev method
(7), (8), (9)	95, 97.5, or 99 percent UCL, respectively, calculated using the MVUE Chebyshev method
(10)	95 percent UCL calculated using the approximate gamma method
(11)	95 percent UCL calculated using the adjusted gamma method
(12)	95 percent UCL calculated using the KM mean and Student's t cuttoff for the UCL
(13), (14), (15)	95, 97.5, or 99 percent UCL, respectively, calculated using the KM mean and the nonparametric Chebyshev method to estimate the UCL
(16)	95 percent UCL calculated using the KM mean and a percentile bootstrap to estimate the UCL
(17)	95 percent UCL calculated using the KM mean and a BCA bootstrap to estimate the UCL
(18)	Hall's bootstrap
(19)	95 percent UCL calculated using Modified t distribution
(20)	95 percent UCL calculated using the adjusted gamma KM statistic

References:

United States Environmental Protection Agency (USEPA). 2002. “Calculating Exposure Point Concentrations at Hazardous Waste Sites.” OSWER 9285.6-10. Office of Emergency and Remedial Response. December.
United States Environmental Protection Agency (USEPA). 2013. “ProUCL Version 5.0.00 Technical Guide.” Prepared by Singh, A., Armbya, N. and Singh, A.K. EPA/600/R-07/041. 2013.

TABLE A-2
Exposure Point Concentration Summary for Macoma
Appendix A - Updated Human Health Risk Assessment for Chemical Exposures

Scenario Timeframe:	Current and Future
Medium:	Macoma
Exposure Medium:	Tissue

Exposure Point	Area	Chemical of Potential Concern	CAS Number	Units	Detection Frequency	Number of High Censored Results (a)	Minimum Concentration	Arithmetic Mean (b)	95 UCL Distribution (c)		Maximum Detected Concentration	Exposure Point Concentration Value	Exposure Point Concentration Units	Exposure Point Concentration Statistic (d)	Exposure Point Concentration Method (e)
Macoma Tissue	Eastern Wetland Area	**Metals**													
		Aluminum	7429-90-5	mg/kg	8 / 8	0	1.18E+02	2.09E+02	2.59E+02	N	3.26E+02	2.59E+02	mg/kg	95UCL	(2)
		Antimony	7440-36-0	mg/kg	8 / 8	0	1.62E-02	2.98E-02	3.89E-02	N	4.98E-02	3.89E-02	mg/kg	95UCL	(2)
		Arsenic	7440-38-2	mg/kg	8 / 8	0	3.02E+00	3.81E+00	4.29E+00	N	5.02E+00	4.29E+00	mg/kg	95UCL	(2)
		Barium	7440-39-3	mg/kg	8 / 8	0	1.25E+00	1.99E+00	2.41E+00	N	3.08E+00	2.41E+00	mg/kg	95UCL	(2)
		Cadmium	7440-43-9	mg/kg	8 / 8	0	3.38E-02	7.24E-02	1.77E-01	NP	2.32E-01	1.77E-01	mg/kg	95UCL	(4)
		Chromium	7440-47-3	mg/kg	8 / 8	0	1.28E+00	2.21E+00	2.74E+00	N	3.75E+00	2.74E+00	mg/kg	95UCL	(2)
		Cobalt	7440-48-4	mg/kg	8 / 8	0	2.54E-01	3.54E-01	4.00E-01	N	4.80E-01	4.00E-01	mg/kg	95UCL	(2)
		Copper	7440-50-8	mg/kg	8 / 8	0	1.53E+00	2.83E+00	3.75E+00	N	5.02E+00	3.75E+00	mg/kg	95UCL	(2)
		Iron	7439-89-6	mg/kg	8 / 8	0	2.06E+02	3.16E+02	3.64E+02	N	4.15E+02	3.64E+02	mg/kg	95UCL	(2)
		Lead	7439-92-1	mg/kg	8 / 8	0	2.97E-01	5.46E-01	7.15E-01	N	8.98E-01	7.15E-01	mg/kg	95UCL	(2)
		Manganese	7439-96-5	mg/kg	8 / 8	0	2.83E+00	4.61E+00	5.23E+00	N	5.71E+00	5.23E+00	mg/kg	95UCL	(2)
		Mercury	7439-97-6	mg/kg	4 / 7	1	1.50E-02	2.29E-02	2.61E-02	NP	3.11E-02	2.61E-02	mg/kg	95UCL	(12)
		Molybdenum	7439-98-7	mg/kg	8 / 8	0	3.44E-01	5.00E-01	5.97E-01	N	7.82E-01	5.97E-01	mg/kg	95UCL	(2)
		Nickel	7440-02-0	mg/kg	8 / 8	0	7.83E-01	1.18E+00	1.38E+00	N	1.60E+00	1.38E+00	mg/kg	95UCL	(2)
		Selenium	7782-49-2	mg/kg	8 / 8	0	6.70E-01	8.00E-01	8.68E-01	N	9.44E-01	8.68E-01	mg/kg	95UCL	(2)
		Silver	7440-22-4	mg/kg	4 / 8	0	1.65E-02	3.41E-02	3.94E-02	NP	6.00E-02	3.94E-02	mg/kg	95UCL	(12)
		Vanadium	7440-62-2	mg/kg	8 / 8	0	7.91E-01	1.17E+00	1.32E+00	N	1.55E+00	1.32E+00	mg/kg	95UCL	(2)
		Zinc	7440-66-6	mg/kg	8 / 8	0	1.25E+01	1.84E+01	2.13E+01	N	2.63E+01	2.13E+01	mg/kg	95UCL	(2)
		Pesticides													
		4,4'-DDD	72-54-8	mg/kg	8 / 8	0	9.00E-05	4.94E-04	6.18E-04	N	7.20E-04	6.18E-04	mg/kg	95UCL	(2)
		4,4'-DDE	72-55-9	mg/kg	8 / 8	0	2.50E-04	1.09E-03	1.36E-03	N	1.45E-03	1.36E-03	mg/kg	95UCL	(2)
		alpha-Chlordane	5103-71-9	mg/kg	8 / 8	0	3.00E-05	1.39E-04	1.78E-04	N	2.20E-04	1.78E-04	mg/kg	95UCL	(2)
		Dieldrin	60-57-1	mg/kg	8 / 8	0	3.00E-05	2.30E-04	3.22E-04	N	4.50E-04	3.22E-04	mg/kg	95UCL	(2)
		gamma-Chlordane	5566-34-7	mg/kg	8 / 8	0	4.00E-05	1.40E-04	1.75E-04	N	2.20E-04	1.75E-04	mg/kg	95UCL	(2)
		PAHs													
		Acenaphthene	83-32-9	mg/kg	6 / 8	0	1.40E-04	2.06E-04	2.31E-04	NP	2.80E-04	2.31E-04	mg/kg	95UCL	(12)
		Acenaphthylene	208-96-8	mg/kg	6 / 8	0	2.10E-04	2.86E-04	3.18E-04	NP	4.11E-04	3.18E-04	mg/kg	95UCL	(12)
		Anthracene	120-12-7	mg/kg	7 / 8	0	9.61E-04	1.62E-03	2.04E-03	NP	3.19E-03	2.04E-03	mg/kg	95UCL	(12)
		Fluorene	86-73-7	mg/kg	6 / 8	0	2.25E-04	3.43E-04	3.74E-04	NP	4.00E-04	3.74E-04	mg/kg	95UCL	(12)
		Phenanthrene	85-01-8	mg/kg	7 / 8	0	1.08E-03	2.14E-03	2.50E-03	NP	3.14E-03	2.50E-03	mg/kg	95UCL	(12)
		Benzo(a)anthracene	56-55-3	mg/kg	7 / 8	0	2.15E-03	3.39E-03	4.00E-03	NP	5.51E-03	4.00E-03	mg/kg	95UCL	(12)
		Benzo(a)pyrene	50-32-8	mg/kg	8 / 8	0	6.20E-04	3.25E-03	4.05E-03	N	4.47E-03	4.05E-03	mg/kg	95UCL	(2)
		Benzo(b)fluoranthene	205-99-2	mg/kg	8 / 8	0	5.74E-04	4.00E-03	5.04E-03	N	5.25E-03	5.04E-03	mg/kg	95UCL	(2)
		Benzo(g,h,i)perylene	191-24-2	mg/kg	7 / 8	0	2.09E-03	3.16E-03	3.67E-03	NP	4.37E-03	3.67E-03	mg/kg	95UCL	(12)
		Benzo(k)fluoranthene	207-08-9	mg/kg	8 / 8	0	8.77E-04	3.90E-03	4.84E-03	N	5.05E-03	4.84E-03	mg/kg	95UCL	(2)
		Chrysene	218-01-9	mg/kg	8 / 8	0	7.95E-04	4.68E-03	6.15E-03	N	8.44E-03	6.15E-03	mg/kg	95UCL	(2)
		Dibenz(a,h)anthracene	53-70-3	mg/kg	6 / 8	0	1.50E-04	1.97E-04	2.13E-04	NP	2.41E-04	2.13E-04	mg/kg	95UCL	(12)
		Fluoranthene	206-44-0	mg/kg	8 / 8	0	2.29E-03	1.13E-02	1.50E-02	N	2.05E-02	1.50E-02	mg/kg	95UCL	(2)
		Indeno(1,2,3-cd)pyrene	193-39-5	mg/kg	7 / 8	0	1.04E-03	1.69E-03	1.95E-03	NP	2.30E-03	1.95E-03	mg/kg	95UCL	(12)
		Pyrene	129-00-0	mg/kg	8 / 8	0	2.39E-03	1.16E-02	1.46E-02	N	1.64E-02	1.46E-02	mg/kg	95UCL	(2)
		Butyltins													
		Monobutyltin	78763-54-9	mg/kg	1 / 1	7	8.74E-04	8.74E-04	N/A	--	8.74E-04	8.74E-04	mg/kg	Max	(1)
		Dibutyltin	1002-53-5	mg/kg	8 / 8	0	1.02E-03	1.39E-03	1.51E-03	N	1.66E-03	1.51E-03	mg/kg	95UCL	(2)
		Tributyltin	688-73-3	mg/kg	8 / 8	0	2.86E-03	4.13E-03	4.58E-03	N	4.89E-03	4.58E-03	mg/kg	95UCL	(2)
		PCBs													
		Total PCB Congeners	1336-36-3	mg/kg	8 / 8	0	4.72E-03	3.44E-02	4.77E-02	N	6.53E-02	4.77E-02	mg/kg	95UCL	(2)
		Total TEQ – PCB DLC	--	mg/kg	8 / 8	0	4.01E-06	9.47E-06	1.92E-05	NP	1.85E-05	1.85E-05	mg/kg	Max	(1)
		Dioxins													
		Total TEQ – TCDD DLC	--	mg/kg	2 / 2	0	4.75E-07	4.80E-07	N/A	--	4.86E-07	4.86E-07	mg/kg	Max	(1)

TABLE A-2
Exposure Point Concentration Summary for Macoma
Appendix A - Updated Human Health Risk Assessment for Chemical Exposures

Scenario Timeframe:	Current and Future
Medium:	Macoma
Exposure Medium:	Tissue

Exposure Point	Area	Chemical of Potential Concern	CAS Number	Units	Detection Frequency	Number of High Censored Results (a)	Minimum Concentration	Arithmetic Mean (b)	95 UCL	Distribution (c)	Maximum Detected Concentration	Exposure Point Concentration Value	Units	Statistic (d)	Method (e)
	India Basin Area I	**Metals**													
		Aluminum	7429-90-5	mg/kg	6 / 6	0	1.02E+02	2.35E+02	3.22E+02	N	3.55E+02	3.22E+02	mg/kg	95UCL	(2)
		Antimony	7440-36-0	mg/kg	6 / 6	0	1.60E-02	2.02E-02	2.40E-02	LN	2.81E-02	2.40E-02	mg/kg	95UCL	(3)
		Arsenic	7440-38-2	mg/kg	6 / 6	0	2.92E+00	3.23E+00	3.47E+00	N	3.63E+00	3.47E+00	mg/kg	95UCL	(2)
		Barium	7440-39-3	mg/kg	6 / 6	0	1.23E+00	2.24E+00	2.99E+00	N	3.72E+00	2.99E+00	mg/kg	95UCL	(2)
		Cadmium	7440-43-9	mg/kg	6 / 6	0	3.10E-02	3.98E-02	4.75E-02	N	5.62E-02	4.75E-02	mg/kg	95UCL	(2)
		Chromium	7440-47-3	mg/kg	6 / 6	0	8.04E-01	1.30E+00	1.61E+00	N	1.89E+00	1.61E+00	mg/kg	95UCL	(2)
		Cobalt	7440-48-4	mg/kg	6 / 6	0	2.28E-01	3.19E-01	3.73E-01	N	3.86E-01	3.73E-01	mg/kg	95UCL	(2)
		Copper	7440-50-8	mg/kg	6 / 6	0	1.47E+00	2.09E+00	2.42E+00	N	2.50E+00	2.42E+00	mg/kg	95UCL	(2)
		Iron	7439-89-6	mg/kg	6 / 6	0	1.93E+02	2.92E+02	3.57E+02	N	4.09E+02	3.57E+02	mg/kg	95UCL	(2)
		Lead	7439-92-1	mg/kg	6 / 6	0	3.01E-01	3.74E-01	4.18E-01	N	4.46E-01	4.18E-01	mg/kg	95UCL	(2)
		Manganese	7439-96-5	mg/kg	6 / 6	0	2.35E+00	3.53E+00	4.47E+00	N	5.37E+00	4.47E+00	mg/kg	95UCL	(2)
		Mercury	7439-97-6	mg/kg	3 / 5	1	1.87E-02	1.99E-02	2.09E-02	NP	2.15E-02	2.09E-02	mg/kg	95UCL	(12)
		Molybdenum	7439-98-7	mg/kg	6 / 6	0	3.63E-01	4.20E-01	4.55E-01	N	4.69E-01	4.55E-01	mg/kg	95UCL	(2)
		Nickel	7440-02-0	mg/kg	6 / 6	0	8.43E-01	1.33E+00	2.00E+00	N	2.86E+00	2.00E+00	mg/kg	95UCL	(19)
		Selenium	7782-49-2	mg/kg	6 / 6	0	4.82E-01	6.71E-01	7.91E-01	N	8.24E-01	7.91E-01	mg/kg	95UCL	(2)
		Silver	7440-22-4	mg/kg	3 / 6	0	2.08E-02	9.13E-02	1.33E-01	NP	2.21E-01	1.33E-01	mg/kg	95UCL	(12)
		Vanadium	7440-62-2	mg/kg	6 / 6	0	6.96E-01	1.03E+00	1.25E+00	N	1.43E+00	1.25E+00	mg/kg	95UCL	(2)
		Zinc	7440-66-6	mg/kg	6 / 6	0	1.05E+01	1.49E+01	1.76E+01	N	2.00E+01	1.76E+01	mg/kg	95UCL	(2)
		Pesticides													
		4,4'-DDD	72-54-8	mg/kg	6 / 6	0	4.50E-04	6.27E-04	7.67E-04	N	8.40E-04	7.67E-04	mg/kg	95UCL	(2)
		4,4'-DDE	72-55-9	mg/kg	6 / 6	0	9.60E-04	1.20E-03	1.36E-03	N	1.45E-03	1.36E-03	mg/kg	95UCL	(2)
		alpha-Chlordane	5103-71-9	mg/kg	5 / 6	0	1.10E-04	2.00E-04	2.55E-04	NP	3.00E-04	2.55E-04	mg/kg	95UCL	(12)
		Dieldrin	60-57-1	mg/kg	6 / 6	0	1.30E-04	2.30E-04	3.48E-04	N	5.10E-04	3.48E-04	mg/kg	95UCL	(2)
		gamma-Chlordane	5566-34-7	mg/kg	6 / 6	0	6.00E-05	1.45E-04	2.10E-04	N	2.90E-04	2.10E-04	mg/kg	95UCL	(2)
		PAHs													
		Acenaphthene	83-32-9	mg/kg	4 / 6	0	2.68E-04	3.40E-04	3.79E-04	NP	4.30E-04	3.79E-04	mg/kg	95UCL	(12)
		Acenaphthylene	208-96-8	mg/kg	4 / 6	0	4.10E-04	6.19E-04	7.07E-04	NP	8.70E-04	7.07E-04	mg/kg	95UCL	(12)
		Anthracene	120-12-7	mg/kg	6 / 6	0	1.46E-03	3.99E-03	6.61E-03	N	1.01E-02	6.61E-03	mg/kg	95UCL	(2)
		Fluorene	86-73-7	mg/kg	4 / 6	0	3.00E-04	4.45E-04	5.11E-04	NP	6.20E-04	5.11E-04	mg/kg	95UCL	(12)
		Phenanthrene	85-01-8	mg/kg	6 / 6	0	1.22E-03	2.43E-03	3.39E-03	N	4.45E-03	3.39E-03	mg/kg	95UCL	(2)
		Benzo(a)anthracene	56-55-3	mg/kg	6 / 6	0	2.94E-03	7.30E-03	1.18E-02	N	1.81E-02	1.18E-02	mg/kg	95UCL	(2)
		Benzo(a)pyrene	50-32-8	mg/kg	6 / 6	0	3.08E-03	5.64E-03	7.85E-03	N	1.02E-02	7.85E-03	mg/kg	95UCL	(2)
		Benzo(b)fluoranthene	205-99-2	mg/kg	6 / 6	0	3.20E-03	6.92E-03	9.98E-03	N	1.40E-02	9.98E-03	mg/kg	95UCL	(2)
		Benzo(g,h,i)perylene	191-24-2	mg/kg	6 / 6	0	1.85E-03	3.21E-03	4.05E-03	N	4.83E-03	4.05E-03	mg/kg	95UCL	(2)
		Benzo(k)fluoranthene	207-08-9	mg/kg	6 / 6	0	4.03E-03	6.77E-03	9.72E-03	N	1.36E-02	9.72E-03	mg/kg	95UCL	(2)
		Chrysene	218-01-9	mg/kg	6 / 6	0	4.74E-03	9.80E-03	1.56E-02	N	2.37E-02	1.56E-02	mg/kg	95UCL	(2)
		Dibenz(a,h)anthracene	53-70-3	mg/kg	3 / 6	0	2.36E-04	3.52E-04	3.63E-04	NP	4.20E-04	3.63E-04	mg/kg	95UCL	(12)
		Fluoranthene	206-44-0	mg/kg	6 / 6	0	1.03E-02	2.43E-02	3.96E-02	N	6.10E-02	3.96E-02	mg/kg	95UCL	(2)
		Indeno(1,2,3-cd)pyrene	193-39-5	mg/kg	6 / 6	0	8.29E-04	1.99E-03	2.65E-03	N	3.20E-03	2.65E-03	mg/kg	95UCL	(2)
		Pyrene	129-00-0	mg/kg	6 / 6	0	1.30E-02	2.77E-02	4.41E-02	N	6.71E-02	4.41E-02	mg/kg	95UCL	(2)
		Butyltins													
		Dibutyltin	1002-53-5	mg/kg	6 / 6	0	9.19E-04	1.44E-03	1.79E-03	N	2.04E-03	1.79E-03	mg/kg	95UCL	(2)
		Tributyltin	688-73-3	mg/kg	6 / 6	0	2.89E-03	5.18E-03	7.23E-03	N	9.97E-03	7.23E-03	mg/kg	95UCL	(2)
		PCBs													
		Total PCB Congeners	1336-36-3	mg/kg	6 / 6	0	9.42E-03	1.36E-02	1.79E-02	N	2.06E-02	1.79E-02	mg/kg	95UCL	(2)
		Dioxins													
		Total TEQ – PCB DLC	--	mg/kg	6 / 6	0	4.52E-06	8.85E-06	1.34E-05	N	1.60E-05	1.34E-05	mg/kg	95UCL	(2)

TABLE A-2
Exposure Point Concentration Summary for Macoma
Appendix A - Updated Human Health Risk Assessment for Chemical Exposures

Scenario Timeframe:	Current and Future
Medium:	Macoma
Exposure Medium:	Tissue

Exposure Point	Area	Chemical of Potential Concern	CAS Number	Units	Detection Frequency	Number of High Censored Results (a)	Minimum Concentration	Arithmetic Mean (b)	95 UCL	Distribution (c)	Maximum Detected Concentration	Exposure Point Concentration			
												Value	Units	Statistic (d)	Method (e)
	Oil Reclamation Area	**Metals**													
		Aluminum	7429-90-5	mg/kg	6 / 6	0	1.71E+02	3.18E+02	4.34E+02	N	5.84E+02	4.34E+02	mg/kg	95UCL	(2)
		Antimony	7440-36-0	mg/kg	6 / 6	0	2.31E-02	3.33E-02	4.43E-02	N	5.75E-02	4.43E-02	mg/kg	95UCL	(2)
		Arsenic	7440-38-2	mg/kg	6 / 6	0	3.07E+00	3.53E+00	3.90E+00	N	4.09E+00	3.90E+00	mg/kg	95UCL	(2)
		Barium	7440-39-3	mg/kg	6 / 6	0	1.33E+00	2.72E+00	3.67E+00	N	4.72E+00	3.67E+00	mg/kg	95UCL	(2)
		Cadmium	7440-43-9	mg/kg	6 / 6	0	3.43E-02	1.15E-01	2.00E-01	N	2.91E-01	2.00E-01	mg/kg	95UCL	(2)
		Chromium	7440-47-3	mg/kg	6 / 6	0	8.63E-01	3.21E+00	4.69E+00	N	5.54E+00	4.69E+00	mg/kg	95UCL	(2)
		Cobalt	7440-48-4	mg/kg	6 / 6	0	2.35E-01	3.64E-01	4.55E-01	N	5.45E-01	4.55E-01	mg/kg	95UCL	(2)
		Copper	7440-50-8	mg/kg	6 / 6	0	2.23E+00	2.97E+00	3.64E+00	N	4.39E+00	3.64E+00	mg/kg	95UCL	(2)
		Iron	7439-89-6	mg/kg	6 / 6	0	2.23E+02	4.55E+02	5.98E+02	N	7.39E+02	5.98E+02	mg/kg	95UCL	(2)
		Lead	7439-92-1	mg/kg	6 / 6	0	3.82E-01	7.60E-01	1.06E+00	N	1.43E+00	1.06E+00	mg/kg	95UCL	(2)
		Manganese	7439-96-5	mg/kg	6 / 6	0	2.29E+00	5.74E+00	8.02E+00	N	9.00E+00	8.02E+00	mg/kg	95UCL	(2)
		Mercury	7439-97-6	mg/kg	5 / 6	0	1.63E-02	2.10E-02	2.46E-02	NP	2.91E-02	2.46E-02	mg/kg	95UCL	(12)
		Molybdenum	7439-98-7	mg/kg	6 / 6	0	3.70E-01	4.50E-01	5.08E-01	N	5.39E-01	5.08E-01	mg/kg	95UCL	(2)
		Nickel	7440-02-0	mg/kg	6 / 6	0	8.36E-01	1.47E+00	1.93E+00	N	2.47E+00	1.93E+00	mg/kg	95UCL	(2)
		Selenium	7782-49-2	mg/kg	6 / 6	0	6.92E-01	7.88E-01	8.68E-01	N	9.26E-01	8.68E-01	mg/kg	95UCL	(2)
		Silver	7440-22-4	mg/kg	1 / 3	3	3.71E-02	3.71E-02	N/A	--	3.71E-02	3.71E-02	mg/kg	Max	(1)
		Vanadium	7440-62-2	mg/kg	6 / 6	0	6.60E-01	1.51E+00	1.99E+00	N	2.43E+00	1.99E+00	mg/kg	95UCL	(2)
		Zinc	7440-66-6	mg/kg	6 / 6	0	1.38E+01	1.67E+01	1.88E+01	N	2.05E+01	1.88E+01	mg/kg	95UCL	(2)
		Pesticides													
		4,4'-DDD	72-54-8	mg/kg	6 / 6	0	5.30E-04	9.35E-04	1.16E-03	N	1.33E-03	1.16E-03	mg/kg	95UCL	(2)
		4,4'-DDE	72-55-9	mg/kg	6 / 6	0	1.52E-03	1.99E-03	2.21E-03	N	2.22E-03	2.21E-03	mg/kg	95UCL	(2)
		4,4'-DDT	50-29-3	mg/kg	1 / 6	0	7.00E-05	7.00E-05	N/A	--	7.00E-05	7.00E-05	mg/kg	Max	(1)
		alpha-Chlordane	5103-71-9	mg/kg	6 / 6	0	1.40E-04	2.35E-04	2.77E-04	N	2.80E-04	2.77E-04	mg/kg	95UCL	(2)
		Dieldrin	60-57-1	mg/kg	6 / 6	0	1.70E-04	2.22E-04	2.61E-04	N	3.10E-04	2.61E-04	mg/kg	95UCL	(2)
		gamma-Chlordane	5566-34-7	mg/kg	6 / 6	0	1.60E-04	2.80E-04	3.34E-04	N	3.40E-04	3.34E-04	mg/kg	95UCL	(2)
		PAHs													
		Acenaphthene	83-32-9	mg/kg	4 / 5	1	1.00E-04	1.38E-04	1.73E-04	NP	2.00E-04	1.73E-04	mg/kg	95UCL	(12)
		Acenaphthylene	208-96-8	mg/kg	5 / 6	0	2.30E-04	3.50E-04	4.32E-04	NP	5.42E-04	4.32E-04	mg/kg	95UCL	(12)
		Anthracene	120-12-7	mg/kg	6 / 6	0	6.90E-04	1.11E-03	1.37E-03	N	1.51E-03	1.37E-03	mg/kg	95UCL	(2)
		Fluorene	86-73-7	mg/kg	4 / 6	0	1.80E-04	2.28E-04	2.59E-04	NP	3.00E-04	2.59E-04	mg/kg	95UCL	(12)
		Phenanthrene	85-01-8	mg/kg	6 / 6	0	1.12E-03	2.03E-03	2.58E-03	N	2.88E-03	2.58E-03	mg/kg	95UCL	(2)
		Benzo(a)anthracene	56-55-3	mg/kg	6 / 6	0	2.09E-03	3.66E-03	4.78E-03	N	5.37E-03	4.78E-03	mg/kg	95UCL	(2)
		Benzo(a)pyrene	50-32-8	mg/kg	6 / 6	0	3.63E-03	5.08E-03	6.56E-03	N	8.00E-03	6.56E-03	mg/kg	95UCL	(2)
		Benzo(b)fluoranthene	205-99-2	mg/kg	6 / 6	0	3.38E-03	5.39E-03	6.75E-03	N	7.66E-03	6.75E-03	mg/kg	95UCL	(2)
		Benzo(g,h,i)perylene	191-24-2	mg/kg	6 / 6	0	1.99E-03	3.37E-03	4.50E-03	N	5.62E-03	4.50E-03	mg/kg	95UCL	(2)
		Benzo(k)fluoranthene	207-08-9	mg/kg	6 / 6	0	4.86E-03	6.49E-03	8.27E-03	N	9.83E-03	8.27E-03	mg/kg	95UCL	(2)
		Chrysene	218-01-9	mg/kg	6 / 6	0	3.59E-03	6.46E-03	9.05E-03	N	1.21E-02	9.05E-03	mg/kg	95UCL	(2)
		Dibenz(a,h)anthracene	53-70-3	mg/kg	4 / 6	0	1.40E-04	2.33E-04	2.79E-04	NP	3.49E-04	2.79E-04	mg/kg	95UCL	(12)
		Fluoranthene	206-44-0	mg/kg	6 / 6	0	7.32E-03	1.26E-02	1.74E-02	N	2.33E-02	1.74E-02	mg/kg	95UCL	(2)
		Indeno(1,2,3-cd)pyrene	193-39-5	mg/kg	6 / 6	0	1.12E-03	2.05E-03	2.65E-03	N	3.12E-03	2.65E-03	mg/kg	95UCL	(2)
		Pyrene	129-00-0	mg/kg	6 / 6	0	9.63E-03	1.52E-02	1.97E-02	N	2.43E-02	1.97E-02	mg/kg	95UCL	(2)
		Butyltins													
		Dibutyltin	1002-53-5	mg/kg	6 / 6	0	1.43E-03	2.56E-03	3.72E-03	N	5.31E-03	3.72E-03	mg/kg	95UCL	(2)
		Tributyltin	688-73-3	mg/kg	6 / 6	0	4.10E-03	1.69E-02	3.21E-02	N	5.28E-02	3.21E-02	mg/kg	95UCL	(2)
		PCBs													
		Total PCB Congeners	1336-36-3	mg/kg	6 / 6	0	5.37E-02	1.28E-01	1.71E-01	N	2.04E-01	1.71E-01	mg/kg	95UCL	(2)
		Total TEQ – PCB DLC	--	mg/kg	6 / 6	0	4.59E-06	5.27E-06	5.60E-06	N	5.61E-06	5.60E-06	mg/kg	95UCL	(2)
		Dioxins													
		Total TEQ – TCDD DLC	--	mg/kg	2 / 2	0	4.55E-07	6.17E-07	N/A	--	7.79E-07	7.79E-07	mg/kg	Max	(1)

TABLE A-2
Exposure Point Concentration Summary for Macoma
Appendix A - Updated Human Health Risk Assessment for Chemical Exposures

Scenario Timeframe:	Current and Future
Medium:	Macoma
Exposure Medium:	Tissue

Exposure Point	Area	Chemical of Potential Concern	CAS Number	Units	Detection Frequency	Number of High Censored Results (a)	Minimum Concentration	Arithmetic Mean (b)	95 UCL Distribution (c)		Maximum Detected Concentration	Exposure Point Concentration			
												Value	Units	Statistic (d)	Method (e)
	Point Avisadero Area	**Metals**													
		Aluminum	7429-90-5	mg/kg	16 / 16	0	1.94E+02	2.83E+02	3.15E+02	N	4.48E+02	3.15E+02	mg/kg	95UCL	(2)
		Antimony	7440-36-0	mg/kg	16 / 16	0	1.65E-02	2.34E-02	2.59E-02	N	3.79E-02	2.59E-02	mg/kg	95UCL	(2)
		Arsenic	7440-38-2	mg/kg	16 / 16	0	2.61E+00	3.38E+00	3.53E+00	N	3.89E+00	3.53E+00	mg/kg	95UCL	(2)
		Barium	7440-39-3	mg/kg	16 / 16	0	1.93E+00	2.91E+00	3.32E+00	N	4.87E+00	3.32E+00	mg/kg	95UCL	(2)
		Cadmium	7440-43-9	mg/kg	16 / 16	0	3.05E-02	4.60E-02	4.98E-02	N	6.30E-02	4.98E-02	mg/kg	95UCL	(2)
		Chromium	7440-47-3	mg/kg	16 / 16	0	8.33E-01	2.67E+00	3.30E+00	N	5.28E+00	3.30E+00	mg/kg	95UCL	(2)
		Cobalt	7440-48-4	mg/kg	16 / 16	0	2.97E-01	4.01E-01	4.24E-01	N	4.87E-01	4.24E-01	mg/kg	95UCL	(2)
		Copper	7440-50-8	mg/kg	16 / 16	0	1.71E+00	6.58E+00	1.51E+01	NP	3.21E+01	1.51E+01	mg/kg	95UCL	(4)
		Iron	7439-89-6	mg/kg	16 / 16	0	2.84E+02	4.35E+02	4.85E+02	N	6.33E+02	4.85E+02	mg/kg	95UCL	(2)
		Lead	7439-92-1	mg/kg	16 / 16	0	2.91E-01	4.74E-01	5.46E-01	N	9.26E-01	5.46E-01	mg/kg	95UCL	(2)
		Manganese	7439-96-5	mg/kg	16 / 16	0	3.49E+00	6.52E+00	7.50E+00	N	1.00E+01	7.50E+00	mg/kg	95UCL	(2)
		Mercury	7439-97-6	mg/kg	13 / 16	0	1.66E-02	1.05E-01	3.48E-01	NP	6.63E-01	3.48E-01	mg/kg	95UCL	(14)
		Molybdenum	7439-98-7	mg/kg	16 / 16	0	3.22E-01	4.29E-01	4.55E-01	N	5.48E-01	4.55E-01	mg/kg	95UCL	(2)
		Nickel	7440-02-0	mg/kg	16 / 16	0	1.01E+00	1.38E+00	1.53E+00	N	2.25E+00	1.53E+00	mg/kg	95UCL	(2)
		Selenium	7782-49-2	mg/kg	16 / 16	0	4.32E-01	6.48E-01	7.12E-01	N	9.22E-01	7.12E-01	mg/kg	95UCL	(2)
		Silver	7440-22-4	mg/kg	3 / 16	0	2.16E-02	2.98E-02	2.59E-02	NP	4.53E-02	2.59E-02	mg/kg	95UCL	(12)
		Vanadium	7440-62-2	mg/kg	16 / 16	0	8.83E-01	1.39E+00	1.54E+00	N	1.95E+00	1.54E+00	mg/kg	95UCL	(2)
		Zinc	7440-66-6	mg/kg	16 / 16	0	1.21E+01	1.69E+01	1.80E+01	N	2.12E+01	1.80E+01	mg/kg	95UCL	(2)
		Pesticides													
		4,4'-DDD	72-54-8	mg/kg	16 / 16	0	3.40E-04	4.95E-04	5.35E-04	N	6.40E-04	5.35E-04	mg/kg	95UCL	(2)
		4,4'-DDE	72-55-9	mg/kg	16 / 16	0	7.20E-04	9.83E-04	1.06E-03	N	1.31E-03	1.06E-03	mg/kg	95UCL	(2)
		4,4'-DDT	50-29-3	mg/kg	1 / 16	0	2.60E-04	2.60E-04	N/A	--	2.60E-04	2.60E-04	mg/kg	Max	(1)
		alpha-Chlordane	5103-71-9	mg/kg	15 / 16	0	7.00E-05	1.13E-04	1.23E-04	NP	1.60E-04	1.23E-04	mg/kg	95UCL	(12)
		Dieldrin	60-57-1	mg/kg	12 / 16	0	1.00E-04	1.56E-04	1.60E-04	NP	3.00E-04	1.60E-04	mg/kg	95UCL	(12)
		gamma-Chlordane	5566-34-7	mg/kg	14 / 16	0	4.00E-05	1.19E-04	1.31E-04	NP	1.90E-04	1.31E-04	mg/kg	95UCL	(12)
		PAHs													
		Acenaphthene	83-32-9	mg/kg	15 / 16	0	1.90E-04	2.73E-04	3.01E-04	NP	4.90E-04	3.01E-04	mg/kg	95UCL	(12)
		Acenaphthylene	208-96-8	mg/kg	15 / 16	0	2.50E-04	4.77E-04	5.21E-04	NP	6.90E-04	5.21E-04	mg/kg	95UCL	(12)
		Anthracene	120-12-7	mg/kg	16 / 16	0	1.06E-03	2.65E-03	3.19E-03	N	5.02E-03	3.19E-03	mg/kg	95UCL	(2)
		Fluorene	86-73-7	mg/kg	15 / 16	0	2.00E-04	4.05E-04	4.51E-04	NP	7.00E-04	4.51E-04	mg/kg	95UCL	(12)
		Phenanthrene	85-01-8	mg/kg	15 / 16	0	1.28E-03	2.86E-03	3.29E-03	NP	5.87E-03	3.29E-03	mg/kg	95UCL	(12)
		Benzo(a)anthracene	56-55-3	mg/kg	16 / 16	0	1.78E-03	4.86E-03	6.08E-03	G	9.81E-03	6.08E-03	mg/kg	95UCL	(11)
		Benzo(a)pyrene	50-32-8	mg/kg	16 / 16	0	1.92E-03	4.84E-03	5.43E-03	N	7.10E-03	5.43E-03	mg/kg	95UCL	(2)
		Benzo(b)fluoranthene	205-99-2	mg/kg	16 / 16	0	2.01E-03	4.72E-03	5.29E-03	N	7.07E-03	5.29E-03	mg/kg	95UCL	(2)
		Benzo(g,h,i)perylene	191-24-2	mg/kg	16 / 16	0	1.19E-03	2.73E-03	3.14E-03	N	4.63E-03	3.14E-03	mg/kg	95UCL	(2)
		Benzo(k)fluoranthene	207-08-9	mg/kg	16 / 16	0	2.69E-03	5.57E-03	6.25E-03	N	8.25E-03	6.25E-03	mg/kg	95UCL	(2)
		Chrysene	218-01-9	mg/kg	16 / 16	0	2.60E-03	6.67E-03	7.84E-03	N	1.25E-02	7.84E-03	mg/kg	95UCL	(2)
		Dibenz(a,h)anthracene	53-70-3	mg/kg	14 / 16	0	1.30E-04	2.02E-04	2.15E-04	NP	3.10E-04	2.15E-04	mg/kg	95UCL	(12)
		Fluoranthene	206-44-0	mg/kg	16 / 16	0	7.20E-03	1.74E-02	2.02E-02	N	3.08E-02	2.02E-02	mg/kg	95UCL	(2)
		Indeno(1,2,3-cd)pyrene	193-39-5	mg/kg	16 / 16	0	6.00E-04	1.70E-03	2.07E-03	N	3.66E-03	2.07E-03	mg/kg	95UCL	(2)
		Pyrene	129-00-0	mg/kg	15 / 16	0	8.79E-03	2.16E-02	2.48E-02	NP	3.81E-02	2.48E-02	mg/kg	95UCL	(12)
		Butyltins													
		Monobutyltin	78763-54-9	mg/kg	2 / 2	14	1.34E-03	1.47E-03	N/A	--	1.60E-03	1.60E-03	mg/kg	Max	(1)
		Dibutyltin	1002-53-5	mg/kg	16 / 16	0	1.20E-03	5.83E-03	8.17E-03	N	2.00E-02	8.17E-03	mg/kg	95UCL	(2)
		Tributyltin	688-73-3	mg/kg	16 / 16	0	4.80E-03	5.59E-02	8.07E-02	N	2.09E-01	8.07E-02	mg/kg	95UCL	(2)
		PCBs													
		Total PCB Congeners	1336-36-3	mg/kg	16 / 16	0	8.11E-03	1.99E-02	2.80E-02	G	6.63E-02	2.80E-02	mg/kg	95UCL	(11)
		Dioxins													
		Total TEQ – PCB DLC	--	mg/kg	16 / 16	0	3.52E-06	6.30E-06	8.17E-06	N	1.65E-05	8.17E-06	mg/kg	95UCL	(19)

TABLE A-2
Exposure Point Concentration Summary for Macoma
Appendix A - Updated Human Health Risk Assessment for Chemical Exposures

Scenario Timeframe:	Current and Future
Medium:	Macoma
Exposure Medium:	Tissue

Exposure Point	Area	Chemical of Potential Concern	CAS Number	Units	Detection Frequency	Number of High Censored Results (a)	Minimum Concentration	Arithmetic Mean (b)	95 UCL Distribution (c)		Maximum Detected Concentration	Exposure Point Concentration			
												Value	Units	Statistic (d)	Method (e)
	South Basin Area X	**Metals**													
		Aluminum	7429-90-5	mg/kg	23 / 23	0	3.14E+01	2.54E+02	2.88E+02	N	4.59E+02	2.88E+02	mg/kg	95UCL	(2)
		Antimony	7440-36-0	mg/kg	23 / 23	0	1.92E-02	4.42E-02	8.36E-02	NP	2.31E-01	8.36E-02	mg/kg	95UCL	(4)
		Arsenic	7440-38-2	mg/kg	23 / 23	0	2.00E+00	3.24E+00	3.42E+00	N	3.97E+00	3.42E+00	mg/kg	95UCL	(2)
		Barium	7440-39-3	mg/kg	23 / 23	0	4.67E-01	2.62E+00	3.03E+00	N	6.04E+00	3.03E+00	mg/kg	95UCL	(2)
		Cadmium	7440-43-9	mg/kg	23 / 23	0	2.51E-02	4.45E-02	4.99E-02	N	8.40E-02	4.99E-02	mg/kg	95UCL	(2)
		Chromium	7440-47-3	mg/kg	23 / 23	0	4.60E-01	1.74E+00	2.00E+00	N	3.52E+00	2.00E+00	mg/kg	95UCL	(2)
		Cobalt	7440-48-4	mg/kg	23 / 23	0	1.47E-01	3.25E-01	3.54E-01	N	4.80E-01	3.54E-01	mg/kg	95UCL	(2)
		Copper	7440-50-8	mg/kg	23 / 23	0	2.07E+00	3.20E+00	3.44E+00	N	4.43E+00	3.44E+00	mg/kg	95UCL	(2)
		Iron	7439-89-6	mg/kg	23 / 23	0	1.07E+02	3.43E+02	3.82E+02	N	6.28E+02	3.82E+02	mg/kg	95UCL	(2)
		Lead	7439-92-1	mg/kg	23 / 23	0	3.76E-01	1.15E+00	1.31E+00	N	2.35E+00	1.31E+00	mg/kg	95UCL	(2)
		Manganese	7439-96-5	mg/kg	23 / 23	0	2.20E+00	3.92E+00	4.37E+00	N	6.72E+00	4.37E+00	mg/kg	95UCL	(2)
		Mercury	7439-97-6	mg/kg	19 / 23	0	1.69E-02	2.32E-02	2.45E-02	NP	3.13E-02	2.45E-02	mg/kg	95UCL	(12)
		Molybdenum	7439-98-7	mg/kg	23 / 23	0	3.04E-01	4.35E-01	4.59E-01	N	5.63E-01	4.59E-01	mg/kg	95UCL	(2)
		Nickel	7440-02-0	mg/kg	23 / 23	0	3.51E-01	1.21E+00	1.34E+00	N	1.84E+00	1.34E+00	mg/kg	95UCL	(2)
		Selenium	7782-49-2	mg/kg	23 / 23	0	3.47E-01	6.88E-01	7.45E-01	N	9.33E-01	7.45E-01	mg/kg	95UCL	(2)
		Silver	7440-22-4	mg/kg	4 / 16	7	3.88E-02	3.95E-02	2.48E-02	NP	4.09E-02	2.48E-02	mg/kg	95UCL	(12)
		Vanadium	7440-62-2	mg/kg	23 / 23	0	4.05E-01	1.08E+00	1.20E+00	N	1.84E+00	1.20E+00	mg/kg	95UCL	(2)
		Zinc	7440-66-6	mg/kg	23 / 23	0	9.91E+00	1.69E+01	1.84E+01	N	2.40E+01	1.84E+01	mg/kg	95UCL	(2)
		Pesticides													
		4,4'-DDD	72-54-8	mg/kg	23 / 23	0	5.10E-04	1.62E-03	1.86E-03	N	3.94E-03	1.86E-03	mg/kg	95UCL	(2)
		4,4'-DDE	72-55-9	mg/kg	23 / 23	0	4.70E-04	5.20E-03	6.10E-03	N	1.07E-02	6.10E-03	mg/kg	95UCL	(2)
		4,4'-DDT	50-29-3	mg/kg	7 / 23	0	6.00E-05	2.34E-04	1.32E-04	NP	3.80E-04	1.32E-04	mg/kg	95UCL	(16)
		alpha-Chlordane	5103-71-9	mg/kg	23 / 23	0	9.00E-05	6.12E-04	1.08E-03	NP	2.69E-03	1.08E-03	mg/kg	95UCL	(4)
		Dieldrin	60-57-1	mg/kg	21 / 23	0	3.40E-04	1.03E-03	1.82E-03	NP	4.69E-03	1.82E-03	mg/kg	95UCL	(13)
		gamma-Chlordane	5566-34-7	mg/kg	23 / 23	0	9.00E-05	8.50E-04	1.52E-03	NP	3.74E-03	1.52E-03	mg/kg	95UCL	(4)
		PAHs													
		2-Methylnaphthalene	91-57-6	mg/kg	2 / 23	0	4.02E-04	5.26E-04	3.30E-04	NP	6.50E-04	3.30E-04	mg/kg	95UCL	(12)
		Acenaphthene	83-32-9	mg/kg	16 / 23	0	9.00E-05	2.77E-04	3.28E-04	NP	1.01E-03	3.28E-04	mg/kg	95UCL	(17)
		Acenaphthylene	208-96-8	mg/kg	17 / 23	0	1.10E-04	4.89E-04	4.91E-04	NP	9.00E-04	4.91E-04	mg/kg	95UCL	(16)
		Anthracene	120-12-7	mg/kg	23 / 23	0	4.70E-04	1.61E-03	1.91E-03	N	3.40E-03	1.91E-03	mg/kg	95UCL	(2)
		Fluorene	86-73-7	mg/kg	18 / 23	0	1.30E-04	3.54E-04	3.69E-04	NP	6.50E-04	3.69E-04	mg/kg	95UCL	(12)
		Naphthalene	91-20-3	mg/kg	1 / 23	0	1.98E-03	1.98E-03	N/A	--	1.98E-03	1.98E-03	mg/kg	Max	(1)
		Phenanthrene	85-01-8	mg/kg	21 / 23	0	9.70E-04	2.66E-03	3.91E-03	NP	6.50E-03	3.91E-03	mg/kg	95UCL	(13)
		Benzo(a)anthracene	56-55-3	mg/kg	23 / 23	0	3.90E-04	4.55E-03	5.25E-03	N	8.13E-03	5.25E-03	mg/kg	95UCL	(2)
		Benzo(a)pyrene	50-32-8	mg/kg	23 / 23	0	4.40E-04	6.75E-03	7.83E-03	N	1.65E-02	7.83E-03	mg/kg	95UCL	(2)
		Benzo(b)fluoranthene	205-99-2	mg/kg	23 / 23	0	6.30E-04	7.81E-03	8.90E-03	N	1.55E-02	8.90E-03	mg/kg	95UCL	(2)
		Benzo(g,h,i)perylene	191-24-2	mg/kg	23 / 23	0	4.30E-04	4.75E-03	5.42E-03	N	9.65E-03	5.42E-03	mg/kg	95UCL	(2)
		Benzo(k)fluoranthene	207-08-9	mg/kg	23 / 23	0	6.20E-04	8.66E-03	1.16E-02	NP	1.65E-02	1.16E-02	mg/kg	95UCL	(4)
		Chrysene	218-01-9	mg/kg	23 / 23	0	1.95E-03	7.48E-03	8.81E-03	N	1.66E-02	8.81E-03	mg/kg	95UCL	(2)
		Dibenz(a,h)anthracene	53-70-3	mg/kg	20 / 23	0	2.30E-04	3.86E-04	5.36E-04	NP	9.40E-04	5.36E-04	mg/kg	95UCL	(13)
		Fluoranthene	206-44-0	mg/kg	23 / 23	0	3.25E-03	1.79E-02	2.35E-02	G	5.39E-02	2.35E-02	mg/kg	95UCL	(11)
		Indeno(1,2,3-cd)pyrene	193-39-5	mg/kg	23 / 23	0	1.90E-04	3.10E-03	3.66E-03	N	7.30E-03	3.66E-03	mg/kg	95UCL	(2)
		Pyrene	129-00-0	mg/kg	21 / 23	0	2.80E-03	2.36E-02	3.02E-02	G	8.08E-02	3.02E-02	mg/kg	95UCL	(20)
		Butyltins													
		Dibutyltin	1002-53-5	mg/kg	21 / 21	2	1.03E-03	2.12E-03	2.46E-03	N	4.30E-03	2.46E-03	mg/kg	95UCL	(19)
		Tributyltin	688-73-3	mg/kg	23 / 23	0	2.11E-03	9.00E-03	1.22E-02	G	3.41E-02	1.22E-02	mg/kg	95UCL	(11)
		PCBs													
		Total PCB Congeners	1336-36-3	mg/kg	23 / 23	0	1.01E-01	2.68E-01	3.30E-01	G	6.62E-01	3.30E-01	mg/kg	95UCL	(11)
		Total TEQ – PCB DLC	--	mg/kg	23 / 23	0	3.76E-06	6.32E-06	7.67E-06	N	1.73E-05	7.67E-06	mg/kg	95UCL	(19)
		Dioxins													
		Total TEQ – TCDD DLC	--	mg/kg	2 / 2	0	5.40E-07	7.10E-07	N/A	--	8.80E-07	8.80E-07	mg/kg	Max	(1)

TABLE A-2
Exposure Point Concentration Summary for Macoma
Appendix A - Updated Human Health Risk Assessment for Chemical Exposures

Scenario Timeframe:	Current and Future
Medium:	Macoma
Exposure Medium:	Tissue

Exposure Point	Area	Chemical of Potential Concern	CAS Number	Units	Detection Frequency	Number of High Censored Results (a)	Minimum Concentration	Arithmetic Mean (b)	95 UCL Distribution (c)		Maximum Detected Concentration	Exposure Point Concentration Value	Units	Statistic (d)	Method (e)
	Reference Area	**Metals**													
		Aluminum	7429-90-5	mg/kg	25 / 25	0	4.96E+01	2.46E+02	2.79E+02	N	4.56E+02	2.79E+02	mg/kg	95UCL	(2)
		Antimony	7440-36-0	mg/kg	24 / 25	0	1.42E-02	2.48E-02	2.67E-02	NP	4.25E-02	2.67E-02	mg/kg	95UCL	(12)
		Arsenic	7440-38-2	mg/kg	25 / 25	0	2.72E+00	3.50E+00	3.78E+00	N	6.47E+00	3.78E+00	mg/kg	95UCL	(19)
		Barium	7440-39-3	mg/kg	25 / 25	0	8.08E-01	2.60E+00	2.94E+00	N	5.36E+00	2.94E+00	mg/kg	95UCL	(2)
		Cadmium	7440-43-9	mg/kg	25 / 25	0	3.38E-02	8.12E-02	1.45E-01	NP	3.53E-01	1.45E-01	mg/kg	95UCL	(4)
		Chromium	7440-47-3	mg/kg	25 / 25	0	6.70E-01	2.21E+00	2.82E+00	LN	8.31E+00	2.82E+00	mg/kg	95UCL	(3)
		Cobalt	7440-48-4	mg/kg	25 / 25	0	2.89E-01	4.70E-01	5.09E-01	N	7.56E-01	5.09E-01	mg/kg	95UCL	(2)
		Copper	7440-50-8	mg/kg	25 / 25	0	1.61E+00	2.26E+00	2.49E+00	N	4.93E+00	2.49E+00	mg/kg	95UCL	(19)
		Iron	7439-89-6	mg/kg	25 / 25	0	1.24E+02	3.45E+02	3.92E+02	N	6.92E+02	3.92E+02	mg/kg	95UCL	(2)
		Lead	7439-92-1	mg/kg	25 / 25	0	2.10E-01	4.33E-01	4.90E-01	N	8.80E-01	4.90E-01	mg/kg	95UCL	(2)
		Manganese	7439-96-5	mg/kg	25 / 25	0	4.08E+00	7.17E+00	7.93E+00	N	1.25E+01	7.93E+00	mg/kg	95UCL	(2)
		Mercury	7439-97-6	mg/kg	16 / 25	0	1.63E-02	2.42E-02	2.54E-02	NP	5.44E-02	2.54E-02	mg/kg	95UCL	(17)
		Molybdenum	7439-98-7	mg/kg	25 / 25	0	3.66E-01	4.55E-01	4.92E-01	N	8.95E-01	4.92E-01	mg/kg	95UCL	(19)
		Nickel	7440-02-0	mg/kg	25 / 25	0	7.52E-01	1.24E+00	1.36E+00	N	2.13E+00	1.36E+00	mg/kg	95UCL	(2)
		Selenium	7782-49-2	mg/kg	25 / 25	0	4.66E-01	7.31E-01	7.87E-01	N	1.15E+00	7.87E-01	mg/kg	95UCL	(2)
		Silver	7440-22-4	mg/kg	9 / 23	2	1.92E-02	2.81E-02	2.76E-02	NP	4.25E-02	2.76E-02	mg/kg	95UCL	(12)
		Vanadium	7440-62-2	mg/kg	25 / 25	0	5.84E-01	1.32E+00	1.52E+00	G	2.50E+00	1.52E+00	mg/kg	95UCL	(11)
		Zinc	7440-66-6	mg/kg	25 / 25	0	1.26E+01	1.68E+01	1.83E+01	N	3.17E+01	1.83E+01	mg/kg	95UCL	(19)
		Pesticides													
		4,4'-DDD	72-54-8	mg/kg	25 / 25	0	1.70E-04	4.60E-04	5.06E-04	N	7.50E-04	5.06E-04	mg/kg	95UCL	(2)
		4,4'-DDE	72-55-9	mg/kg	25 / 25	0	4.20E-04	7.93E-04	8.73E-04	N	1.29E-03	8.73E-04	mg/kg	95UCL	(2)
		4,4'-DDT	50-29-3	mg/kg	1 / 25	0	3.70E-04	3.70E-04	N/A	--	3.70E-04	3.70E-04	mg/kg	Max	(1)
		alpha-Chlordane	5103-71-9	mg/kg	22 / 25	0	5.00E-05	1.08E-04	1.18E-04	NP	2.00E-04	1.18E-04	mg/kg	95UCL	(12)
		Dieldrin	60-57-1	mg/kg	19 / 25	0	8.00E-05	1.58E-04	1.60E-04	NP	3.60E-04	1.60E-04	mg/kg	95UCL	(17)
		gamma-Chlordane	5566-34-7	mg/kg	21 / 25	0	2.00E-05	8.71E-05	9.69E-05	G	1.60E-04	9.69E-05	mg/kg	95UCL	(20)
		PAHs													
		Acenaphthene	83-32-9	mg/kg	20 / 25	0	9.00E-05	1.74E-04	1.85E-04	NP	2.70E-04	1.85E-04	mg/kg	95UCL	(12)
		Acenaphthylene	208-96-8	mg/kg	20 / 25	0	1.40E-04	2.94E-04	3.12E-04	NP	5.40E-04	3.12E-04	mg/kg	95UCL	(12)
		Anthracene	120-12-7	mg/kg	25 / 25	0	3.20E-04	1.01E-03	1.22E-03	G	2.21E-03	1.22E-03	mg/kg	95UCL	(11)
		Fluorene	86-73-7	mg/kg	20 / 25	0	1.50E-04	2.50E-04	2.67E-04	NP	4.40E-04	2.67E-04	mg/kg	95UCL	(16)
		Phenanthrene	85-01-8	mg/kg	20 / 25	0	8.40E-04	2.33E-03	2.53E-03	NP	4.62E-03	2.53E-03	mg/kg	95UCL	(17)
		Benzo(a)anthracene	56-55-3	mg/kg	25 / 25	0	1.07E-03	2.20E-03	2.49E-03	N	4.19E-03	2.49E-03	mg/kg	95UCL	(2)
		Benzo(a)pyrene	50-32-8	mg/kg	25 / 25	0	1.75E-03	3.37E-03	3.78E-03	N	5.68E-03	3.78E-03	mg/kg	95UCL	(2)
		Benzo(b)fluoranthene	205-99-2	mg/kg	25 / 25	0	1.30E-03	3.09E-03	3.49E-03	N	5.09E-03	3.49E-03	mg/kg	95UCL	(2)
		Benzo(g,h,i)perylene	191-24-2	mg/kg	25 / 25	0	8.00E-04	2.61E-03	3.03E-03	N	4.78E-03	3.03E-03	mg/kg	95UCL	(2)
		Benzo(k)fluoranthene	207-08-9	mg/kg	25 / 25	0	1.76E-03	3.58E-03	3.99E-03	N	6.33E-03	3.99E-03	mg/kg	95UCL	(2)
		Chrysene	218-01-9	mg/kg	25 / 25	0	1.77E-03	3.77E-03	4.35E-03	N	7.95E-03	4.35E-03	mg/kg	95UCL	(2)
		Dibenz(a,h)anthracene	53-70-3	mg/kg	14 / 25	0	1.10E-04	1.81E-04	1.41E-04	NP	3.15E-04	1.41E-04	mg/kg	95UCL	(12)
		Fluoranthene	206-44-0	mg/kg	25 / 25	0	3.86E-03	8.52E-03	1.01E-02	G	1.72E-02	1.01E-02	mg/kg	95UCL	(11)
		Indeno(1,2,3-cd)pyrene	193-39-5	mg/kg	25 / 25	0	4.70E-04	1.56E-03	1.83E-03	N	2.87E-03	1.83E-03	mg/kg	95UCL	(2)
		Pyrene	129-00-0	mg/kg	20 / 25	0	4.11E-03	1.11E-02	1.21E-02	NP	2.25E-02	1.21E-02	mg/kg	95UCL	(12)
		Butyltins													
		Dibutyltin	1002-53-5	mg/kg	23 / 23	1	1.05E-03	1.46E-03	1.60E-03	G	2.52E-03	1.60E-03	mg/kg	95UCL	(11)
		Tributyltin	688-73-3	mg/kg	24 / 24	0	2.02E-03	3.88E-03	4.78E-03	N	1.24E-02	4.78E-03	mg/kg	95UCL	(19)
		PCBs													
		Total PCB Congeners	1336-36-3	mg/kg	25 / 25	0	5.55E-03	1.01E-02	1.19E-02	N	2.25E-02	1.19E-02	mg/kg	95UCL	(19)
		Total TEQ – PCB DLC	--	mg/kg	25 / 25	0	3.51E-06	5.94E-06	7.17E-06	N	1.65E-05	7.17E-06	mg/kg	95UCL	(19)
		Dioxins													
		Total TEQ – TCDD DLC	--	mg/kg	5 / 5	0	3.64E-07	3.76E-07	3.87E-07	N	3.90E-07	3.87E-07	mg/kg	95UCL	(2)

TABLE A-2
Exposure Point Concentration Summary for Macoma
Appendix A - Updated Human Health Risk Assessment for Chemical Exposures

Scenario Timeframe:	Current and Future
Medium:	Macoma
Exposure Medium:	Tissue

Exposure Point	Area	Chemical of Potential Concern	CAS Number	Units	Detection Frequency	Number of High Censored Results (a)	Minimum Concentration	Arithmetic Mean (b)	95 UCL Distribution (c)	Maximum Detected Concentration	Exposure Point Concentration			
											Value	Units	Statistic (d)	Method (e)

Notes:

--	Not applicable
95UCL	A 95% upper confidence limit, the upper boundary (or limit) of a confidence interval of a parameter of interest such as the population mean
DDD	Dichlorodiphenyldichloroethane
DDE	Dichlorodiphenyldichloroethylene
DDT	Dichlorodiphenyltrichloroethane
DLC	Dioxin-like Congeners
EPC	Exposure point concentration
KM	Kaplan-Meier product limit estimator
Max	Maximum detected concentration
mg/kg	Milligram per kilogram
N/A	Not applicable, no estimate provided because there were fewer than five total results and four distinct detected results.
PAH	Polycyclic Aromatic Hydrocarbons
PCB	Polychlorinated biphenyl
TCDD	Tetrachlorodibenzo-p-dioxin
TEQ	Toxic Equivalents
USEPA	United States Environmental Protection Agency
a	Number of censored (nondetect) results that exceeded the maximum detected concentration. The nondetected results are based on the sample-specific detection limits. These results were excluded from the statistical calculations. The three data distributions considered in ProUCL 5.0.00 include the normal, lognormal, and the gamma distributions. Shapiro-Wilk (n 50) and Lilliefors (n > 50) test statistics are used to test for normality or lognormality of a data set. A five percent level of significance was used in all tests. Distribution tests were only conducted for samples with at least 4 detected results. Distributions not confirmed as normal, lognormal, or gamma, or not tested, were treated as nonparametric in all statistical calculations.
b	Arithmetic mean based on detected data only. <u>Distribution Codes</u>: G= gamma, LN= lognormal, N= normal, NP= nonparametric
d	The EPC is the lesser of the UCL and the maximum detected result. The maximum detected result is the default when there are fewer than 5 total results or fewer than 4 detected results.
e	All methods follow USEPA (2002, 2013).

<u>Method (Statistic) Codes are defined as follows</u>:

(1)	Maximum detected concentration
(2)	95 percent UCL calculated using Student's t distribution
(3)	95 percent UCL calculated using Land's H statistic
(4), (5), (6)	95, 97.5, or 99 percent UCL, respectively, calculated using the nonparametric Chebyshev method
(7), (8), (9)	95, 97.5, or 99 percent UCL, respectively, calculated using the MVUE Chebyshev method
(10)	95 percent UCL calculated using the approximate gamma method
(11)	95 percent UCL calculated using the adjusted gamma method
(12)	95 percent UCL calculated using the KM mean and Student's t cuttoff for the UCL
(13), (14), (15)	95, 97.5, or 99 percent UCL, respectively, calculated using the KM mean and the nonparametric Chebyshev method to estimate the UCL
(16)	95 percent UCL calculated using the KM mean and a percentile bootstrap to estimate the UCL
(17)	95 percent UCL calculated using the KM mean and a BCA bootstrap to estimate the UCL
(18)	Hall's bootstrap
(19)	95 percent UCL calculated using Modified t distribution
(20)	95 percent UCL calculated using the adjusted gamma KM statistic

References:

United States Environmental Protection Agency (USEPA). 2002. “Calculating Exposure Point Concentrations at Hazardous Waste Sites.” OSWER 9285.6-10. Office of Emergency and Remedial Response. December.
United States Environmental Protection Agency (USEPA). 2013. “ProUCL Version 5.0.00 Technical Guide.” Prepared by Singh, A., Armbya, N. and Singh, A.K. EPA/600/R-07/041. 2013.

TABLE A-3

Values Used for Daily Intake, Sediment Exposure

Appendix A - Updated Human Health Risk Assessment for Chemical Exposures

Scenario Timef	Current/Future
Medium:	Sediment
Exposure Mediu	Sediment

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter	Parameter Definition	2005 HHRA RME Value[a]	RME Value Used for Updated HHRA	Units	RME Exposure Value Revised for Updated HHRA?	Reference for RME Value Used for Updated HHRA	Intake Equation[b]
Ingestion	Construction Worker	Adult	Parcel F	CS	Chemical Concentration in Sediment	Chemical-specific	Chemical-specific	mg/kg		See Table A-1.	Intake (mg/kg-day) = (CS x FI x IRS x EF x ED x MCF) / (BW x AT)
				IRS	Ingestion Rate – Sediment	100	330	mg/day	Yes	USEPA, 2002; DTSC, 2014. Soil ingestion rate assumed for sediment ingestion rate.	
				FI	Fraction Ingested	1	1	unitless		BBL, 2005	
				RBA	Relative bioavailability (arsenic)	--	0.6	unitless	Yes	USEPA, 2014	Arsenic Intake (mg/kg-day) = (CS x FI x IRS x RBA x EF x ED x MCF) / (BW x AT)
				EF	Exposure Frequency	120	250	days/year	Yes	USEPA, 2002; DTSC, 2014. Soil exposure frequency assumed for sediment exposure frequency.	
				ED	Exposure Duration	1	1	years		USEPA, 2002; DTSC, 2014	
				MCF	Mass Conversion Factor	1E-06	1E-06	kg/mg		Not applicable	
				BW	Body Weight	70	80	kg	Yes	USEPA, 2014	
				AT-C	Averaging Time – Cancer	25,550	25,550	days		USEPA, 2002; DTSC, 2014	
				AT-NC	Averaging Time – Noncancer	365	365	days		USEPA, 2002; DTSC, 2014	
	Recreational User	Adult	Parcel F	CS	Chemical Concentration in Sediment	Chemical-specific	Chemical-specific	mg/kg		See Table A-1.	Intake (mg/kg-day) = (CS x FI x IRS x EF x ED x MCF) / (BW x AT)
				IRS	Ingestion Rate – Sediment	100	100	mg/day		USEPA, 2014; DTSC 2014. Soil ingestion rate assumed for sediment ingestion rate.	
				FI	Fraction Ingested	1	1	unitless		BBL, 2005	See note c for recreational user intake equation for mutagenic chemicals.
				RBA	Relative bioavailability (arsenic)	--	0.6	unitless	Yes	USEPA, 2014	Arsenic Intake (mg/kg-day) = (CS x FI x IRS x RBA x EF x ED x MCF) / (BW x AT)
				EF	Exposure Frequency	26	26	days/year		BBL, 2005	
				ED	Exposure Duration	30	20	years	Yes	USEPA, 2014; DTSC, 2014. Soil exposure duration assumed for sediment exposure duration.	
				MCF	Mass Conversion Factor	1E-06	1E-06	kg/mg		Not applicable	
				BW	Body Weight	70	80	kg	Yes	USEPA, 2014	
				AT-C	Averaging Time – Cancer	25,550	25,550	days		USEPA, 2014; DTSC, 2014	
				AT-NC	Averaging Time – Noncancer	10,950	7,300	days	Yes	USEPA, 2014	
		Child	Parcel F	CS	Chemical Concentration in Sediment	Chemical-specific	Chemical-specific	mg/kg		See Table A-1.	Intake (mg/kg-day) = (CS x FI x IRS x EF x ED x MCF) / (BW x AT)
				IRS	Ingestion Rate – Sediment	100	200	mg/day	Yes	USEPA, 2013; DTSC 2014. Soil ingestion rate assumed for sediment ingestion rate.	
				FI	Fraction Ingested	1	1	unitless		BBL, 2005	See note b for intake equation for mutagenic chemicals.
				RBA	Relative bioavailability (arsenic)	--	0.6	unitless	Yes	USEPA, 2014	Arsenic Intake (mg/kg-day) = (CS x FI x IRS x RBA x EF x ED x MCF) / (BW x AT)
				EF	Exposure Frequency	26	26	days/year		BBL, 2005	
				ED	Exposure Duration	6	6	years		USEPA, 2014; DTSC, 2014. Soil exposure duration assumed for sediment exposure duration.	
				MCF	Mass Conversion Factor	1E-06	1E-06	kg/mg		Not applicable	
				BW	Body Weight	15	15	kg		USEPA, 2014; DTSC, 2014	
				AT-C	Averaging Time – Cancer	25,550	25,550	days		USEPA, 2014; DTSC, 2014	
				AT-NC	Averaging Time – Noncancer	2,190	2,190	days		USEPA, 2014; DTSC, 2014	
Dermal	Construction Worker	Adult	Parcel F	CS	Chemical Concentration in Sediment	Chemical-specific	Chemical-specific	mg/kg		See Table A-1.	Intake (mg/kg-day) = (CS x ABS x SA x AF x EF x ED x MCF) / (BW x AT)
				ABS	Dermal Absorption Factor	Chemical-specific	Chemical-specific	unitless		See Table A-5.	
				SA	Exposed Skin Surface Area	3,300	6,032	cm^2/day	Yes	DTSC, 2014. Soil exposed skin surface area assumed for sediment exposed skin surface area.	
				AF	Sediment to Skin Adherence	0.2	0.8	mg/cm^2	Yes	DTSC, 2014.	
				EF	Exposure Frequency	120	250	days/year	Yes	DTSC, 2014. Soil exposure frequency assumed for sediment exposure frequency.	
				ED	Exposure Duration	1	1	years		USEPA, 2002; DTSC, 2014	
				MCF	Mass Conversion Factor	1E-06	1E-06	kg/mg		Not applicable	
				BW	Body Weight	70	80	kg	Yes	USEPA, 2014	
				AT-C	Averaging Time – Cancer	25,550	25,550	days		USEPA, 2002; DTSC, 2014	
				AT-NC	Averaging Time – Noncancer	365	365	days		USEPA, 2014	

TABLE A-3

Values Used for Daily Intake, Sediment Exposure

Appendix A - Updated Human Health Risk Assessment for Chemical Exposures

Scenario Timef	Current/Future
Medium:	Sediment
Exposure Mediu	Sediment

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter	Parameter Definition	2005 HHRA RME Value[a]	RME Value Used for Updated HHRA	Units	RME Exposure Value Revised for Updated HHRA?	Reference for RME Value Used for Updated HHRA	Intake Equation[b]
Dermal (Continued)	Recreational User	Adult	Parcel F	CS	Chemical Concentration in Sediment	Chemical-specific	Chemical-specific	mg/kg		See Table A-1.	Intake (mg/kg-day) = (CS x ABS x SA x AF x EF x ED x MCF) / (BW x AT)
				ABS	Dermal Absorption Factor	Chemical-specific	Chemical-specific	unitless		See Table A-5.	
				SA	Exposed Skin Surface Area	5,700	6,032	cm^2/day	Yes	USEPA, 2014; DTSC, 2014. Soil exposed skin surface area assumed for sediment exposed skin	
				AF	Sediment to Skin Adherence	0.07	0.07	mg/cm^2		USEPA, 2014; DTSC, 2014	See note b for intake equation for mutagenic mutagenic chemicals.
				EF	Exposure Frequency	26	26	days/year		BBL, 2005	
				ED	Exposure Duration	30	20	years	Yes	USEPA, 2014; DTSC, 2014	
				MCF	Mass Conversion Factor	1E-06	1E-06	kg/mg		Not applicable	
				BW	Body Weight	70	80	kg	Yes	USEPA, 2014	
				AT-C	Averaging Time – Cancer	25,550	25,550	days		USEPA, 2014; DTSC, 2014	
				AT-NC	Averaging Time – Noncancer	10,950	7,300	days	Yes	USEPA, 2014	
		Child	Parcel F	CS	Chemical Concentration in Sediment	Chemical-specific	Chemical-specific	mg/kg		See Table A-1.	Intake (mg/kg-day) = (CS x ABS x SA x AF x EF x ED x MCF) / (BW x AT)
				ABS	Dermal Absorption Factor	Chemical-specific	Chemical-specific	unitless		See Table A-5.	
				SA	Exposed Skin Surface Area	2,800	2,900	cm^2/day	Yes	USEPA, 2014; DTSC, 2014. Soil exposed skin surface area assumed for sediment exposed skin	
				AF	Sediment to Skin Adherence	0.2	0.2	mg/cm^2		USEPA, 2014; DTSC 2014	See note b for intake equation for mutagenic mutagenic chemicals.
				EF	Exposure Frequency	26	26	days/year		BBL, 2005	
				ED	Exposure Duration	6	6	years		USEPA, 2014; DTSC, 2014	
				MCF	Mass Conversion Factor	1E-06	1E-06	kg/mg		Not applicable	
				BW	Body Weight	15	15	kg		USEPA, 2014; DTSC, 2014	
				AT-C	Averaging Time – Cancer	25,550	25,550	days		USEPA, 2014; DTSC, 2014	
				AT-NC	Averaging Time – Noncancer	2,190	2,190	days		USEPA, 2014; DTSC, 2014	

Notes:

[a] 2005 HHRA RME values from BBL and Neptune & Company (2005).

[b] Unless otherwise indicated, intake equations shown are for non-mutagenic chemicals.

[c] Consistent with USEPA (2014), intake of mutagenic chemicals in sediment was calculated using the following equations. Receptors exposed to carcinogens with a mutagenic mode of action (MMOA) are assumed to have increased early-life susceptibility; therefore, evaluation of MMOA is limited to the residential scenario. See Section 5.1 for discussion of the chemicals of potential concern identified as mutagens.

Sediment Ingestion

Intake (M) (mg/kg-day) = CS x FI x IRS (M) x EF x MCF / AT-C, where IRS (M) (mg-year/kg-day) =

[$ADAF_{0\text{-}2}$ (10) x $ED_{0\text{-}2}$ (2 years) x IRS_{child} (200 mg/day) / BW_{child} (15 kg)] + [$ADAF_{2\text{-}6}$ (3) x ($ED_{2\text{-}6}$ (4 years) x IRS_{child} (200 mg/day) / BW_{child} (15 kg)] + [$ADAF_{6\text{-}16}$ (3) x ($ED_{6\text{-}16}$ (10 years) x IRS_{adult} (100 mg/day) / BW_{adult} (80 kg)] + [$ADAF_{16\text{-}26}$ (1) x ($ED_{16\text{-}26}$ (10 years) x IRS_{adult} (100 mg/day) / BW_{adult} (80 kg)]

Dermal Contact with Sediment

Intake (M) (mg/kg-day) = CS x ABS x SA (M) x EF x MCF / AT-C, where SA (M) (mg-year/kg-day) =

[$ADAF_{0\text{-}2}$ (10) x $ED_{0\text{-}2}$ (2 years) x SA_{child} (2,900 cm^2/day) x AF_{child} (0.2 mg/cm^2) / BW_{child} (15 kg)] + [$ADAF_{2\text{-}6}$ (3) x ($ED_{2\text{-}6}$ (4 years) x SA_{child} (2,900 cm^2/day) x AF_{child} (0.2 mg/cm^2) / BW_{child} (15 kg)] + [$ADAF_{6\text{-}16}$ (3) x ($ED_{6\text{-}16}$ (10 years) x SA_{adult} (5,700 cm^2/day) x AF_{adult} (0.07 mg/cm^2) / BW_{adult} (80 kg)] + [$ADAF_{16\text{-}26}$ (1) x ($ED_{16\text{-}26}$ (10 years) x SA_{adult} (5,700 cm^2/day) x AF_{adult} (0.07 mg/cm^2) / BW_{adult} (80 kg)]

Acronyms/Abbreviations:

ADAF =	age-dependent adjustment factor	mg/day =	milligram(s) per day
cm^2 =	square centimeter(s)	mg/kg =	milligram(s) per kilogram
cm^2/day =	square centimeter(s) per day	mg/kg-day =	milligram(s) per kilogram(s) per day
kg =	kilogram(s)	mg-year/kg-day =	milligram(s) per year per kilogram(s) per day
kg/mg =	kilogram(s) per milligram	MMOA =	mutagenic mode of action
(M) =	mutagenic	USEPA =	United States Environmental Protection Agency
mg/cm^2 =	milligram(s) per square centimeter		

References:

Battelle, Blasland, Bouck & Lee, Inc. (BBL), and Neptune & Company. 2005. “Final Hunter Point Shipyard Parcel F, Validation Study Report, San Francisco Bay, California.” May 2.

California Department of Toxic Substances Control (DTSC). 2014. Recommended DTSC Default Exposure Factors for Use in Risk Assessment at California Hazardous Waste Sites and Permitted Facilities. Office of Human and Ecological Risk (HERO). HERO HHRA Note Number 1. September 30.
United States Environmental Protection Agency (EPA). 2002. "Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites, Interim Guidance." Office of Solid Waste and Emergency Response. OSWER 9355.4-24. December.
United States Environmental Protection Agency (USEPA). 2014. "Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites." May.

TABLE A-4
Values Used for Daily Intake, Macoma Exposure
Appendix A - Updated Human Health Risk Assessment for Chemical Exposures

Scenario Timeframe:	Current/Future
Medium:	Macoma
Exposure Medium:	Macoma

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter	Parameter Definition	2005 VS HHRA RME Value (a)	RME Value Used for Updated HHRA	Units	RME Exposure Value Revised for Updated HHRA?	Reference for RME Value Used for Updated HHRA	Intake Equation
Ingestion	Recreational User	Adult	Parcel F	CS	Chemical Concentration in shellfish	Chemical-specific	Chemical-specific	mg/kg		See Table A-2.	Intake (mg/kg-day) = (CS x FI x IRS x EF x ED) / (BW x AT)
				IRS	Ingestion Rate – shellfish	0.048	0.00213	kg/day	Yes	Barajas & Associates, Inc., 2008	
				FI	Fraction Ingested	1	1	unitless		Barajas & Associates, Inc., 2008	
				EF	Exposure Frequency	365	365	days/year		BBL, 2005	
				ED	Exposure Duration	30	20	years	Yes	USEPA, 2014	
				BW	Body Weight	70	80	kg	Yes	USEPA, 2014	
				AT-C	Averaging Time – Cancer	25,550	25,550	days		USEPA, 2014; DTSC, 2014	
				AT-NC	Averaging Time – Noncancer	10,950	7,300	days	Yes	USEPA, 2014	

Notes:

[a] Macoma tissue risk calculations are evaluated for the adult receptor only with the assumption there is no child ingestion of shellfish. Therefore, mutagenic mode of action (MMOA) was not evaluated for mutagenic COPCs for Macoma, because cancer risks are limited to adult exposures.

Acronyms/Abbreviations:

kg =	kilogram(s)
kg/day =	kilogram(s) per day
mg/kg =	milligram(s) per kilogram
mg/kg-day =	milligram(s) per kilogram(s) per day
mg-year/kg-day =	milligram(s) per year per kilogram(s) per day
USEPA =	United States Environmental Protection Agency

Sources:

Barajas & Associates, Inc. 2008. "Final Feasibility Study Report for Parcel F, Hunters Point Shipyard, San Francisco, California." April 30.
Battelle, Blasland, Bouck & Lee, Inc. (BBL), and Neptune & Company. 2005. “Final Hunter Point Shipyard Parcel F, Validation Study Report, San Francisco Bay, California.” May 2.
California Department of Toxic Substances Control (DTSC). 2014. Recommended DTSC Default Exposure Factors for Use in Risk Assessment at California Hazardous Waste Sites and Permitted Facilities. Office of Human and Ecological Risk (HERO). HERO HHRA Note Number 1. September 30.

United States Environmental Protection Agency (USEPA). 2014. Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites. May.

TABLE A-5

Cancer and Noncancer Toxicity Values Used for Risk Estimates

Appendix A - Updated Human Health Risk Assessment for Chemical Exposures

Analyte	CAS Number	Mutagen (M)	Dermal ABS (unitless) (a)	2005 HHRA Dermal ABS (b)	Change in Dermal ABS?	GI Absorption Fraction (c)	Current Oral Slope Factor $(mg/kg\text{-}day)^{-1}$ (d)	Ref	Current Dermal Slope Factor $(mg/kg\text{-}day)^{-1}$ (d)	Ref	2005 HHRA Oral Slope Factor $(mg/kg\text{-}day)^{-1}$ (b)	Change in Oral Slope Factor?	Oral Reference Dose (mg/kg-day)	Ref	Dermal Reference Dose (mg/kg-day)	Ref	2005 HHRA Oral Reference Dose (mg/kg-day) (b)	Change in Oral Reference Dose?	Notes
2,4'-DDD	53-19-0		0.05	0.03	Yes	1	0.24	I	0.24	I	0.24		0.0005	I	0.0005	I	--		4,4-DDD as surrogate for oral SF; 4,4-DDT as surrogate for oral RfD
2,4'-DDE	3424-82-6		0.05	0.03	Yes	1	0.34	I	0.34	I	0.34		0.0005	I	0.0005	I	--		4,4-DDE as surrogate for oral SF; 4,4-DDT as surrogate for oral RfD
2,4'-DDT	789-02-6		0.05	0.03	Yes	1	0.34	I	0.34	I	0.34		0.0005	I	0.0005	I	--	Yes	4,4-DDT as surrogate
2-Methylnaphthalene	91-57-6		0.15	--	Yes	1	--		--		--		0.004	I	0.004	I	--	Yes	
4,4'-DDD	72-54-8		0.05	0.03	Yes	1	0.24	I	0.24	I	0.24		0.0005	I	0.0005	I	--	Yes	4,4-DDT as surrogate for oral RfD
4,4'-DDE	72-55-9		0.05	0.03	Yes	1	0.34	I	0.34	I	0.34		0.0005	I	0.0005	I	--	Yes	4,4-DDT as surrogate for oral RfD
4,4'-DDT	50-29-3		0.05	0.03	Yes	1	0.34	I	0.34	I	0.34		0.0005	I	0.0005	I	--	Yes	
Acenaphthene	83-32-9		0.15	0.1	Yes	1	--		--		--		0.06	I	0.06	I	0.06		
Acenaphthylene	208-96-8		0.15	0.1	Yes	1	--		--		--		0.06	I	0.06	I	--	Yes	Acenaphthene as surrogate
alpha-Chlordane	5103-71-9		0.05	0.04	Yes	1	0.35	I	0.35	I	1.3	Yes	0.0005	I	0.0005	I	0.0005		Chlordane as surrogate
Aluminum	7429-90-5		0.01	0.01		1	--		--		--		1	P	1	P	--	Yes	
Anthracene	120-12-7		0.15	0.001	Yes	1	--		--		--		0.3	I	0.3	I	0.3		
Antimony	7440-36-0		0.01	0.01		0.15	--		--		--		0.0004	I	0.00006	I	0.0004		
Arsenic	7440-38-2		0.03	0.03		1	9.5	O	9.5	O	1.5	Yes	0.0003	I	0.0003	I	0.0003		
Barium	7440-39-3		0.01	0.01		0.07	--		--		--		0.2	I	0.014	I	--	Yes	
Benzo(a)anthracene	56-55-3	M	0.15	0.13	Yes	1	1.2	O	1.2	O	1.2		--		--		--		
Benzo(a)pyrene	50-32-8	M	0.15	0.13	Yes	1	7.3	I	7.3	I	12	Yes	--		--		--		
Benzo(b)fluoranthene	205-99-2	M	0.15	0.13	Yes	1	1.2	O	1.2	O	1.2		--		--		--		
Benzo(g,h,i)perylene	191-24-2		0.15	0.13	Yes	1	--		--		--		0.03	I	0.03	I	--	Yes	Pyrene as surrogate
Benzo(k)fluoranthene	207-08-9	M	0.15	0.13	Yes	1	1.2	O	1.2	O	1.2		--		--		--		
Cadmium	7440-43-9		0.001	0.01	Yes	0.025	15	O	600	O	0.38	Yes	0.001	I	0.000025	I	0.0005	Yes	
Chromium	7440-47-3		0.01	0.01		0.013	--		--		0.19	Yes	1.5	I	0.0195	I	0.003	Yes	Chromium III as surrogate for oral RfD
Chrysene	218-01-9	M	0.15	0.13	Yes	1	0.12	O	0.12	O	0.12		--		--		--		
Cobalt	7440-48-4		0.01	0.01		1	--		--		--		0.0003	P	0.0003	P	--	Yes	
Copper	7440-50-8		0.01	0.01		1	--		--		--		0.04	H	0.04	H	0.037	Yes	
Dibenz(a,h)anthracene	53-70-3	M	0.15	0.13	Yes	1	7.3	E	7.3	E	4.1	Yes	--		--		--		
Dibutyltin	1002-53-5		0.1	0.1		1	--		--		--		0.0003	A	0.0003	A	--	Yes	Tributyltin as surrogate
Dieldrin	60-57-1		0.1	0.1		1	16	I	16	I	16		0.00005	I	0.00005	I	0.00005		
Endosulfan II	33213-65-9		0.1	0.1		1	--		--		--		0.006	I	0.006	I	0.006		Endosulfan as surrogate
Endrin	72-20-8		0.1	0.1		1	--		--		--		0.0003	I	0.0003	I	0.0003		
Fluoranthene	206-44-0		0.15	0.13	Yes	1	--		--		--		0.04	I	0.04	I	0.04		
Fluorene	86-73-7		0.15	0.1	Yes	1	--		--		--		0.04	I	0.04	I	0.04		
gamma-Chlordane	5566-34-7		0.05	0.04	Yes	1	0.35	I	0.35	I	1.3	Yes	0.0005	I	0.0005	I	0.0005		Chlordane as surrogate
Heptachlor	76-44-8		0.1	0.1		1	4.5	I	4.5	I	4.1	Yes	0.0005	I	0.0005	I	0.0005		
Indeno(1,2,3-cd)pyrene	193-39-5	M	0.15	0.13	Yes	1	1.2	O	1.2	O	1.2		--		--		--		
Iron	7439-89-6		0.01	--	Yes	1	--		--		--		0.7	P	0.7	P	--	Yes	
Lead	7439-92-1		0.01	0.01		1	--		--		0.0085	Yes	--		--		--		
Manganese	7439-96-5		0.01	0.01		1	--		--		--		0.14	I	0.14	I	--	Yes	Manganese (diet)
Mercury	7439-97-6		0.01	0.01		1	--		--		--		0.0001	I	0.0001	I	0.0001		Methyl mercury as surrogate
Molybdenum	7439-98-7		0.01	0.1	Yes	1	--		--		--		0.005	I	0.005	I	--	Yes	
Monobutyltin	78763-54-9		0.1	0.1		1	--		--		--		0.0003	A	0.0003	A	--	Yes	Tributyltin as surrogate
Naphthalene	91-20-3		0.15	0.1	Yes	1	--		--		--		0.02	I	0.02	I	0.02		
Nickel	7440-02-0		0.01	0.01		0.04	--		--		--		0.02	I	0.0008	I	0.02		
Phenanthrene	85-01-8		0.15	0.1	Yes	1	--		--		--		0.3	I	0.3	I	--	Yes	Anthracene as surrogate
Pyrene	129-00-0		0.15	0.1	Yes	1	--		--		--		0.03	I	0.03	I	0.03		
Selenium	7782-49-2		0.01	0.01		1	--		--		--		0.005	I	0.005	I	0.005		

TABLE A-5

Cancer and Noncancer Toxicity Values Used for Risk Estimates

Appendix A - Updated Human Health Risk Assessment for Chemical Exposures

Analyte	CAS Number	Mutagen (M)	Dermal ABS (unitless) (a)	2005 HHRA Dermal ABS (b)	Change in Dermal ABS?	GI Absorption Fraction (c)	Current Oral Slope Factor $(mg/kg\text{-}day)^{-1}$ (d)	Ref	Current Dermal Slope Factor $(mg/kg\text{-}day)^{-1}$ (d)	Ref	2005 HHRA Oral Slope Factor $(mg/kg\text{-}day)^{-1}$ (b)	Change in Oral Slope Factor?	Oral Reference Dose (mg/kg-day)	Ref	Dermal Reference Dose (mg/kg-day)	Ref	2005 HHRA Oral Reference Dose (mg/kg-day) (b)	Change in Oral Reference Dose?	Notes
Silver	7440-22-4		0.01	0.01		0.04	--		--		--		0.005	I	0.0002	I	0.005		
Tetrabutyltin	1461-25-2		0.1	0.1		1	--		--		--		0.0003	A	0.0003	A	--	Yes	Tributyltin as surrogate
Total PCB Congeners	1336-36-3		0.15	0.14	Yes	1	2	I	2	I	5	Yes	0.00002	I	0.00002	I	--		Polychlorinated biphenyls (high risk); Aroclor-1254 as surrogate for oral RfD
Total TEQ – PCB DLC	--		0.03	0.03		1	130000	C	130000	C	130000		7E-10	I	7E-10	I	--	Yes	2,3,7,8-TCDD as surrogate
Total TEQ – TCDD DLC	--		0.03	0.03		1	130000	C	130000	C	130000		7E-10	I	7E-10	I	--	Yes	2,3,7,8-TCDD as surrogate
Tributyltin	688-73-3		0.1	0.1		1	--		--		--		0.0003	A	0.0003	A	--	Yes	
Vanadium	7440-62-2		0.01	0.01		0.026	--		--		--		0.005	I	0.00013	I	--	Yes	
Zinc	7440-66-6		0.01	0.01		1	--		--		--		0.3	I	0.3	I	0.3		

Notes:
(a) The dermal ABS is the most conservative between USEPA (2014) and DTSC (2013).
(b) Values from Battelle, BBL, and Nepture & Company (2005)
(c) Values from USEPA (2004)
(d) Values are based the most conservative value between oral SFs between USEPA (2014) and OEHHA (2014).
-- = not applicable or not available
A = ATSDR (as cited in EPA [2014])
C = California Environmental Protection Agencty (as cited in USEPA [2014]))
E = Environmental Criteria and Assessment Office (as cited in USEPA [2014])
H = Health Effects Assessment Summary Tables (as cited in USEPA [2014])
I = Integrated Risk Information System (as cited in USEPA [2014])
M = mutagen
O = Office of Enviornmental and Health Hazard Assessment (OEHHA, 2014)
P = Provisional Peer-Reviewed Toxicity Value (as cited in USEPA [2014])
V = volatile
ABS = absorption
CAS = Chemical Abstracts Service
DDD = dichlorodiphenyldichloroethane
DDE = dichlorodiphenyldichloroethylene
DDT = dichlorodiphenyltrichloroethane
GI = gastrointestinal
HHRA = human health risk assessment
mg/kg = milligram per kilogram
PCB = polychlorinated biphenyl
RfD = reference dose
SF = slope factor
TCDD = tetrachlorodibenzo-p-dioxin

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TABLE A-6A

Calculation of RME Chemical Cancer Risks and Noncancer Hazards - Adult and Child Recreational User, Eastern Wetland Area

Appendix A - Updated Human Health Risk Assessment for Chemical Exposures

Scenario Timeframe:	Future
Receptor Population:	Recreational User
Receptor Age:	Adult and Child

								Cancer Risk Calculations					Noncancer Hazard Quotient				
								Intake/Exposure Concentration		CSF / Unit Risk			Intake/Exposure Concentration		RfD / RfC		
	Exposure	Exposure	Exposure	Chemical of		EPC						Cancer					Hazard
Medium	Medium	Point	Route	Potential Concern		Value	Units	Value	Units	Value	Units	Risk	Value	Units	Value	Units	Quotient
Sediment	Sediment	Sediment	Ingestion	Aluminum		6.4E+04	mg/kg	6.8E-03	mg/kg-day	--	--	--	6.1E-02	mg/kg-day	1.0E+00	mg/kg-day	6.1E-02
				Antimony		2.8E+00	mg/kg	3.0E-07	mg/kg-day	--	--	--	2.6E-06	mg/kg-day	4.0E-04	mg/kg-day	6.6E-03
				Arsenic		9.7E+00	mg/kg	6.2E-07	mg/kg-day	9.5E+00	(mg/kg-day)-1	5.9E-06	5.5E-06	mg/kg-day	3.0E-04	mg/kg-day	1.8E-02
				Barium		4.2E+02	mg/kg	4.5E-05	mg/kg-day	--	--	--	4.0E-04	mg/kg-day	2.0E-01	mg/kg-day	2.0E-03
				Cadmium		2.6E-01	mg/kg	2.8E-08	mg/kg-day	1.5E+01	(mg/kg-day)-1	4.2E-07	2.5E-07	mg/kg-day	1.0E-03	mg/kg-day	2.5E-04
				Chromium		2.9E+02	mg/kg	3.1E-05	mg/kg-day	--	--	--	2.8E-04	mg/kg-day	1.5E+00	mg/kg-day	1.8E-04
				Cobalt		1.7E+01	mg/kg	1.9E-06	mg/kg-day	--	--	--	1.7E-05	mg/kg-day	3.0E-04	mg/kg-day	5.5E-02
				Copper		4.1E+01	mg/kg	4.4E-06	mg/kg-day	--	--	--	3.9E-05	mg/kg-day	4.0E-02	mg/kg-day	9.8E-04
				Iron		3.9E+04	mg/kg	4.2E-03	mg/kg-day	--	--	--	3.7E-02	mg/kg-day	7.0E-01	mg/kg-day	5.3E-02
				Lead		2.5E+01	mg/kg	2.6E-06	mg/kg-day	--	--	--	2.3E-05	mg/kg-day	--	--	--
				Manganese		5.3E+02	mg/kg	5.7E-05	mg/kg-day	--	--	--	5.1E-04	mg/kg-day	1.4E-01	mg/kg-day	3.6E-03
				Mercury		2.2E-01	mg/kg	2.3E-08	mg/kg-day	--	--	--	2.1E-07	mg/kg-day	1.0E-04	mg/kg-day	2.1E-03
				Molybdenum		9.5E-01	mg/kg	1.0E-07	mg/kg-day	--	--	--	9.0E-07	mg/kg-day	5.0E-03	mg/kg-day	1.8E-04
				Nickel		8.5E+01	mg/kg	9.1E-06	mg/kg-day	--	--	--	8.1E-05	mg/kg-day	2.0E-02	mg/kg-day	4.0E-03
				Selenium		3.4E-01	mg/kg	3.6E-08	mg/kg-day	--	--	--	3.2E-07	mg/kg-day	5.0E-03	mg/kg-day	6.4E-05
				Silver		2.8E-01	mg/kg	3.0E-08	mg/kg-day	--	--	--	2.7E-07	mg/kg-day	5.0E-03	mg/kg-day	5.3E-05
				Vanadium		1.4E+02	mg/kg	1.5E-05	mg/kg-day	--	--	--	1.3E-04	mg/kg-day	5.0E-03	mg/kg-day	2.6E-02
				Zinc		1.1E+02	mg/kg	1.2E-05	mg/kg-day	--	--	--	1.0E-04	mg/kg-day	3.0E-01	mg/kg-day	3.4E-04
				4,4'-DDD		7.4E-04	mg/kg	7.9E-11	mg/kg-day	2.4E-01	(mg/kg-day)-1	1.9E-11	7.1E-10	mg/kg-day	5.0E-04	mg/kg-day	1.4E-06
				4,4'-DDE		8.7E-04	mg/kg	9.3E-11	mg/kg-day	3.4E-01	(mg/kg-day)-1	3.2E-11	8.3E-10	mg/kg-day	5.0E-04	mg/kg-day	1.7E-06
				4,4'-DDT		2.9E-04	mg/kg	3.1E-11	mg/kg-day	3.4E-01	(mg/kg-day)-1	1.1E-11	2.8E-10	mg/kg-day	5.0E-04	mg/kg-day	5.6E-07
				alpha-Chlordane		1.2E-04	mg/kg	1.3E-11	mg/kg-day	3.5E-01	(mg/kg-day)-1	4.4E-12	1.1E-10	mg/kg-day	5.0E-04	mg/kg-day	2.2E-07
				gamma-Chlordane		2.0E-05	mg/kg	2.1E-12	mg/kg-day	3.5E-01	(mg/kg-day)-1	7.5E-13	1.9E-11	mg/kg-day	5.0E-04	mg/kg-day	3.8E-08
				2-Methylnaphthalene		4.9E-03	mg/kg	5.2E-10	mg/kg-day	--	--	--	4.6E-09	mg/kg-day	4.0E-03	mg/kg-day	1.2E-06
				Acenaphthene		4.4E-03	mg/kg	4.7E-10	mg/kg-day	--	--	--	4.2E-09	mg/kg-day	6.0E-02	mg/kg-day	6.9E-08
				Acenaphthylene		6.6E-03	mg/kg	7.0E-10	mg/kg-day	--	--	--	6.2E-09	mg/kg-day	6.0E-02	mg/kg-day	1.0E-07
				Anthracene		3.2E-02	mg/kg	3.4E-09	mg/kg-day	--	--	--	3.0E-08	mg/kg-day	3.0E-01	mg/kg-day	1.0E-07
				Fluorene		6.4E-03	mg/kg	6.8E-10	mg/kg-day	--	--	--	6.0E-09	mg/kg-day	4.0E-02	mg/kg-day	1.5E-07
				Naphthalene		1.2E-02	mg/kg	1.3E-09	mg/kg-day	--	--	--	1.1E-08	mg/kg-day	2.0E-02	mg/kg-day	5.6E-07
				Phenanthrene		8.9E-02	mg/kg	9.5E-09	mg/kg-day	--	--	--	8.4E-08	mg/kg-day	3.0E-01	mg/kg-day	2.8E-07
				Benzo(a)anthracene	M	9.3E-02	mg/kg	4.5E-08	mg/kg-day	1.2E+00	(mg/kg-day)-1	5.4E-08	8.9E-08	mg/kg-day	--	--	--
				Benzo(a)pyrene	M	1.4E-01	mg/kg	6.9E-08	mg/kg-day	7.3E+00	(mg/kg-day)-1	5.1E-07	1.4E-07	mg/kg-day	--	--	--
				Benzo(b)fluoranthene	M	8.8E-02	mg/kg	4.3E-08	mg/kg-day	1.2E+00	(mg/kg-day)-1	5.1E-08	8.4E-08	mg/kg-day	--	--	--
				Benzo(g,h,i)perylene		1.2E-01	mg/kg	1.3E-08	mg/kg-day	--	--	--	1.2E-07	mg/kg-day	3.0E-02	mg/kg-day	3.9E-06
				Benzo(k)fluoranthene	M	9.3E-02	mg/kg	4.5E-08	mg/kg-day	1.2E+00	(mg/kg-day)-1	5.4E-08	8.8E-08	mg/kg-day	--	--	--
				Chrysene	M	1.1E-01	mg/kg	5.5E-08	mg/kg-day	1.2E-01	(mg/kg-day)-1	6.6E-09	1.1E-07	mg/kg-day	--	--	--
				Dibenz(a,h)anthracene	M	1.2E-02	mg/kg	5.9E-09	mg/kg-day	7.3E+00	(mg/kg-day)-1	4.3E-08	1.2E-08	mg/kg-day	--	--	--
				Fluoranthene		2.0E-01	mg/kg	2.1E-08	mg/kg-day	--	--	--	1.9E-07	mg/kg-day	4.0E-02	mg/kg-day	4.7E-06
				Indeno(1,2,3-cd)pyrene	M	1.1E-01	mg/kg	5.4E-08	mg/kg-day	1.2E+00	(mg/kg-day)-1	6.5E-08	1.1E-07	mg/kg-day	--	--	--
				Pyrene		2.6E-01	mg/kg	2.8E-08	mg/kg-day	--	--	--	2.5E-07	mg/kg-day	3.0E-02	mg/kg-day	8.3E-06
				Dibutyltin		3.9E-03	mg/kg	4.2E-10	mg/kg-day	--	--	--	3.7E-09	mg/kg-day	3.0E-04	mg/kg-day	1.2E-05
				Tributyltin		4.8E-03	mg/kg	5.1E-10	mg/kg-day	--	--	--	4.5E-09	mg/kg-day	3.0E-04	mg/kg-day	1.5E-05
				Total PCB Congeners		2.8E-02	mg/kg	3.0E-09	mg/kg-day	2.0E+00	(mg/kg-day)-1	6.0E-09	2.7E-08	mg/kg-day	2.0E-05	mg/kg-day	1.3E-03
				Total TEQ – PCB DLC		7.5E-06	mg/kg	8.0E-13	mg/kg-day	1.3E+05	(mg/kg-day)-1	1.0E-07	7.1E-12	mg/kg-day	7.0E-10	mg/kg-day	1.0E-02
			Exp. Route Total									7.2E-06					2.5E-01
			Dermal	Aluminum		6.4E+04	mg/kg	2.2E-04	mg/kg-day	--	--	--	1.8E-03	mg/kg-day	1.0E+00	mg/kg-day	1.8E-03
				Antimony		2.8E+00	mg/kg	9.5E-09	mg/kg-day	--	--	--	7.6E-08	mg/kg-day	6.0E-05	mg/kg-day	1.3E-03
				Arsenic		9.7E+00	mg/kg	1.0E-07	mg/kg-day	9.5E+00	(mg/kg-day)-1	9.5E-07	8.0E-07	mg/kg-day	3.0E-04	mg/kg-day	2.7E-03
				Barium		4.2E+02	mg/kg	1.5E-06	mg/kg-day	--	--	--	1.2E-05	mg/kg-day	1.4E-02	mg/kg-day	8.3E-04
				Cadmium		2.6E-01	mg/kg	8.9E-11	mg/kg-day	6.0E+02	(mg/kg-day)-1	5.3E-08	7.1E-10	mg/kg-day	2.5E-05	mg/kg-day	2.9E-05
				Chromium		2.9E+02	mg/kg	1.0E-06	mg/kg-day	--	--	--	8.0E-06	mg/kg-day	2.0E-02	mg/kg-day	4.1E-04
				Cobalt		1.7E+01	mg/kg	6.0E-08	mg/kg-day	--	--	--	4.8E-07	mg/kg-day	3.0E-04	mg/kg-day	1.6E-03
				Copper		4.1E+01	mg/kg	1.4E-07	mg/kg-day	--	--	--	1.1E-06	mg/kg-day	4.0E-02	mg/kg-day	2.8E-05
				Iron		3.9E+04	mg/kg	1.4E-04	mg/kg-day	--	--	--	1.1E-03	mg/kg-day	7.0E-01	mg/kg-day	1.5E-03
				Lead		2.5E+01	mg/kg	8.5E-08	mg/kg-day	--	--	--	6.8E-07	mg/kg-day	--	--	--
				Manganese		5.3E+02	mg/kg	1.8E-06	mg/kg-day	--	--	--	1.5E-05	mg/kg-day	1.4E-01	mg/kg-day	1.1E-04
				Mercury		2.2E-01	mg/kg	7.5E-10	mg/kg-day	--	--	--	6.0E-09	mg/kg-day	1.0E-04	mg/kg-day	6.0E-05
				Molybdenum		9.5E-01	mg/kg	3.3E-09	mg/kg-day	--	--	--	2.6E-08	mg/kg-day	5.0E-03	mg/kg-day	5.2E-06
				Nickel		8.5E+01	mg/kg	2.9E-07	mg/kg-day	--	--	--	2.3E-06	mg/kg-day	8.0E-04	mg/kg-day	2.9E-03
				Selenium		3.4E-01	mg/kg	1.2E-09	mg/kg-day	--	--	--	9.3E-09	mg/kg-day	5.0E-03	mg/kg-day	1.9E-06
				Silver		2.8E-01	mg/kg	9.7E-10	mg/kg-day	--	--	--	7.7E-09	mg/kg-day	2.0E-04	mg/kg-day	3.9E-05

TABLE A-6A

Calculation of RME Chemical Cancer Risks and Noncancer Hazards - Adult and Child Recreational User, Eastern Wetland Area

Appendix A - Updated Human Health Risk Assessment for Chemical Exposures

Scenario Timeframe:	Future
Receptor Population:	Recreational User
Receptor Age:	Adult and Child

								Cancer Risk Calculations					Noncancer Hazard Quotient				
						EPC		Intake/Exposure Concentration		CSF / Unit Risk			Intake/Exposure Concentration		RfD / RfC		
Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern		Value	Units	Value	Units	Value	Units	Cancer Risk	Value	Units	Value	Units	Hazard Quotient
				Vanadium		1.4E+02	mg/kg	4.8E-07	mg/kg-day	--	--	--	3.8E-06	mg/kg-day	1.3E-04	mg/kg-day	2.9E-02
				Zinc		1.1E+02	mg/kg	3.7E-07	mg/kg-day	--	--	--	3.0E-06	mg/kg-day	3.0E-01	mg/kg-day	1.0E-05
				4,4'-DDD		7.4E-04	mg/kg	1.3E-11	mg/kg-day	2.4E-01	(mg/kg-day)-1	3.1E-12	1.0E-10	mg/kg-day	5.0E-04	mg/kg-day	2.0E-07
				4,4'-DDE		8.7E-04	mg/kg	1.5E-11	mg/kg-day	3.4E-01	(mg/kg-day)-1	5.1E-12	1.2E-10	mg/kg-day	5.0E-04	mg/kg-day	2.4E-07
				4,4'-DDT		2.9E-04	mg/kg	5.0E-12	mg/kg-day	3.4E-01	(mg/kg-day)-1	1.7E-12	4.0E-11	mg/kg-day	5.0E-04	mg/kg-day	8.1E-08
				alpha-Chlordane		1.2E-04	mg/kg	2.0E-12	mg/kg-day	3.5E-01	(mg/kg-day)-1	7.1E-13	1.6E-11	mg/kg-day	5.0E-04	mg/kg-day	3.3E-08
				gamma-Chlordane		2.0E-05	mg/kg	3.4E-13	mg/kg-day	3.5E-01	(mg/kg-day)-1	1.2E-13	2.8E-12	mg/kg-day	5.0E-04	mg/kg-day	5.5E-09
				2-Methylnaphthalene		4.9E-03	mg/kg	2.5E-10	mg/kg-day	--	--	--	2.0E-09	mg/kg-day	4.0E-03	mg/kg-day	5.1E-07
				Acenaphthene		4.4E-03	mg/kg	2.3E-10	mg/kg-day	--	--	--	1.8E-09	mg/kg-day	6.0E-02	mg/kg-day	3.0E-08
				Acenaphthylene		6.6E-03	mg/kg	3.4E-10	mg/kg-day	--	--	--	2.7E-09	mg/kg-day	6.0E-02	mg/kg-day	4.5E-08
				Anthracene		3.2E-02	mg/kg	1.6E-09	mg/kg-day	--	--	--	1.3E-08	mg/kg-day	3.0E-01	mg/kg-day	4.4E-08
				Fluorene		6.4E-03	mg/kg	3.3E-10	mg/kg-day	--	--	--	2.6E-09	mg/kg-day	4.0E-02	mg/kg-day	6.6E-08
				Naphthalene		1.2E-02	mg/kg	6.1E-10	mg/kg-day	--	--	--	4.9E-09	mg/kg-day	2.0E-02	mg/kg-day	2.4E-07
				Phenanthrene		8.9E-02	mg/kg	4.6E-09	mg/kg-day	--	--	--	3.7E-08	mg/kg-day	3.0E-01	mg/kg-day	1.2E-07
				Benzo(a)anthracene	M	9.3E-02	mg/kg	2.1E-08	mg/kg-day	1.2E+00	(mg/kg-day)-1	2.5E-08	3.9E-08	mg/kg-day	--	--	--
				Benzo(a)pyrene	M	1.4E-01	mg/kg	3.2E-08	mg/kg-day	7.3E+00	(mg/kg-day)-1	2.3E-07	5.9E-08	mg/kg-day	--	--	--
				Benzo(b)fluoranthene	M	8.8E-02	mg/kg	2.0E-08	mg/kg-day	1.2E+00	(mg/kg-day)-1	2.3E-08	3.7E-08	mg/kg-day	--	--	--
				Benzo(g,h,i)perylene		1.2E-01	mg/kg	6.4E-09	mg/kg-day	--	--	--	5.1E-08	mg/kg-day	3.0E-02	mg/kg-day	1.7E-06
				Benzo(k)fluoranthene	M	9.3E-02	mg/kg	2.1E-08	mg/kg-day	1.2E+00	(mg/kg-day)-1	2.5E-08	3.8E-08	mg/kg-day	--	--	--
				Chrysene	M	1.1E-01	mg/kg	2.5E-08	mg/kg-day	1.2E-01	(mg/kg-day)-1	3.0E-09	4.7E-08	mg/kg-day	--	--	--
				Dibenz(a,h)anthracene	M	1.2E-02	mg/kg	2.7E-09	mg/kg-day	7.3E+00	(mg/kg-day)-1	2.0E-08	5.0E-09	mg/kg-day	--	--	--
				Fluoranthene		2.0E-01	mg/kg	1.0E-08	mg/kg-day	--	--	--	8.2E-08	mg/kg-day	4.0E-02	mg/kg-day	2.1E-06
				Indeno(1,2,3-cd)pyrene	M	1.1E-01	mg/kg	2.5E-08	mg/kg-day	1.2E+00	(mg/kg-day)-1	3.0E-08	4.6E-08	mg/kg-day	--	--	--
				Pyrene		2.6E-01	mg/kg	1.3E-08	mg/kg-day	--	--	--	1.1E-07	mg/kg-day	3.0E-02	mg/kg-day	3.6E-06
				Dibutyltin		3.9E-03	mg/kg	1.3E-10	mg/kg-day	--	--	--	1.1E-09	mg/kg-day	3.0E-04	mg/kg-day	3.6E-06
				Tributyltin		4.8E-03	mg/kg	1.6E-10	mg/kg-day	--	--	--	1.3E-09	mg/kg-day	3.0E-04	mg/kg-day	4.4E-06
				Total PCB Congeners		2.8E-02	mg/kg	1.5E-09	mg/kg-day	2.0E+00	(mg/kg-day)-1	2.9E-09	1.2E-08	mg/kg-day	2.0E-05	mg/kg-day	5.8E-04
				Total TEQ – PCB DLC		7.5E-06	mg/kg	7.8E-14	mg/kg-day	1.3E+05	(mg/kg-day)-1	1.0E-08	6.2E-13	mg/kg-day	7.0E-10	mg/kg-day	8.9E-04
			Exp. Route Total									1.4E-06					4.4E-02
		Exposure Point Total										8.6E-06					2.9E-01
	Exposure Medium Total											8.6E-06					2.9E-01
Medium Total												8.6E-06					2.9E-01
Macoma[a]	Macoma	Macoma	Ingestion	Aluminum		2.6E+02	mg/kg	2.0E-03	mg/kg-day	--	--	--	6.9E-03	mg/kg-day	1.0E+00	mg/kg-day	6.9E-03
				Antimony		3.9E-02	mg/kg	3.0E-07	mg/kg-day	--	--	--	1.0E-06	mg/kg-day	4.0E-04	mg/kg-day	2.6E-03
				Arsenic		4.3E+00	mg/kg	3.3E-05	mg/kg-day	9.5E+00	(mg/kg-day)-1	3.1E-04	1.1E-04	mg/kg-day	3.0E-04	mg/kg-day	3.8E-01
				Barium		2.4E+00	mg/kg	1.8E-05	mg/kg-day	--	--	--	6.4E-05	mg/kg-day	2.0E-01	mg/kg-day	3.2E-04
				Cadmium		1.8E-01	mg/kg	1.3E-06	mg/kg-day	1.5E+01	(mg/kg-day)-1	2.0E-05	4.7E-06	mg/kg-day	1.0E-03	mg/kg-day	4.7E-03
				Chromium		2.7E+00	mg/kg	2.1E-05	mg/kg-day	--	--	--	7.3E-05	mg/kg-day	1.5E+00	mg/kg-day	4.9E-05
				Cobalt		4.0E-01	mg/kg	3.0E-06	mg/kg-day	--	--	--	1.1E-05	mg/kg-day	3.0E-04	mg/kg-day	3.6E-02
				Copper		3.7E+00	mg/kg	2.8E-05	mg/kg-day	--	--	--	1.0E-04	mg/kg-day	4.0E-02	mg/kg-day	2.5E-03
				Iron		3.6E+02	mg/kg	2.8E-03	mg/kg-day	--	--	--	9.7E-03	mg/kg-day	7.0E-01	mg/kg-day	1.4E-02
				Lead		7.2E-01	mg/kg	5.4E-06	mg/kg-day	--	--	--	1.9E-05	mg/kg-day	--	--	--
				Manganese		5.2E+00	mg/kg	4.0E-05	mg/kg-day	--	--	--	1.4E-04	mg/kg-day	1.4E-01	mg/kg-day	9.9E-04
				Mercury		2.6E-02	mg/kg	2.0E-07	mg/kg-day	--	--	--	6.9E-07	mg/kg-day	1.0E-04	mg/kg-day	6.9E-03
				Molybdenum		6.0E-01	mg/kg	4.5E-06	mg/kg-day	--	--	--	1.6E-05	mg/kg-day	5.0E-03	mg/kg-day	3.2E-03
				Nickel		1.4E+00	mg/kg	1.0E-05	mg/kg-day	--	--	--	3.7E-05	mg/kg-day	2.0E-02	mg/kg-day	1.8E-03
				Selenium		8.7E-01	mg/kg	6.6E-06	mg/kg-day	--	--	--	2.3E-05	mg/kg-day	5.0E-03	mg/kg-day	4.6E-03
				Silver		3.9E-02	mg/kg	3.0E-07	mg/kg-day	--	--	--	1.0E-06	mg/kg-day	5.0E-03	mg/kg-day	2.1E-04
				Vanadium		1.3E+00	mg/kg	1.0E-05	mg/kg-day	--	--	--	3.5E-05	mg/kg-day	5.0E-03	mg/kg-day	7.0E-03
				Zinc		2.1E+01	mg/kg	1.6E-04	mg/kg-day	--	--	--	5.7E-04	mg/kg-day	3.0E-01	mg/kg-day	1.9E-03
				4,4'-DDD		6.2E-04	mg/kg	4.7E-09	mg/kg-day	2.4E-01	(mg/kg-day)-1	1.1E-09	1.6E-08	mg/kg-day	5.0E-04	mg/kg-day	3.3E-05
				4,4'-DDE		1.4E-03	mg/kg	1.0E-08	mg/kg-day	3.4E-01	(mg/kg-day)-1	3.5E-09	3.6E-08	mg/kg-day	5.0E-04	mg/kg-day	7.2E-05
				alpha-Chlordane		1.8E-04	mg/kg	1.4E-09	mg/kg-day	3.5E-01	(mg/kg-day)-1	4.7E-10	4.7E-09	mg/kg-day	5.0E-04	mg/kg-day	9.5E-06
				Dieldrin		3.2E-04	mg/kg	2.4E-09	mg/kg-day	1.6E+01	(mg/kg-day)-1	3.9E-08	8.6E-09	mg/kg-day	5.0E-05	mg/kg-day	1.7E-04
				gamma-Chlordane		1.7E-04	mg/kg	1.3E-09	mg/kg-day	3.5E-01	(mg/kg-day)-1	4.7E-10	4.7E-09	mg/kg-day	5.0E-04	mg/kg-day	9.3E-06
				Acenaphthene		2.3E-04	mg/kg	1.8E-09	mg/kg-day	--	--	--	6.2E-09	mg/kg-day	6.0E-02	mg/kg-day	1.0E-07
				Acenaphthylene		3.2E-04	mg/kg	2.4E-09	mg/kg-day	--	--	--	8.5E-09	mg/kg-day	6.0E-02	mg/kg-day	1.4E-07

TABLE A-6A
Calculation of RME Chemical Cancer Risks and Noncancer Hazards - Adult and Child Recreational User, Eastern Wetland Area
Appendix A - Updated Human Health Risk Assessment for Chemical Exposures

Scenario Timeframe:	Future
Receptor Population:	Recreational User
Receptor Age:	Adult and Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC Value	EPC Units	Cancer Risk Calculations: Intake/Exposure Concentration Value	Intake/Exposure Concentration Units	CSF / Unit Risk Value	CSF / Unit Risk Units	Cancer Risk	Noncancer Hazard Quotient: Intake/Exposure Concentration Value	Intake/Exposure Concentration Units	RfD / RfC Value	RfD / RfC Units	Hazard Quotient
				Anthracene	2.0E-03	mg/kg	1.6E-08	mg/kg-day	--	--	--	5.4E-08	mg/kg-day	3.0E-01	mg/kg-day	1.8E-07
				Fluorene	3.7E-04	mg/kg	2.8E-09	mg/kg-day	--	--	--	1.0E-08	mg/kg-day	4.0E-02	mg/kg-day	2.5E-07
				Phenanthrene	2.5E-03	mg/kg	1.9E-08	mg/kg-day	--	--	--	6.7E-08	mg/kg-day	3.0E-01	mg/kg-day	2.2E-07
				Benzo(a)anthracene	4.0E-03	mg/kg	3.0E-08	mg/kg-day	1.2E+00	(mg/kg-day)-1	3.7E-08	1.1E-07	mg/kg-day	--	--	--
				Benzo(a)pyrene	4.1E-03	mg/kg	3.1E-08	mg/kg-day	7.3E+00	(mg/kg-day)-1	2.2E-07	1.1E-07	mg/kg-day	--	--	--
				Benzo(b)fluoranthene	5.0E-03	mg/kg	3.8E-08	mg/kg-day	1.2E+00	(mg/kg-day)-1	4.6E-08	1.3E-07	mg/kg-day	--	--	--
				Benzo(g,h,i)perylene	3.7E-03	mg/kg	2.8E-08	mg/kg-day	--	--	--	9.8E-08	mg/kg-day	3.0E-02	mg/kg-day	3.3E-06
				Benzo(k)fluoranthene	4.8E-03	mg/kg	3.7E-08	mg/kg-day	1.2E+00	(mg/kg-day)-1	4.4E-08	1.3E-07	mg/kg-day	--	--	--
				Chrysene	6.2E-03	mg/kg	4.7E-08	mg/kg-day	1.2E-01	(mg/kg-day)-1	5.6E-09	1.6E-07	mg/kg-day	--	--	--
				Dibenz(a,h)anthracene	2.1E-04	mg/kg	1.6E-09	mg/kg-day	7.3E+00	(mg/kg-day)-1	1.2E-08	5.7E-09	mg/kg-day	--	--	--
				Fluoranthene	1.5E-02	mg/kg	1.1E-07	mg/kg-day	--	--	--	4.0E-07	mg/kg-day	4.0E-02	mg/kg-day	1.0E-05
				Indeno(1,2,3-cd)pyrene	2.0E-03	mg/kg	1.5E-08	mg/kg-day	1.2E+00	(mg/kg-day)-1	1.8E-08	5.2E-08	mg/kg-day	--	--	--
				Pyrene	1.5E-02	mg/kg	1.1E-07	mg/kg-day	--	--	--	3.9E-07	mg/kg-day	3.0E-02	mg/kg-day	1.3E-05
				Monobutyltin	8.7E-04	mg/kg	6.7E-09	mg/kg-day	--	--	--	2.3E-08	mg/kg-day	3.0E-04	mg/kg-day	7.8E-05
				Dibutyltin	1.5E-03	mg/kg	1.1E-08	mg/kg-day	--	--	--	4.0E-08	mg/kg-day	3.0E-04	mg/kg-day	1.3E-04
				Tributyltin	4.6E-03	mg/kg	3.5E-08	mg/kg-day	--	--	--	1.2E-07	mg/kg-day	3.0E-04	mg/kg-day	4.1E-04
				Total PCB Congeners	4.8E-02	mg/kg	3.6E-07	mg/kg-day	2.0E+00	(mg/kg-day)-1	7.3E-07	1.3E-06	mg/kg-day	2.0E-05	mg/kg-day	6.4E-02
				Total TEQ – PCB DLC	1.9E-05	mg/kg	1.4E-10	mg/kg-day	1.3E+05	(mg/kg-day)-1	1.8E-05	4.9E-10	mg/kg-day	7.0E-10	mg/kg-day	7.1E-01
				Total TEQ – TCDD DLC	4.9E-07	mg/kg	3.7E-12	mg/kg-day	1.3E+05	(mg/kg-day)-1	4.8E-07	1.3E-11	mg/kg-day	7.0E-10	mg/kg-day	1.8E-02
			Exp. Route Total								3.5E-04					1.3E+00
		Exposure Point Total									3.5E-04					1.3E+00
	Exposure Medium Total										3.5E-04					1.3E+00
Medium Total											3.5E-04					1.3E+00
										Total of Receptor Risks across All Media	3.6E-04				Total of Receptor Hazards across All Media	1.6E+00

Notes:
[a] Macoma ingestion risks are evaluated for the adult receptor only.
Acronyms/Abbreviations:

-- =	not available or not applicable	(mg/kg-day)-1 =	1/(milligram[s] per kilogram per day)
CSF =	cancer slope factor	mg/kg =	milligram(s) per kilogram
DDD =	dichlorodiphenyldichloroethane	mg/kg-day =	milligram(s) per kilogram per day
DDE =	dichlorodiphenyldichloroethylene	PCB =	polychlorinated biphenyl
DDT =	dichlorodiphenyltrichloroethane	RfC =	reference concentration
EPC =	exposure point concentration	RfD =	reference dose
Exp. =	exposure	RME =	reasonable maximum exposure
M =	lifetime exposure from birth, mutagenic endpoint	TCDD =	tetrachlorodibenzo-p-dioxin

TABLE A-6B

Summary of Receptor Risks and Hazards - Adult and Child Recreational User, Eastern Wetland Area

Appendix A - Updated Human Health Risk Assessment for Chemical Exposures

Scenario Timeframe:	Future
Receptor Population:	Recreational User
Receptor Age:	Adult and Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient			
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total
Sediment	Sediment	Sediment	Aluminum	--	--	--	--	6.1E-02	--	1.8E-03	6.3E-02
			Antimony	--	--	--	--	6.6E-03	--	1.3E-03	7.9E-03
			Arsenic	5.9E-06	--	9.5E-07	6.8E-06	1.8E-02	--	2.7E-03	2.1E-02
			Barium	--	--	--	--	2.0E-03	--	8.3E-04	2.9E-03
			Cadmium	4.2E-07	--	5.3E-08	4.7E-07	2.5E-04	--	2.9E-05	2.7E-04
			Chromium	--	--	--	--	1.8E-04	--	4.1E-04	5.9E-04
			Cobalt	--	--	--	--	5.5E-02	--	1.6E-03	5.7E-02
			Copper	--	--	--	--	9.8E-04	--	2.8E-05	1.0E-03
			Iron	--	--	--	--	5.3E-02	--	1.5E-03	5.5E-02
			Lead	--	--	--	--	--	--	--	--
			Manganese	--	--	--	--	3.6E-03	--	1.1E-04	3.7E-03
			Mercury	--	--	--	--	2.1E-03	--	6.0E-05	2.1E-03
			Molybdenum	--	--	--	--	1.8E-04	--	5.2E-06	1.9E-04
			Nickel	--	--	--	--	4.0E-03	--	2.9E-03	7.0E-03
			Selenium	--	--	--	--	6.4E-05	--	1.9E-06	6.6E-05
			Silver	--	--	--	--	5.3E-05	--	3.9E-05	9.2E-05
			Vanadium	--	--	--	--	2.6E-02	--	2.9E-02	5.6E-02
			Zinc	--	--	--	--	3.4E-04	--	1.0E-05	3.5E-04
			4,4'-DDD	1.9E-11	--	3.1E-12	2.2E-11	1.4E-06	--	2.0E-07	1.6E-06
			4,4'-DDE	3.2E-11	--	5.1E-12	3.7E-11	1.7E-06	--	2.4E-07	1.9E-06
			4,4'-DDT	1.1E-11	--	1.7E-12	1.2E-11	5.6E-07	--	8.1E-08	6.4E-07
			alpha-Chlordane	4.4E-12	--	7.1E-13	5.1E-12	2.2E-07	--	3.3E-08	2.6E-07
			2-Methylnaphthalene	--	--	--	--	1.2E-06	--	5.1E-07	1.7E-06
			Acenaphthene	--	--	--	--	6.9E-08	--	3.0E-08	9.9E-08
			Acenaphthylene	--	--	--	--	1.0E-07	--	4.5E-08	1.5E-07
			Anthracene	--	--	--	--	1.0E-07	--	4.4E-08	1.4E-07
			Fluorene	--	--	--	--	1.5E-07	--	6.6E-08	2.2E-07
			Naphthalene	--	--	--	--	5.6E-07	--	2.4E-07	8.0E-07
			Phenanthrene	--	--	--	--	2.8E-07	--	1.2E-07	4.0E-07
			Benzo(a)anthracene	5.4E-08	--	2.5E-08	7.9E-08	--	--	--	--
			Benzo(a)pyrene	5.1E-07	--	2.3E-07	7.4E-07	--	--	--	--
			Benzo(b)fluoranthene	5.1E-08	--	2.3E-08	7.5E-08	--	--	--	--
			Benzo(g,h,i)perylene	--	--	--	--	3.9E-06	--	1.7E-06	5.6E-06
			Benzo(k)fluoranthene	5.4E-08	--	2.5E-08	7.9E-08	--	--	--	--
			Chrysene	6.6E-09	--	3.0E-09	9.6E-09	--	--	--	--
			Dibenz(a,h)anthracene	4.3E-08	--	2.0E-08	6.3E-08	--	--	--	--
			Fluoranthene	--	--	--	--	4.7E-06	--	2.1E-06	6.8E-06
			Indeno(1,2,3-cd)pyrene	6.5E-08	--	3.0E-08	9.5E-08	--	--	--	--
			Pyrene	--	--	--	--	8.3E-06	--	3.6E-06	1.2E-05
			Dibutyltin	--	--	--	--	1.2E-05	--	3.6E-06	1.6E-05
			Tributyltin	--	--	--	--	1.5E-05	--	4.4E-06	2.0E-05
			Total PCB Congeners	6.0E-09	--	2.9E-09	8.9E-09	1.3E-03	--	5.8E-04	1.9E-03
			Total TEQ – PCB DLC	1.0E-07	--	1.0E-08	1.1E-07	1.0E-02	--	8.9E-04	1.1E-02
			Total TEQ – PCB DLC	1.0E-07	--	1.0E-08	1.1E-07	1.0E-02	--	8.9E-04	1.1E-02
			Chemical Total	7.3E-06	--	1.4E-06	8.7E-06	2.6E-01	--	4.5E-02	3.0E-01
		Exposure Point Total					8.7E-06				3.0E-01
	Exposure Medium Total						8.7E-06				3.0E-01
Medium Total							8.7E-06				3.0E-01

TABLE A-6B

Summary of Receptor Risks and Hazards - Adult and Child Recreational User, Eastern Wetland Area

Appendix A - Updated Human Health Risk Assessment for Chemical Exposures

Scenario Timeframe:	Future
Receptor Population:	Recreational User
Receptor Age:	Adult and Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient			
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total
Macoma	Macoma	Macoma	Aluminum	--	--	--	--	6.9E-03	--	--	6.9E-03
		(ingestion)	Antimony	--	--	--	--	2.6E-03	--	--	2.6E-03
			Arsenic	3.1E-04	--	--	3.1E-04	3.8E-01	--	--	3.8E-01
			Barium	--	--	--	--	3.2E-04	--	--	3.2E-04
			Cadmium	2.0E-05	--	--	2.0E-05	4.7E-03	--	--	4.7E-03
			Chromium	--	--	--	--	4.9E-05	--	--	4.9E-05
			Cobalt	--	--	--	--	3.6E-02	--	--	3.6E-02
			Copper	--	--	--	--	2.5E-03	--	--	2.5E-03
			Iron	--	--	--	--	1.4E-02	--	--	1.4E-02
			Lead	--	--	--	--	--	--	--	--
			Manganese	--	--	--	--	9.9E-04	--	--	9.9E-04
			Mercury	--	--	--	--	6.9E-03	--	--	6.9E-03
			Molybdenum	--	--	--	--	3.2E-03	--	--	3.2E-03
			Nickel	--	--	--	--	1.8E-03	--	--	1.8E-03
			Selenium	--	--	--	--	4.6E-03	--	--	4.6E-03
			Silver	--	--	--	--	2.1E-04	--	--	2.1E-04
			Vanadium	--	--	--	--	7.0E-03	--	--	7.0E-03
			Zinc	--	--	--	--	1.9E-03	--	--	1.9E-03
			4,4'-DDD	1.1E-09	--	--	1.1E-09	3.3E-05	--	--	3.3E-05
			4,4'-DDE	3.5E-09	--	--	3.5E-09	7.2E-05	--	--	7.2E-05
			alpha-Chlordane	4.7E-10	--	--	4.7E-10	9.5E-06	--	--	9.5E-06
			Dieldrin	3.9E-08	--	--	3.9E-08	1.7E-04	--	--	1.7E-04
			gamma-Chlordane	4.7E-10	--	--	4.7E-10	9.3E-06	--	--	9.3E-06
			Acenaphthene	--	--	--	--	1.0E-07	--	--	1.0E-07
			Acenaphthylene	--	--	--	--	1.4E-07	--	--	1.4E-07
			Anthracene	--	--	--	--	1.8E-07	--	--	1.8E-07
			Fluorene	--	--	--	--	2.5E-07	--	--	2.5E-07
			Phenanthrene	--	--	--	--	2.2E-07	--	--	2.2E-07
			Benzo(a)anthracene	3.7E-08	--	--	3.7E-08	--	--	--	--
			Benzo(a)pyrene	2.2E-07	--	--	2.2E-07	--	--	--	--
			Benzo(b)fluoranthene	4.6E-08	--	--	4.6E-08	--	--	--	--
			Benzo(g,h,i)perylene	--	--	--	--	3.3E-06	--	--	3.3E-06
			Benzo(k)fluoranthene	4.4E-08	--	--	4.4E-08	--	--	--	--
			Chrysene	5.6E-09	--	--	5.6E-09	--	--	--	--
			Dibenz(a,h)anthracene	1.2E-08	--	--	1.2E-08	--	--	--	--
			Fluoranthene	--	--	--	--	1.0E-05	--	--	1.0E-05
			Indeno(1,2,3-cd)pyrene	1.8E-08	--	--	1.8E-08	--	--	--	--
			Pyrene	--	--	--	--	1.3E-05	--	--	1.3E-05
			Monobutyltin	--	--	--	--	7.8E-05	--	--	7.8E-05
			Dibutyltin	--	--	--	--	1.3E-04	--	--	1.3E-04
			Tributyltin	--	--	--	--	4.1E-04	--	--	4.1E-04
			Total PCB Congeners	7.3E-07	--	--	7.3E-07	6.4E-02	--	--	6.4E-02
			Total TEQ – PCB DLC	1.8E-05	--	--	1.8E-05	7.1E-01	--	--	7.1E-01
			Total TEQ – TCDD DLC	4.8E-07	--	--	4.8E-07	1.8E-02	--	--	1.8E-02
			Chemical Total	3.5E-04	--	--	3.5E-04	1.3E+00	--	--	1.3E+00
		Exposure Point Total					3.5E-04				1.3E+00
	Exposure Medium Total						3.5E-04				1.3E+00
Medium Total							3.5E-04				1.3E+00
Receptor Total						Total Risk across All Media	3.6E-04			Total Hazard across All Media	1.6E+00

Acronyms/Abbreviations:

-- = not available or not applicable

EPA = United States Environmental Protection Agency

DDD = dichlorodiphenyldichloroethane

DDE = dichlorodiphenyldichloroethylene

DDT = dichlorodiphenyltrichloroethane

PCB = polychlorinated biphenyl

TCDD = tetrachlorodibenzo-p-dioxin

TABLE A-6C

Summary of Risk Drivers - Adult and Child Recreational User, Eastern Wetland Area

Appendix A - Updated Human Health Risk Assessment for Chemical Exposures

Scenario Timeframe:	Future
Receptor Population:	Recreational User
Receptor Age:	Adult and Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk: Ingestion	Cancer Risk: Inhalation	Cancer Risk: Dermal	Cancer Risk: Exposure Routes Total	Noncancer Hazard Quotient: Ingestion	Noncancer Hazard Quotient: Inhalation	Noncancer Hazard Quotient: Dermal	Noncancer Hazard Quotient: Exposure Routes Total
Sediment	Sediment	Sediment (Oral/Dermal)	BAP (EQ)*	7.4E-07	--	3.4E-07	1.1E-06	--	--	--	--
			Arsenic	5.9E-06	--	9.5E-07	6.8E-06	1.8E-02	--	2.7E-03	2.1E-02
			Chemical Total	6.6E-06	--	1.3E-06	7.9E-06	1.8E-02	--	2.7E-03	2.1E-02
		Exposure Point Total					7.9E-06				2.1E-02
	Exposure Medium Total						7.9E-06				2.1E-02
Medium Total							7.9E-06				2.1E-02
Macoma	Macoma	Macoma (Oral)	Arsenic	3.1E-04	--	--	3.1E-04	3.8E-01	--	--	3.8E-01
			Cadmium	2.0E-05	--	--	2.0E-05	4.7E-03	--	--	4.7E-03
			Total TEQ – PCB DLC	1.8E-05	--	--	1.8E-05	7.1E-01	--	--	7.1E-01
			Chemical Total	3.5E-04	--	--	3.5E-04	1.1E+00	--	--	1.1E+00
		Exposure Point Total					3.5E-04				1.1E+00
	Exposure Medium Total						3.5E-04				1.1E+00
Medium Total							3.5E-04				1.1E+00
Receptor Total						Total Risk across All Media	3.6E-04			Total Hazard across All Media	1.1E+00

Notes:

* Risk for benzo(a)pyrene equivalent (BAP [EQ]) is calculated by summing the risks for each of the individual potentially carcinogenic PAHs: benzo(a)anthracene, benzo(b)fluoranthene, benzo(a)pyrene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene.

Acronyms/Abbreviations:

-- = not available or not applicable

BAP (EQ) = benzo(a)pyrene equivalent

PAH = polycyclic aromatic hydrocarbon

PCB = polychlorinated biphenyl

TABLE A-7A

Calculation of RME Chemical Cancer Risks and Noncancer Hazards - Construction Worker, Eastern Wetland Area

Appendix A - Updated Human Health Risk Assessment for Chemical Exposures

Scenario Timeframe:	Future
Receptor Population:	Construction Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Noncancer Hazard Quotient				
							Intake/Exposure Concentration		CSF / Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD / RfC		Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
Sediment	Sediment	Sediment	Ingestion	Aluminum	6.4E+04	mg/kg	2.6E-03	mg/kg-day	--	--	--	1.8E-01	mg/kg-day	1.0E+00	mg/kg-day	1.8E-01
				Antimony	2.8E+00	mg/kg	1.1E-07	mg/kg-day	--	--	--	7.8E-06	mg/kg-day	4.0E-04	mg/kg-day	2.0E-02
				Arsenic	9.7E+00	mg/kg	2.3E-07	mg/kg-day	9.5E+00	(mg/kg-day)-1	2.2E-06	1.6E-05	mg/kg-day	3.0E-04	mg/kg-day	5.5E-02
				Barium	4.2E+02	mg/kg	1.7E-05	mg/kg-day	--	--	--	1.2E-03	mg/kg-day	2.0E-01	mg/kg-day	6.0E-03
				Cadmium	2.6E-01	mg/kg	1.0E-08	mg/kg-day	1.5E+01	(mg/kg-day)-1	1.6E-07	7.3E-07	mg/kg-day	1.0E-03	mg/kg-day	7.3E-04
				Chromium	2.9E+02	mg/kg	1.2E-05	mg/kg-day	--	--	--	8.2E-04	mg/kg-day	1.5E+00	mg/kg-day	5.5E-04
				Cobalt	1.7E+01	mg/kg	7.0E-07	mg/kg-day	--	--	--	4.9E-05	mg/kg-day	3.0E-04	mg/kg-day	1.6E-01
				Copper	4.1E+01	mg/kg	1.7E-06	mg/kg-day	--	--	--	1.2E-04	mg/kg-day	4.0E-02	mg/kg-day	2.9E-03
				Iron	3.9E+04	mg/kg	1.6E-03	mg/kg-day	--	--	--	1.1E-01	mg/kg-day	7.0E-01	mg/kg-day	1.6E-01
				Lead	2.5E+01	mg/kg	1.0E-06	mg/kg-day	--	--	--	7.0E-05	mg/kg-day	--	--	--
				Manganese	5.3E+02	mg/kg	2.2E-05	mg/kg-day	--	--	--	1.5E-03	mg/kg-day	1.4E-01	mg/kg-day	1.1E-02
				Mercury	2.2E-01	mg/kg	8.8E-09	mg/kg-day	--	--	--	6.2E-07	mg/kg-day	1.0E-04	mg/kg-day	6.2E-03
				Molybdenum	9.5E-01	mg/kg	3.8E-08	mg/kg-day	--	--	--	2.7E-06	mg/kg-day	5.0E-03	mg/kg-day	5.4E-04
				Nickel	8.5E+01	mg/kg	3.4E-06	mg/kg-day	--	--	--	2.4E-04	mg/kg-day	2.0E-02	mg/kg-day	1.2E-02
				Selenium	3.4E-01	mg/kg	1.4E-08	mg/kg-day	--	--	--	9.6E-07	mg/kg-day	5.0E-03	mg/kg-day	1.9E-04
				Silver	2.8E-01	mg/kg	1.1E-08	mg/kg-day	--	--	--	7.9E-07	mg/kg-day	5.0E-03	mg/kg-day	1.6E-04
				Vanadium	1.4E+02	mg/kg	5.6E-06	mg/kg-day	--	--	--	3.9E-04	mg/kg-day	5.0E-03	mg/kg-day	7.8E-02
				Zinc	1.1E+02	mg/kg	4.4E-06	mg/kg-day	--	--	--	3.1E-04	mg/kg-day	3.0E-01	mg/kg-day	1.0E-03
				4,4'-DDD	7.4E-04	mg/kg	3.0E-11	mg/kg-day	2.4E-01	(mg/kg-day)-1	7.2E-12	2.1E-09	mg/kg-day	5.0E-04	mg/kg-day	4.2E-06
				4,4'-DDE	8.7E-04	mg/kg	3.5E-11	mg/kg-day	3.4E-01	(mg/kg-day)-1	1.2E-11	2.5E-09	mg/kg-day	5.0E-04	mg/kg-day	4.9E-06
				4,4'-DDT	2.9E-04	mg/kg	1.2E-11	mg/kg-day	3.4E-01	(mg/kg-day)-1	4.0E-12	8.3E-10	mg/kg-day	5.0E-04	mg/kg-day	1.7E-06
				alpha-Chlordane	1.2E-04	mg/kg	4.8E-12	mg/kg-day	3.5E-01	(mg/kg-day)-1	1.7E-12	3.3E-10	mg/kg-day	5.0E-04	mg/kg-day	6.7E-07
				gamma-Chlordane	2.0E-05	mg/kg	8.1E-13	mg/kg-day	3.5E-01	(mg/kg-day)-1	2.8E-13	5.7E-11	mg/kg-day	5.0E-04	mg/kg-day	1.1E-07
				2-Methylnaphthalene	4.9E-03	mg/kg	2.0E-10	mg/kg-day	--	--	--	1.4E-08	mg/kg-day	4.0E-03	mg/kg-day	3.5E-06
				Acenaphthene	4.4E-03	mg/kg	1.8E-10	mg/kg-day	--	--	--	1.2E-08	mg/kg-day	6.0E-02	mg/kg-day	2.1E-07
				Acenaphthylene	6.6E-03	mg/kg	2.7E-10	mg/kg-day	--	--	--	1.9E-08	mg/kg-day	6.0E-02	mg/kg-day	3.1E-07
				Anthracene	3.2E-02	mg/kg	1.3E-09	mg/kg-day	--	--	--	9.0E-08	mg/kg-day	3.0E-01	mg/kg-day	3.0E-07
				Fluorene	6.4E-03	mg/kg	2.6E-10	mg/kg-day	--	--	--	1.8E-08	mg/kg-day	4.0E-02	mg/kg-day	4.5E-07
				Naphthalene	1.2E-02	mg/kg	4.8E-10	mg/kg-day	--	--	--	3.3E-08	mg/kg-day	2.0E-02	mg/kg-day	1.7E-06
				Phenanthrene	8.9E-02	mg/kg	3.6E-09	mg/kg-day	--	--	--	2.5E-07	mg/kg-day	3.0E-01	mg/kg-day	8.3E-07
				Benzo(a)anthracene	9.3E-02	mg/kg	3.8E-09	mg/kg-day	1.2E+00	(mg/kg-day)-1	4.5E-09	2.6E-07	mg/kg-day	--	--	--
				Benzo(a)pyrene	1.4E-01	mg/kg	5.8E-09	mg/kg-day	7.3E+00	(mg/kg-day)-1	4.2E-08	4.0E-07	mg/kg-day	--	--	--
				Benzo(b)fluoranthene	8.8E-02	mg/kg	3.6E-09	mg/kg-day	1.2E+00	(mg/kg-day)-1	4.3E-09	2.5E-07	mg/kg-day	--	--	--
				Benzo(g,h,i)perylene	1.2E-01	mg/kg	5.0E-09	mg/kg-day	--	--	--	3.5E-07	mg/kg-day	3.0E-02	mg/kg-day	1.2E-05
				Benzo(k)fluoranthene	9.3E-02	mg/kg	3.8E-09	mg/kg-day	1.2E+00	(mg/kg-day)-1	4.5E-09	2.6E-07	mg/kg-day	--	--	--
				Chrysene	1.1E-01	mg/kg	4.6E-09	mg/kg-day	1.2E-01	(mg/kg-day)-1	5.5E-10	3.2E-07	mg/kg-day	--	--	--
				Dibenz(a,h)anthracene	1.2E-02	mg/kg	4.9E-10	mg/kg-day	7.3E+00	(mg/kg-day)-1	3.6E-09	3.4E-08	mg/kg-day	--	--	--
				Fluoranthene	2.0E-01	mg/kg	8.0E-09	mg/kg-day	--	--	--	5.6E-07	mg/kg-day	4.0E-02	mg/kg-day	1.4E-05
				Indeno(1,2,3-cd)pyrene	1.1E-01	mg/kg	4.5E-09	mg/kg-day	1.2E+00	(mg/kg-day)-1	5.4E-09	3.2E-07	mg/kg-day	--	--	--
				Pyrene	2.6E-01	mg/kg	1.1E-08	mg/kg-day	--	--	--	7.4E-07	mg/kg-day	3.0E-02	mg/kg-day	2.5E-05
				Dibutyltin	3.9E-03	mg/kg	1.6E-10	mg/kg-day	--	--	--	1.1E-08	mg/kg-day	3.0E-04	mg/kg-day	3.7E-05
				Tributyltin	4.8E-03	mg/kg	1.9E-10	mg/kg-day	--	--	--	1.4E-08	mg/kg-day	3.0E-04	mg/kg-day	4.5E-05
				Total PCB Congeners	2.8E-02	mg/kg	1.1E-09	mg/kg-day	2.0E+00	(mg/kg-day)-1	2.3E-09	8.0E-08	mg/kg-day	2.0E-05	mg/kg-day	4.0E-03
				Total TEQ – PCB DLC	7.5E-06	mg/kg	3.0E-13	mg/kg-day	1.3E+05	(mg/kg-day)-1	3.9E-08	2.1E-11	mg/kg-day	7.0E-10	mg/kg-day	3.0E-02
			Exp. Route Total								2.5E-06					7.3E-01

TABLE A-7A

Calculation of RME Chemical Cancer Risks and Noncancer Hazards - Construction Worker, Eastern Wetland Area

Appendix A - Updated Human Health Risk Assessment for Chemical Exposures

Scenario Timeframe:	Future
Receptor Population:	Construction Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC Value	EPC Units	Cancer Risk Calculations: Intake/Exposure Concentration Value	Intake/Exposure Concentration Units	CSF / Unit Risk Value	CSF / Unit Risk Units	Cancer Risk	Noncancer Hazard Quotient: Intake/Exposure Concentration Value	Intake/Exposure Concentration Units	RfD / RfC Value	RfD / RfC Units	Hazard Quotient
			Dermal	Aluminum	6.4E+04	mg/kg	3.8E-04	mg/kg-day	--	--	--	2.6E-02	mg/kg-day	1.0E+00	mg/kg-day	2.6E-02
				Antimony	2.8E+00	mg/kg	1.6E-08	mg/kg-day	--	--	--	1.1E-06	mg/kg-day	6.0E-05	mg/kg-day	1.9E-02
				Arsenic	9.7E+00	mg/kg	1.7E-07	mg/kg-day	9.5E+00	(mg/kg-day)-1	1.6E-06	1.2E-05	mg/kg-day	3.0E-04	mg/kg-day	4.0E-02
				Barium	4.2E+02	mg/kg	2.5E-06	mg/kg-day	--	--	--	1.8E-04	mg/kg-day	1.4E-02	mg/kg-day	1.3E-02
				Cadmium	2.6E-01	mg/kg	1.5E-10	mg/kg-day	6.0E+02	(mg/kg-day)-1	9.2E-08	1.1E-08	mg/kg-day	2.5E-05	mg/kg-day	4.3E-04
				Chromium	2.9E+02	mg/kg	1.7E-06	mg/kg-day	--	--	--	1.2E-04	mg/kg-day	2.0E-02	mg/kg-day	6.1E-03
				Cobalt	1.7E+01	mg/kg	1.0E-07	mg/kg-day	--	--	--	7.2E-06	mg/kg-day	3.0E-04	mg/kg-day	2.4E-02
				Copper	4.1E+01	mg/kg	2.4E-07	mg/kg-day	--	--	--	1.7E-05	mg/kg-day	4.0E-02	mg/kg-day	4.2E-04
				Iron	3.9E+04	mg/kg	2.3E-04	mg/kg-day	--	--	--	1.6E-02	mg/kg-day	7.0E-01	mg/kg-day	2.3E-02
				Lead	2.5E+01	mg/kg	1.5E-07	mg/kg-day	--	--	--	1.0E-05	mg/kg-day	--	--	--
				Manganese	5.3E+02	mg/kg	3.2E-06	mg/kg-day	--	--	--	2.2E-04	mg/kg-day	1.4E-01	mg/kg-day	1.6E-03
				Mercury	2.2E-01	mg/kg	1.3E-09	mg/kg-day	--	--	--	9.0E-08	mg/kg-day	1.0E-04	mg/kg-day	9.0E-04
				Molybdenum	9.5E-01	mg/kg	5.6E-09	mg/kg-day	--	--	--	3.9E-07	mg/kg-day	5.0E-03	mg/kg-day	7.8E-05
				Nickel	8.5E+01	mg/kg	5.0E-07	mg/kg-day	--	--	--	3.5E-05	mg/kg-day	8.0E-04	mg/kg-day	4.4E-02
				Selenium	3.4E-01	mg/kg	2.0E-09	mg/kg-day	--	--	--	1.4E-07	mg/kg-day	5.0E-03	mg/kg-day	2.8E-05
				Silver	2.8E-01	mg/kg	1.7E-09	mg/kg-day	--	--	--	1.2E-07	mg/kg-day	2.0E-04	mg/kg-day	5.8E-04
				Vanadium	1.4E+02	mg/kg	8.2E-07	mg/kg-day	--	--	--	5.7E-05	mg/kg-day	1.3E-04	mg/kg-day	4.4E-01
				Zinc	1.1E+02	mg/kg	6.4E-07	mg/kg-day	--	--	--	4.5E-05	mg/kg-day	3.0E-01	mg/kg-day	1.5E-04
				4,4'-DDD	7.4E-04	mg/kg	2.2E-11	mg/kg-day	2.4E-01	(mg/kg-day)-1	5.3E-12	1.5E-09	mg/kg-day	5.0E-04	mg/kg-day	3.1E-06
				4,4'-DDE	8.7E-04	mg/kg	2.6E-11	mg/kg-day	3.4E-01	(mg/kg-day)-1	8.8E-12	1.8E-09	mg/kg-day	5.0E-04	mg/kg-day	3.6E-06
				4,4'-DDT	2.9E-04	mg/kg	8.6E-12	mg/kg-day	3.4E-01	(mg/kg-day)-1	2.9E-12	6.1E-10	mg/kg-day	5.0E-04	mg/kg-day	1.2E-06
				alpha-Chlordane	1.2E-04	mg/kg	3.5E-12	mg/kg-day	3.5E-01	(mg/kg-day)-1	1.2E-12	2.4E-10	mg/kg-day	5.0E-04	mg/kg-day	4.9E-07
				gamma-Chlordane	2.0E-05	mg/kg	5.9E-13	mg/kg-day	3.5E-01	(mg/kg-day)-1	2.1E-13	4.1E-11	mg/kg-day	5.0E-04	mg/kg-day	8.3E-08
				2-Methylnaphthalene	4.9E-03	mg/kg	4.3E-10	mg/kg-day	--	--	--	3.0E-08	mg/kg-day	4.0E-03	mg/kg-day	7.6E-06
				Acenaphthene	4.4E-03	mg/kg	3.9E-10	mg/kg-day	--	--	--	2.7E-08	mg/kg-day	6.0E-02	mg/kg-day	4.5E-07
				Acenaphthylene	6.6E-03	mg/kg	5.8E-10	mg/kg-day	--	--	--	4.1E-08	mg/kg-day	6.0E-02	mg/kg-day	6.8E-07
				Anthracene	3.2E-02	mg/kg	2.8E-09	mg/kg-day	--	--	--	2.0E-07	mg/kg-day	3.0E-01	mg/kg-day	6.6E-07
				Fluorene	6.4E-03	mg/kg	5.6E-10	mg/kg-day	--	--	--	3.9E-08	mg/kg-day	4.0E-02	mg/kg-day	9.9E-07
				Naphthalene	1.2E-02	mg/kg	1.0E-09	mg/kg-day	--	--	--	7.3E-08	mg/kg-day	2.0E-02	mg/kg-day	3.7E-06
				Phenanthrene	8.9E-02	mg/kg	7.8E-09	mg/kg-day	--	--	--	5.5E-07	mg/kg-day	3.0E-01	mg/kg-day	1.8E-06
				Benzo(a)anthracene	9.3E-02	mg/kg	8.3E-09	mg/kg-day	1.2E+00	(mg/kg-day)-1	9.9E-09	5.8E-07	mg/kg-day	--	--	--
				Benzo(a)pyrene	1.4E-01	mg/kg	1.3E-08	mg/kg-day	7.3E+00	(mg/kg-day)-1	9.2E-08	8.9E-07	mg/kg-day	--	--	--
				Benzo(b)fluoranthene	8.8E-02	mg/kg	7.8E-09	mg/kg-day	1.2E+00	(mg/kg-day)-1	9.4E-09	5.5E-07	mg/kg-day	--	--	--
				Benzo(g,h,i)perylene	1.2E-01	mg/kg	1.1E-08	mg/kg-day	--	--	--	7.7E-07	mg/kg-day	3.0E-02	mg/kg-day	2.6E-05
				Benzo(k)fluoranthene	9.3E-02	mg/kg	8.2E-09	mg/kg-day	1.2E+00	(mg/kg-day)-1	9.9E-09	5.8E-07	mg/kg-day	--	--	--
				Chrysene	1.1E-01	mg/kg	1.0E-08	mg/kg-day	1.2E-01	(mg/kg-day)-1	1.2E-09	7.0E-07	mg/kg-day	--	--	--
				Dibenz(a,h)anthracene	1.2E-02	mg/kg	1.1E-09	mg/kg-day	7.3E+00	(mg/kg-day)-1	7.9E-09	7.6E-08	mg/kg-day	--	--	--
				Fluoranthene	2.0E-01	mg/kg	1.8E-08	mg/kg-day	--	--	--	1.2E-06	mg/kg-day	4.0E-02	mg/kg-day	3.1E-05
				Indeno(1,2,3-cd)pyrene	1.1E-01	mg/kg	9.9E-09	mg/kg-day	1.2E+00	(mg/kg-day)-1	1.2E-08	6.9E-07	mg/kg-day	--	--	--
				Pyrene	2.6E-01	mg/kg	2.3E-08	mg/kg-day	--	--	--	1.6E-06	mg/kg-day	3.0E-02	mg/kg-day	5.4E-05
				Dibutyltin	3.9E-03	mg/kg	2.3E-10	mg/kg-day	--	--	--	1.6E-08	mg/kg-day	3.0E-04	mg/kg-day	5.4E-05
				Tributyltin	4.8E-03	mg/kg	2.8E-10	mg/kg-day	--	--	--	2.0E-08	mg/kg-day	3.0E-04	mg/kg-day	6.6E-05
				Total PCB Congeners	2.8E-02	mg/kg	2.5E-09	mg/kg-day	2.0E+00	(mg/kg-day)-1	5.0E-09	1.7E-07	mg/kg-day	2.0E-05	mg/kg-day	8.7E-03
				Total TEQ – PCB DLC	7.5E-06	mg/kg	1.3E-13	mg/kg-day	1.3E+05	(mg/kg-day)-1	1.7E-08	9.3E-12	mg/kg-day	7.0E-10	mg/kg-day	1.3E-02
			Exp. Route Total								1.9E-06					6.6E-01
		Exposure Point Total									4.4E-06					1.4E+00
	Exposure Medium Total										4.4E-06					1.4E+00
Medium Total											4.4E-06					1.4E+00
										Total of Receptor Risks across All Media	4.4E-06				Total of Receptor Hazards across All Media	1.4E+00

Acronyms/Abbreviations:

-- =	not available or not applicable	(mg/kg-day)-	1/(milligram[s] per kilogram per day)
CSF =	cancer slope factor	mg/kg =	milligram(s) per kilogram
DDD =	dichlorodiphenyldichloroethane	mg/kg-day =	milligram(s) per kilogram per day
DDE =	dichlorodiphenyldichloroethylene	PCB =	polychlorinated biphenyl
DDT =	dichlorodiphenyltrichloroethane	RfC =	reference concentration
EPC =	exposure point concentration	RfD =	reference dose
Exp. =	exposure	RME =	reasonable maximum exposure
M =	lifetime exposure from birth, mutagenic endpoint	TCDD =	tetrachlorodibenzo-p-dioxin

TABLE A-7B

Summary of Receptor Risks and Hazards - Construction Worker, Eastern Wetland Area

Appendix A - Updated Human Health Risk Assessment for Chemical Exposures

Scenario Timeframe:	Future
Receptor Population:	Construction Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk: Ingestion	Cancer Risk: Inhalation	Cancer Risk: Dermal	Cancer Risk: Exposure Routes Total	Noncancer Hazard Quotient: Ingestion	Noncancer Hazard Quotient: Inhalation	Noncancer Hazard Quotient: Dermal	Noncancer Hazard Quotient: Exposure Routes Total
Sediment	Sediment	Sediment	Aluminum	--	--	--	--	1.8E-01	--	2.6E-02	2.1E-01
			Antimony	--	--	--	--	2.0E-02	--	1.9E-02	3.9E-02
			Arsenic	2.2E-06	--	1.6E-06	3.9E-06	5.5E-02	--	4.0E-02	9.5E-02
			Barium	--	--	--	--	6.0E-03	--	1.3E-02	1.9E-02
			Cadmium	1.6E-07	--	9.2E-08	2.5E-07	7.3E-04	--	4.3E-04	1.2E-03
			Chromium	--	--	--	--	5.5E-04	--	6.1E-03	6.7E-03
			Cobalt	--	--	--	--	1.6E-01	--	2.4E-02	1.9E-01
			Copper	--	--	--	--	2.9E-03	--	4.2E-04	3.3E-03
			Iron	--	--	--	--	1.6E-01	--	2.3E-02	1.8E-01
			Lead	--	--	--	--	--	--	--	--
			Manganese	--	--	--	--	1.1E-02	--	1.6E-03	1.2E-02
			Mercury	--	--	--	--	6.2E-03	--	9.0E-04	7.1E-03
			Molybdenum	--	--	--	--	5.4E-04	--	7.8E-05	6.1E-04
			Nickel	--	--	--	--	1.2E-02	--	4.4E-02	5.6E-02
			Selenium	--	--	--	--	1.9E-04	--	2.8E-05	2.2E-04
			Silver	--	--	--	--	1.6E-04	--	5.8E-04	7.4E-04
			Vanadium	--	--	--	--	7.8E-02	--	4.4E-01	5.2E-01
			Zinc	--	--	--	--	1.0E-03	--	1.5E-04	1.2E-03
			4,4'-DDE	1.2E-11	--	8.8E-12	2.1E-11	4.9E-06	--	3.6E-06	8.5E-06
			4,4'-DDT	4.0E-12	--	2.9E-12	7.0E-12	1.7E-06	--	1.2E-06	2.9E-06
			alpha-Chlordane	1.7E-12	--	1.2E-12	2.9E-12	6.7E-07	--	4.9E-07	1.2E-06
			gamma-Chlordane	2.8E-13	--	2.1E-13	4.9E-13	1.1E-07	--	8.3E-08	2.0E-07
			2-Methylnaphthalene	--	--	--	--	3.5E-06	--	7.6E-06	1.1E-05
			Acenaphthene	--	--	--	--	2.1E-07	--	4.5E-07	6.6E-07
			Acenaphthylene	--	--	--	--	3.1E-07	--	6.8E-07	9.9E-07
			Anthracene	--	--	--	--	3.0E-07	--	6.6E-07	9.6E-07
			Fluorene	--	--	--	--	4.5E-07	--	9.9E-07	1.4E-06
			Naphthalene	--	--	--	--	1.7E-06	--	3.7E-06	5.3E-06
			Phenanthrene	--	--	--	--	8.3E-07	--	1.8E-06	2.7E-06
			Benzo(a)anthracene	4.5E-09	--	9.9E-09	1.4E-08	--	--	--	--
			Benzo(a)pyrene	4.2E-08	--	9.2E-08	1.3E-07	--	--	--	--
			Benzo(b)fluoranthene	4.3E-09	--	9.4E-09	1.4E-08	--	--	--	--
			Benzo(g,h,i)perylene	--	--	--	--	1.2E-05	--	2.6E-05	3.7E-05
			Benzo(k)fluoranthene	4.5E-09	--	9.9E-09	1.4E-08	--	--	--	--
			Chrysene	5.5E-10	--	1.2E-09	1.7E-09	--	--	--	--
			Dibenz(a,h)anthracene	3.6E-09	--	7.9E-09	1.1E-08	--	--	--	--
			Fluoranthene	--	--	--	--	1.4E-05	--	3.1E-05	4.5E-05
			Indeno(1,2,3-cd)pyrene	5.4E-09	--	1.2E-08	1.7E-08	--	--	--	--
			Pyrene	--	--	--	--	2.5E-05	--	5.4E-05	7.9E-05
			Dibutyltin	--	--	--	--	3.7E-05	--	5.4E-05	9.1E-05
			Tributyltin	--	--	--	--	4.5E-05	--	6.6E-05	1.1E-04
			Total PCB Congeners	2.3E-09	--	5.0E-09	7.3E-09	4.0E-03	--	8.7E-03	1.3E-02
			Total TEQ – PCB DLC	3.9E-08	--	1.7E-08	5.7E-08	3.0E-02	--	1.3E-02	4.4E-02
			Chemical Total	2.5E-06	--	1.9E-06	4.4E-06	7.3E-01	--	6.6E-01	1.4E+00
		Exposure Point Total					4.4E-06				1.4E+00
	Exposure Medium Total						4.4E-06				1.4E+00
Medium Total							4.4E-06				1.4E+00
Receptor Total						Total Risk across All Media	4.4E-06			Total Hazard across All Media	1.4E+00

TABLE A-7B

Summary of Receptor Risks and Hazards - Construction Worker, Eastern Wetland Area

Appendix A - Updated Human Health Risk Assessment for Chemical Exposures

Scenario Timeframe:	Future
Receptor Population:	Construction Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient			
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total

Acronyms/Abbreviations:

-- =	not available or not applicable
DDD =	dichlorodiphenyldichloroethane
DDE =	dichlorodiphenyldichloroethylene
DDT =	dichlorodiphenyltrichloroethane
PCB =	polychlorinated biphenyl
TCDD =	tetrachlorodibenzo-p-dioxin

TABLE A-7C

Summary of Risk Drivers - Construction Worker, Eastern Wetland Area

Appendix A - Updated Human Health Risk Assessment for Chemical Exposures

Scenario Timeframe:	Future
Receptor Population:	Construction Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient			
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total
Sediment	Sediment	Sediment	Arsenic	2.2E-06	--	1.6E-06	3.9E-06	5.5E-02	--	4.0E-02	9.5E-02
			Chemical Total	--	--	--	3.9E-06	--	--	--	9.5E-02
		Exposure Point Total					3.9E-06				9.5E-02
	Exposure Medium Total						3.9E-06				9.5E-02
Medium Total							3.9E-06				9.5E-02
Receptor Total						Total Risk across All Media	3.9E-06			Total Hazard across All Media	9.5E-02

Acronyms/Abbreviations:

-- = not available or not applicable

TABLE A-8A
Calculation of RME Chemical Cancer Risks and Noncancer Hazards - Adult and Child Recreational User, India Basin I
Appendix A - Updated Human Health Risk Assessment for Chemical Exposures

Scenario Timeframe:	Future
Receptor Population:	Recreational User
Receptor Age:	Adult and Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern		EPC Value	EPC Units	Cancer Risk Calculations: Intake/Exposure Concentration Value	Intake/Exposure Concentration Units	CSF / Unit Risk Value	CSF / Unit Risk Units	Cancer Risk	Noncancer Hazard Quotient: Intake/Exposure Concentration Value	Intake/Exposure Concentration Units	RfD / RfC Value	RfD / RfC Units	Hazard Quotient
Sediment	Sediment	Sediment	Ingestion	Aluminum		7.2E+04	mg/kg	7.7E-03	mg/kg-day	--	--	--	6.8E-02	mg/kg-day	1.0E+00	mg/kg-day	6.8E-02
				Antimony		1.1E+00	mg/kg	1.2E-07	mg/kg-day	--	--	--	1.0E-06	mg/kg-day	4.0E-04	mg/kg-day	2.6E-03
				Arsenic		1.1E+01	mg/kg	7.0E-07	mg/kg-day	9.5E+00	(mg/kg-day)-1	6.7E-06	6.3E-06	mg/kg-day	3.0E-04	mg/kg-day	2.1E-02
				Barium		5.0E+02	mg/kg	5.3E-05	mg/kg-day	--	--	--	4.7E-04	mg/kg-day	2.0E-01	mg/kg-day	2.4E-03
				Cadmium		2.5E-01	mg/kg	2.6E-08	mg/kg-day	1.5E+01	(mg/kg-day)-1	3.9E-07	2.3E-07	mg/kg-day	1.0E-03	mg/kg-day	2.3E-04
				Chromium		2.7E+02	mg/kg	2.8E-05	mg/kg-day	--	--	--	2.5E-04	mg/kg-day	1.5E+00	mg/kg-day	1.7E-04
				Cobalt		1.9E+01	mg/kg	2.0E-06	mg/kg-day	--	--	--	1.8E-05	mg/kg-day	3.0E-04	mg/kg-day	5.9E-02
				Copper		8.4E+01	mg/kg	8.9E-06	mg/kg-day	--	--	--	7.9E-05	mg/kg-day	4.0E-02	mg/kg-day	2.0E-03
				Iron		4.3E+04	mg/kg	4.6E-03	mg/kg-day	--	--	--	4.1E-02	mg/kg-day	7.0E-01	mg/kg-day	5.8E-02
				Lead		1.2E+02	mg/kg	1.2E-05	mg/kg-day	--	--	--	1.1E-04	mg/kg-day	--	--	--
				Manganese		4.4E+02	mg/kg	4.7E-05	mg/kg-day	--	--	--	4.2E-04	mg/kg-day	1.4E-01	mg/kg-day	3.0E-03
				Mercury		3.6E-01	mg/kg	3.9E-08	mg/kg-day	--	--	--	3.4E-07	mg/kg-day	1.0E-04	mg/kg-day	3.4E-03
				Molybdenum		1.3E+00	mg/kg	1.4E-07	mg/kg-day	--	--	--	1.2E-06	mg/kg-day	5.0E-03	mg/kg-day	2.5E-04
				Nickel		1.8E+02	mg/kg	1.9E-05	mg/kg-day	--	--	--	1.7E-04	mg/kg-day	2.0E-02	mg/kg-day	8.5E-03
				Selenium		3.9E-01	mg/kg	4.1E-08	mg/kg-day	--	--	--	3.7E-07	mg/kg-day	5.0E-03	mg/kg-day	7.4E-05
				Silver		3.0E-01	mg/kg	3.2E-08	mg/kg-day	--	--	--	2.8E-07	mg/kg-day	5.0E-03	mg/kg-day	5.7E-05
				Vanadium		1.4E+02	mg/kg	1.5E-05	mg/kg-day	--	--	--	1.3E-04	mg/kg-day	5.0E-03	mg/kg-day	2.7E-02
				Zinc		1.3E+02	mg/kg	1.4E-05	mg/kg-day	--	--	--	1.2E-04	mg/kg-day	3.0E-01	mg/kg-day	4.1E-04
				4,4'-DDD		1.6E-03	mg/kg	1.7E-10	mg/kg-day	2.4E-01	(mg/kg-day)-1	4.0E-11	1.5E-09	mg/kg-day	5.0E-04	mg/kg-day	2.9E-06
				4,4'-DDE		1.5E-03	mg/kg	1.6E-10	mg/kg-day	3.4E-01	(mg/kg-day)-1	5.6E-11	1.5E-09	mg/kg-day	5.0E-04	mg/kg-day	2.9E-06
				4,4'-DDT		7.1E-04	mg/kg	7.6E-11	mg/kg-day	3.4E-01	(mg/kg-day)-1	2.6E-11	6.8E-10	mg/kg-day	5.0E-04	mg/kg-day	1.4E-06
				alpha-Chlordane		3.2E-04	mg/kg	3.4E-11	mg/kg-day	3.5E-01	(mg/kg-day)-1	1.2E-11	3.1E-10	mg/kg-day	5.0E-04	mg/kg-day	6.1E-07
				gamma-Chlordane		1.4E-04	mg/kg	1.5E-11	mg/kg-day	3.5E-01	(mg/kg-day)-1	5.2E-12	1.3E-10	mg/kg-day	5.0E-04	mg/kg-day	2.7E-07
				2-Methylnaphthalene		1.0E-02	mg/kg	1.1E-09	mg/kg-day	--	--	--	9.7E-09	mg/kg-day	4.0E-03	mg/kg-day	2.4E-06
				Acenaphthene		9.7E-03	mg/kg	1.0E-09	mg/kg-day	--	--	--	9.2E-09	mg/kg-day	6.0E-02	mg/kg-day	1.5E-07
				Acenaphthylene		1.2E-02	mg/kg	1.3E-09	mg/kg-day	--	--	--	1.2E-08	mg/kg-day	6.0E-02	mg/kg-day	1.9E-07
				Anthracene		2.1E-01	mg/kg	2.2E-08	mg/kg-day	--	--	--	2.0E-07	mg/kg-day	3.0E-01	mg/kg-day	6.6E-07
				Fluorene		3.0E-02	mg/kg	3.2E-09	mg/kg-day	--	--	--	2.8E-08	mg/kg-day	4.0E-02	mg/kg-day	7.0E-07
				Naphthalene		1.7E-02	mg/kg	1.8E-09	mg/kg-day	--	--	--	1.6E-08	mg/kg-day	2.0E-02	mg/kg-day	7.8E-07
				Phenanthrene		1.4E-01	mg/kg	1.5E-08	mg/kg-day	--	--	--	1.3E-07	mg/kg-day	3.0E-01	mg/kg-day	4.3E-07
				Benzo(a)anthracene	M	1.8E-01	mg/kg	8.6E-08	mg/kg-day	1.2E+00	(mg/kg-day)-1	1.0E-07	1.7E-07	mg/kg-day	--	--	--
				Benzo(a)pyrene	M	2.5E-01	mg/kg	1.2E-07	mg/kg-day	7.3E+00	(mg/kg-day)-1	8.7E-07	2.3E-07	mg/kg-day	--	--	--
				Benzo(b)fluoranthene	M	2.0E-01	mg/kg	9.7E-08	mg/kg-day	1.2E+00	(mg/kg-day)-1	1.2E-07	1.9E-07	mg/kg-day	--	--	--
				Benzo(g,h,i)perylene		1.9E-01	mg/kg	2.1E-08	mg/kg-day	--	--	--	1.8E-07	mg/kg-day	3.0E-02	mg/kg-day	6.1E-06
				Benzo(k)fluoranthene	M	1.9E-01	mg/kg	9.3E-08	mg/kg-day	1.2E+00	(mg/kg-day)-1	1.1E-07	1.8E-07	mg/kg-day	--	--	--
				Chrysene	M	2.7E-01	mg/kg	1.3E-07	mg/kg-day	1.2E-01	(mg/kg-day)-1	1.5E-08	2.5E-07	mg/kg-day	--	--	--
				Dibenz(a,h)anthracene	M	3.3E-02	mg/kg	1.6E-08	mg/kg-day	7.3E+00	(mg/kg-day)-1	1.2E-07	3.1E-08	mg/kg-day	--	--	--
				Fluoranthene		3.3E-01	mg/kg	3.6E-08	mg/kg-day	--	--	--	3.2E-07	mg/kg-day	4.0E-02	mg/kg-day	7.9E-06
				Indeno(1,2,3-cd)pyrene	M	1.9E-01	mg/kg	9.1E-08	mg/kg-day	1.2E+00	(mg/kg-day)-1	1.1E-07	1.8E-07	mg/kg-day	--	--	--
				Pyrene		3.8E-01	mg/kg	4.0E-08	mg/kg-day	--	--	--	3.6E-07	mg/kg-day	3.0E-02	mg/kg-day	1.2E-05
				Dibutyltin		1.1E-02	mg/kg	1.2E-09	mg/kg-day	--	--	--	1.0E-08	mg/kg-day	3.0E-04	mg/kg-day	3.5E-05
				Tributyltin		1.8E-02	mg/kg	1.9E-09	mg/kg-day	--	--	--	1.7E-08	mg/kg-day	3.0E-04	mg/kg-day	5.6E-05
				Total PCB Congeners		9.0E-02	mg/kg	9.6E-09	mg/kg-day	2.0E+00	(mg/kg-day)-1	1.9E-08	8.5E-08	mg/kg-day	2.0E-05	mg/kg-day	4.3E-03
				Total TEQ – PCB DLC		8.3E-06	mg/kg	8.9E-13	mg/kg-day	1.3E+05	(mg/kg-day)-1	1.2E-07	7.9E-12	mg/kg-day	7.0E-10	mg/kg-day	1.1E-02
			Exp. Route Total									8.7E-06					2.7E-01

TABLE A-8A

Calculation of RME Chemical Cancer Risks and Noncancer Hazards - Adult and Child Recreational User, India Basin I

Appendix A - Updated Human Health Risk Assessment for Chemical Exposures

Scenario Timeframe:	Future
Receptor Population:	Recreational User
Receptor Age:	Adult and Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC Value	EPC Units	Cancer Risk Calculations: Intake/Exposure Concentration Value	Intake/Exposure Concentration Units	CSF / Unit Risk Value	CSF / Unit Risk Units	Cancer Risk	Noncancer Hazard Quotient: Intake/Exposure Concentration Value	Intake/Exposure Concentration Units	RfD / RfC Value	RfD / RfC Units	Hazard Quotient
			Dermal	Aluminum	7.2E+04	mg/kg	2.5E-04	mg/kg-day	--	--	--	2.0E-03	mg/kg-day	1.0E+00	mg/kg-day	2.0E-03
				Antimony	1.1E+00	mg/kg	3.7E-09	mg/kg-day	--	--	--	3.0E-08	mg/kg-day	6.0E-05	mg/kg-day	5.0E-04
				Arsenic	1.1E+01	mg/kg	1.1E-07	mg/kg-day	9.5E+00	(mg/kg-day)-1	1.1E-06	9.1E-07	mg/kg-day	3.0E-04	mg/kg-day	3.0E-03
				Barium	5.0E+02	mg/kg	1.7E-06	mg/kg-day	--	--	--	1.4E-05	mg/kg-day	1.4E-02	mg/kg-day	9.8E-04
				Cadmium	2.5E-01	mg/kg	8.4E-11	mg/kg-day	6.0E+02	(mg/kg-day)-1	5.0E-08	6.7E-10	mg/kg-day	2.5E-05	mg/kg-day	2.7E-05
				Chromium	2.7E+02	mg/kg	9.1E-07	mg/kg-day	--	--	--	7.3E-06	mg/kg-day	2.0E-02	mg/kg-day	3.8E-04
				Cobalt	1.9E+01	mg/kg	6.4E-08	mg/kg-day	--	--	--	5.2E-07	mg/kg-day	3.0E-04	mg/kg-day	1.7E-03
				Copper	8.4E+01	mg/kg	2.9E-07	mg/kg-day	--	--	--	2.3E-06	mg/kg-day	4.0E-02	mg/kg-day	5.8E-05
				Iron	4.3E+04	mg/kg	1.5E-04	mg/kg-day	--	--	--	1.2E-03	mg/kg-day	7.0E-01	mg/kg-day	1.7E-03
				Lead	1.2E+02	mg/kg	4.0E-07	mg/kg-day	--	--	--	3.2E-06	mg/kg-day	--	--	--
				Manganese	4.4E+02	mg/kg	1.5E-06	mg/kg-day	--	--	--	1.2E-05	mg/kg-day	1.4E-01	mg/kg-day	8.7E-05
				Mercury	3.6E-01	mg/kg	1.2E-09	mg/kg-day	--	--	--	1.0E-08	mg/kg-day	1.0E-04	mg/kg-day	1.0E-04
				Molybdenum	1.3E+00	mg/kg	4.4E-09	mg/kg-day	--	--	--	3.6E-08	mg/kg-day	5.0E-03	mg/kg-day	7.1E-06
				Nickel	1.8E+02	mg/kg	6.2E-07	mg/kg-day	--	--	--	4.9E-06	mg/kg-day	8.0E-04	mg/kg-day	6.2E-03
				Selenium	3.9E-01	mg/kg	1.3E-09	mg/kg-day	--	--	--	1.1E-08	mg/kg-day	5.0E-03	mg/kg-day	2.1E-06
				Silver	3.0E-01	mg/kg	1.0E-09	mg/kg-day	--	--	--	8.3E-09	mg/kg-day	2.0E-04	mg/kg-day	4.1E-05
				Vanadium	1.4E+02	mg/kg	4.8E-07	mg/kg-day	--	--	--	3.9E-06	mg/kg-day	1.3E-04	mg/kg-day	3.0E-02
				Zinc	1.3E+02	mg/kg	4.5E-07	mg/kg-day	--	--	--	3.6E-06	mg/kg-day	3.0E-01	mg/kg-day	1.2E-05
				4,4'-DDD	1.6E-03	mg/kg	2.7E-11	mg/kg-day	2.4E-01	(mg/kg-day)-1	6.4E-12	2.1E-10	mg/kg-day	5.0E-04	mg/kg-day	4.3E-07
				4,4'-DDE	1.5E-03	mg/kg	2.6E-11	mg/kg-day	3.4E-01	(mg/kg-day)-1	9.0E-12	2.1E-10	mg/kg-day	5.0E-04	mg/kg-day	4.2E-07
				4,4'-DDT	7.1E-04	mg/kg	1.2E-11	mg/kg-day	3.4E-01	(mg/kg-day)-1	4.2E-12	9.8E-11	mg/kg-day	5.0E-04	mg/kg-day	2.0E-07
				alpha-Chlordane	3.2E-04	mg/kg	5.5E-12	mg/kg-day	3.5E-01	(mg/kg-day)-1	1.9E-12	4.4E-11	mg/kg-day	5.0E-04	mg/kg-day	8.9E-08
				gamma-Chlordane	1.4E-04	mg/kg	2.4E-12	mg/kg-day	3.5E-01	(mg/kg-day)-1	8.4E-13	1.9E-11	mg/kg-day	5.0E-04	mg/kg-day	3.9E-08
				2-Methylnaphthalene	1.0E-02	mg/kg	5.3E-10	mg/kg-day	--	--	--	4.2E-09	mg/kg-day	4.0E-03	mg/kg-day	1.1E-06
				Acenaphthene	9.7E-03	mg/kg	5.0E-10	mg/kg-day	--	--	--	4.0E-09	mg/kg-day	6.0E-02	mg/kg-day	6.7E-08
				Acenaphthylene	1.2E-02	mg/kg	6.3E-10	mg/kg-day	--	--	--	5.0E-09	mg/kg-day	6.0E-02	mg/kg-day	8.4E-08
				Anthracene	2.1E-01	mg/kg	1.1E-08	mg/kg-day	--	--	--	8.7E-08	mg/kg-day	3.0E-01	mg/kg-day	2.9E-07
				Fluorene	3.0E-02	mg/kg	1.5E-09	mg/kg-day	--	--	--	1.2E-08	mg/kg-day	4.0E-02	mg/kg-day	3.0E-07
				Naphthalene	1.7E-02	mg/kg	8.5E-10	mg/kg-day	--	--	--	6.8E-09	mg/kg-day	2.0E-02	mg/kg-day	3.4E-07
				Phenanthrene	1.4E-01	mg/kg	7.1E-09	mg/kg-day	--	--	--	5.7E-08	mg/kg-day	3.0E-01	mg/kg-day	1.9E-07
				Benzo(a)anthracene M	1.8E-01	mg/kg	3.9E-08	mg/kg-day	1.2E+00	(mg/kg-day)-1	4.7E-08	7.4E-08	mg/kg-day	--	--	--
				Benzo(a)pyrene M	2.5E-01	mg/kg	5.4E-08	mg/kg-day	7.3E+00	(mg/kg-day)-1	4.0E-07	1.0E-07	mg/kg-day	--	--	--
				Benzo(b)fluoranthene M	2.0E-01	mg/kg	4.4E-08	mg/kg-day	1.2E+00	(mg/kg-day)-1	5.3E-08	8.2E-08	mg/kg-day	--	--	--
				Benzo(g,h,i)perylene	1.9E-01	mg/kg	9.9E-09	mg/kg-day	--	--	--	8.0E-08	mg/kg-day	3.0E-02	mg/kg-day	2.7E-06
				Benzo(k)fluoranthene M	1.9E-01	mg/kg	4.2E-08	mg/kg-day	1.2E+00	(mg/kg-day)-1	5.1E-08	7.9E-08	mg/kg-day	--	--	--
				Chrysene M	2.7E-01	mg/kg	5.9E-08	mg/kg-day	1.2E-01	(mg/kg-day)-1	7.1E-09	1.1E-07	mg/kg-day	--	--	--
				Dibenz(a,h)anthracene M	3.3E-02	mg/kg	7.2E-09	mg/kg-day	7.3E+00	(mg/kg-day)-1	5.3E-08	1.4E-08	mg/kg-day	--	--	--
				Fluoranthene	3.3E-01	mg/kg	1.7E-08	mg/kg-day	--	--	--	1.4E-07	mg/kg-day	4.0E-02	mg/kg-day	3.4E-06
				Indeno(1,2,3-cd)pyrene M	1.9E-01	mg/kg	4.2E-08	mg/kg-day	1.2E+00	(mg/kg-day)-1	5.0E-08	7.8E-08	mg/kg-day	--	--	--
				Pyrene	3.8E-01	mg/kg	1.9E-08	mg/kg-day	--	--	--	1.6E-07	mg/kg-day	3.0E-02	mg/kg-day	5.2E-06
				Dibutyltin	1.1E-02	mg/kg	3.7E-10	mg/kg-day	--	--	--	3.0E-09	mg/kg-day	3.0E-04	mg/kg-day	1.0E-05
				Tributyltin	1.8E-02	mg/kg	6.1E-10	mg/kg-day	--	--	--	4.9E-09	mg/kg-day	3.0E-04	mg/kg-day	1.6E-05
				Total PCB Congeners	9.0E-02	mg/kg	4.6E-09	mg/kg-day	2.0E+00	(mg/kg-day)-1	9.3E-09	3.7E-08	mg/kg-day	2.0E-05	mg/kg-day	1.9E-03
				Total TEQ – PCB DLC	8.3E-06	mg/kg	8.5E-14	mg/kg-day	1.3E+05	(mg/kg-day)-1	1.1E-08	6.8E-13	mg/kg-day	7.0E-10	mg/kg-day	9.8E-04
			Exp. Route Total								1.8E-06					5.0E-02
		Exposure Point Total									1.0E-05					3.2E-01
	Exposure Medium Total										1.0E-05					3.2E-01
Medium Total											1.0E-05					3.2E-01

TABLE A-8A
Calculation of RME Chemical Cancer Risks and Noncancer Hazards - Adult and Child Recreational User, India Basin I
Appendix A - Updated Human Health Risk Assessment for Chemical Exposures

Scenario Timeframe:	Future
Receptor Population:	Recreational User
Receptor Age:	Adult and Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC Value	EPC Units	Cancer Risk Calculations: Intake/Exposure Concentration Value	Intake/Exposure Concentration Units	CSF / Unit Risk Value	CSF / Unit Risk Units	Cancer Risk	Noncancer Hazard Quotient: Intake/Exposure Concentration Value	Intake/Exposure Concentration Units	RfD / RfC Value	RfD / RfC Units	Hazard Quotient
Macoma[a]	Macoma	Macoma	Ingestion	Aluminum	3.2E+02	mg/kg	2.5E-03	mg/kg-day	--	--	--	8.6E-03	mg/kg-day	1.0E+00	mg/kg-day	8.6E-03
				Antimony	2.4E-02	mg/kg	1.8E-07	mg/kg-day	--	--	--	6.4E-07	mg/kg-day	4.0E-04	mg/kg-day	1.6E-03
				Arsenic	3.5E+00	mg/kg	2.6E-05	mg/kg-day	9.5E+00	(mg/kg-day)-1	2.5E-04	9.2E-05	mg/kg-day	3.0E-04	mg/kg-day	3.1E-01
				Barium	3.0E+00	mg/kg	2.3E-05	mg/kg-day	--	--	--	8.0E-05	mg/kg-day	2.0E-01	mg/kg-day	4.0E-04
				Cadmium	4.8E-02	mg/kg	3.6E-07	mg/kg-day	1.5E+01	(mg/kg-day)-1	5.4E-06	1.3E-06	mg/kg-day	1.0E-03	mg/kg-day	1.3E-03
				Chromium	1.6E+00	mg/kg	1.2E-05	mg/kg-day	--	--	--	4.3E-05	mg/kg-day	1.5E+00	mg/kg-day	2.9E-05
				Cobalt	3.7E-01	mg/kg	2.8E-06	mg/kg-day	--	--	--	9.9E-06	mg/kg-day	3.0E-04	mg/kg-day	3.3E-02
				Copper	2.4E+00	mg/kg	1.8E-05	mg/kg-day	--	--	--	6.4E-05	mg/kg-day	4.0E-02	mg/kg-day	1.6E-03
				Iron	3.6E+02	mg/kg	2.7E-03	mg/kg-day	--	--	--	9.5E-03	mg/kg-day	7.0E-01	mg/kg-day	1.4E-02
				Lead	4.2E-01	mg/kg	3.2E-06	mg/kg-day	--	--	--	1.1E-05	mg/kg-day	--	--	--
				Manganese	4.5E+00	mg/kg	3.4E-05	mg/kg-day	--	--	--	1.2E-04	mg/kg-day	1.4E-01	mg/kg-day	8.5E-04
				Mercury	2.1E-02	mg/kg	1.6E-07	mg/kg-day	--	--	--	5.6E-07	mg/kg-day	1.0E-04	mg/kg-day	5.6E-03
				Molybdenum	4.6E-01	mg/kg	3.5E-06	mg/kg-day	--	--	--	1.2E-05	mg/kg-day	5.0E-03	mg/kg-day	2.4E-03
				Nickel	2.0E+00	mg/kg	1.5E-05	mg/kg-day	--	--	--	5.3E-05	mg/kg-day	2.0E-02	mg/kg-day	2.7E-03
				Selenium	7.9E-01	mg/kg	6.0E-06	mg/kg-day	--	--	--	2.1E-05	mg/kg-day	5.0E-03	mg/kg-day	4.2E-03
				Silver	1.3E-01	mg/kg	1.0E-06	mg/kg-day	--	--	--	3.5E-06	mg/kg-day	5.0E-03	mg/kg-day	7.1E-04
				Vanadium	1.2E+00	mg/kg	9.5E-06	mg/kg-day	--	--	--	3.3E-05	mg/kg-day	5.0E-03	mg/kg-day	6.6E-03
				Zinc	1.8E+01	mg/kg	1.3E-04	mg/kg-day	--	--	--	4.7E-04	mg/kg-day	3.0E-01	mg/kg-day	1.6E-03
				4,4'-DDD	7.7E-04	mg/kg	5.8E-09	mg/kg-day	2.4E-01	(mg/kg-day)-1	1.4E-09	2.0E-08	mg/kg-day	5.0E-04	mg/kg-day	4.1E-05
				4,4'-DDE	1.4E-03	mg/kg	1.0E-08	mg/kg-day	3.4E-01	(mg/kg-day)-1	3.5E-09	3.6E-08	mg/kg-day	5.0E-04	mg/kg-day	7.2E-05
				alpha-Chlordane	2.5E-04	mg/kg	1.9E-09	mg/kg-day	3.5E-01	(mg/kg-day)-1	6.8E-10	6.8E-09	mg/kg-day	5.0E-04	mg/kg-day	1.4E-05
				Dieldrin	3.5E-04	mg/kg	2.6E-09	mg/kg-day	1.6E+01	(mg/kg-day)-1	4.2E-08	9.3E-09	mg/kg-day	5.0E-05	mg/kg-day	1.9E-04
				gamma-Chlordane	2.1E-04	mg/kg	1.6E-09	mg/kg-day	3.5E-01	(mg/kg-day)-1	5.6E-10	5.6E-09	mg/kg-day	5.0E-04	mg/kg-day	1.1E-05
				Acenaphthene	3.8E-04	mg/kg	2.9E-09	mg/kg-day	--	--	--	1.0E-08	mg/kg-day	6.0E-02	mg/kg-day	1.7E-07
				Acenaphthylene	7.1E-04	mg/kg	5.4E-09	mg/kg-day	--	--	--	1.9E-08	mg/kg-day	6.0E-02	mg/kg-day	3.1E-07
				Anthracene	6.6E-03	mg/kg	5.0E-08	mg/kg-day	--	--	--	1.8E-07	mg/kg-day	3.0E-01	mg/kg-day	5.9E-07
				Fluorene	5.1E-04	mg/kg	3.9E-09	mg/kg-day	--	--	--	1.4E-08	mg/kg-day	4.0E-02	mg/kg-day	3.4E-07
				Phenanthrene	3.4E-03	mg/kg	2.6E-08	mg/kg-day	--	--	--	9.0E-08	mg/kg-day	3.0E-01	mg/kg-day	3.0E-07
				Benzo(a)anthracene	1.2E-02	mg/kg	9.0E-08	mg/kg-day	1.2E+00	(mg/kg-day)-1	1.1E-07	3.1E-07	mg/kg-day	--	--	--
				Benzo(a)pyrene	7.9E-03	mg/kg	6.0E-08	mg/kg-day	7.3E+00	(mg/kg-day)-1	4.4E-07	2.1E-07	mg/kg-day	--	--	--
				Benzo(b)fluoranthene	1.0E-02	mg/kg	7.6E-08	mg/kg-day	1.2E+00	(mg/kg-day)-1	9.1E-08	2.7E-07	mg/kg-day	--	--	--
				Benzo(g,h,i)perylene	4.1E-03	mg/kg	3.1E-08	mg/kg-day	--	--	--	1.1E-07	mg/kg-day	3.0E-02	mg/kg-day	3.6E-06
				Benzo(k)fluoranthene	9.7E-03	mg/kg	7.4E-08	mg/kg-day	1.2E+00	(mg/kg-day)-1	8.9E-08	2.6E-07	mg/kg-day	--	--	--
				Chrysene	1.6E-02	mg/kg	1.2E-07	mg/kg-day	1.2E-01	(mg/kg-day)-1	1.4E-08	4.2E-07	mg/kg-day	--	--	--
				Dibenz(a,h)anthracene	3.6E-04	mg/kg	2.8E-09	mg/kg-day	7.3E+00	(mg/kg-day)-1	2.0E-08	9.7E-09	mg/kg-day	--	--	--
				Fluoranthene	4.0E-02	mg/kg	3.0E-07	mg/kg-day	--	--	--	1.1E-06	mg/kg-day	4.0E-02	mg/kg-day	2.6E-05
				Indeno(1,2,3-cd)pyrene	2.7E-03	mg/kg	2.0E-08	mg/kg-day	1.2E+00	(mg/kg-day)-1	2.4E-08	7.1E-08	mg/kg-day	--	--	--
				Pyrene	4.4E-02	mg/kg	3.4E-07	mg/kg-day	--	--	--	1.2E-06	mg/kg-day	3.0E-02	mg/kg-day	3.9E-05
				Dibutyltin	1.8E-03	mg/kg	1.4E-08	mg/kg-day	--	--	--	4.8E-08	mg/kg-day	3.0E-04	mg/kg-day	1.6E-04
				Tributyltin	7.2E-03	mg/kg	5.5E-08	mg/kg-day	--	--	--	1.9E-07	mg/kg-day	3.0E-04	mg/kg-day	6.4E-04
				Total PCB Congeners	1.8E-02	mg/kg	1.4E-07	mg/kg-day	2.0E+00	(mg/kg-day)-1	2.7E-07	4.8E-07	mg/kg-day	2.0E-05	mg/kg-day	2.4E-02
				Total TEQ – PCB DLC	1.3E-05	mg/kg	1.0E-10	mg/kg-day	1.3E+05	(mg/kg-day)-1	1.3E-05	3.6E-10	mg/kg-day	7.0E-10	mg/kg-day	5.1E-01
			Exp. Route Total								2.7E-04					9.3E-01
		Exposure Point Total									2.7E-04					9.3E-01
	Exposure Medium Total										2.7E-04					9.3E-01
Medium Total											2.7E-04					9.3E-01
										Total of Receptor Risks across All Media	2.8E-04				Total of Receptor Hazards across All Media	1.3E+00

TABLE A-8A

Calculation of RME Chemical Cancer Risks and Noncancer Hazards - Adult and Child Recreational User, India Basin I

Appendix A - Updated Human Health Risk Assessment for Chemical Exposures

Scenario Timeframe:	Future
Receptor Population:	Recreational User
Receptor Age:	Adult and Child

							Cancer Risk Calculations					Noncancer Hazard Quotient				
					EPC		Intake/Exposure Concentration		CSF / Unit Risk			Intake/Exposure Concentration		RfD / RfC		
Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	Value	Units	Value	Units	Value	Units	Cancer Risk	Value	Units	Value	Units	Hazard Quotient

Notes:

[a] Macoma ingestion risks are evaluated for the adult receptor only.

Acronyms/Abbreviations:

-- =	not available or not applicable	(mg/kg-day)-1 =	1/(milligram[s] per kilogram per day)
CSF =	cancer slope factor	mg/kg =	milligram(s) per kilogram
DDD =	dichlorodiphenyldichloroethane	mg/kg-day =	milligram(s) per kilogram per day
DDE =	dichlorodiphenyldichloroethylene	PCB =	polychlorinated biphenyl
DDT =	dichlorodiphenyltrichloroethane	RfC =	reference concentration
EPC =	exposure point concentration	RfD =	reference dose
Exp. =	exposure	RME =	reasonable maximum exposure
M =	lifetime exposure from birth, mutagenic endpoint	TCDD =	tetrachlorodibenzo-p-dioxin

TABLE A-8B
Summary of Receptor Risks and Hazards - Adult and Child Recreational User, India Basin I
Appendix A - Updated Human Health Risk Assessment for Chemical Exposures

Scenario Timeframe:	Future
Receptor Population:	Recreational User
Receptor Age:	Adult and Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk: Ingestion	Cancer Risk: Inhalation	Cancer Risk: Dermal	Cancer Risk: Exposure Routes Total	Noncancer Hazard Quotient: Ingestion	Noncancer Hazard Quotient: Inhalation	Noncancer Hazard Quotient: Dermal	Noncancer Hazard Quotient: Exposure Routes Total
Sediment	Sediment	Sediment	Aluminum	--	--	--	--	6.8E-02	--	2.0E-03	7.0E-02
			Antimony	--	--	--	--	2.6E-03	--	5.0E-04	3.1E-03
			Arsenic	6.7E-06	--	1.1E-06	7.8E-06	2.1E-02	--	3.0E-03	2.4E-02
			Barium	--	--	--	--	2.4E-03	--	9.8E-04	3.3E-03
			Cadmium	3.9E-07	--	5.0E-08	4.4E-07	2.3E-04	--	2.7E-05	2.6E-04
			Chromium	--	--	--	--	1.7E-04	--	3.8E-04	5.4E-04
			Cobalt	--	--	--	--	5.9E-02	--	1.7E-03	6.1E-02
			Copper	--	--	--	--	2.0E-03	--	5.8E-05	2.0E-03
			Iron	--	--	--	--	5.8E-02	--	1.7E-03	6.0E-02
			Lead	--	--	--	--	--	--	--	--
			Manganese	--	--	--	--	3.0E-03	--	8.7E-05	3.1E-03
			Mercury	--	--	--	--	3.4E-03	--	1.0E-04	3.5E-03
			Molybdenum	--	--	--	--	2.5E-04	--	7.1E-06	2.5E-04
			Nickel	--	--	--	--	8.5E-03	--	6.2E-03	1.5E-02
			Selenium	--	--	--	--	7.4E-05	--	2.1E-06	7.6E-05
			Silver	--	--	--	--	5.7E-05	--	4.1E-05	9.8E-05
			Vanadium	--	--	--	--	2.7E-02	--	3.0E-02	5.7E-02
			Zinc	--	--	--	--	4.1E-04	--	1.2E-05	4.2E-04
			4,4'-DDD	4.0E-11	--	6.4E-12	4.6E-11	2.9E-06	--	4.3E-07	3.4E-06
			4,4'-DDE	5.6E-11	--	9.0E-12	6.5E-11	2.9E-06	--	4.2E-07	3.3E-06
			4,4'-DDT	2.6E-11	--	4.2E-12	3.0E-11	1.4E-06	--	2.0E-07	1.5E-06
			alpha-Chlordane	1.2E-11	--	1.9E-12	1.4E-11	6.1E-07	--	8.9E-08	7.0E-07
			gamma-Chlordane	5.2E-12	--	8.4E-13	6.1E-12	2.7E-07	--	3.9E-08	3.0E-07
			2-Methylnaphthalene	--	--	--	--	2.4E-06	--	1.1E-06	3.5E-06
			Acenaphthene	--	--	--	--	1.5E-07	--	6.7E-08	2.2E-07
			Acenaphthylene	--	--	--	--	1.9E-07	--	8.4E-08	2.8E-07
			Anthracene	--	--	--	--	6.6E-07	--	2.9E-07	9.5E-07
			Fluorene	--	--	--	--	7.0E-07	--	3.0E-07	1.0E-06
			Naphthalene	--	--	--	--	7.8E-07	--	3.4E-07	1.1E-06
			Phenanthrene	--	--	--	--	4.3E-07	--	1.9E-07	6.2E-07
			Benzo(a)anthracene	1.0E-07	--	4.7E-08	1.5E-07	--	--	--	--
			Benzo(a)pyrene	8.7E-07	--	4.0E-07	1.3E-06	--	--	--	--
			Benzo(b)fluoranthene	1.2E-07	--	5.3E-08	1.7E-07	--	--	--	--
			Benzo(g,h,i)perylene	--	--	--	--	6.1E-06	--	2.7E-06	8.8E-06
			Benzo(k)fluoranthene	1.1E-07	--	5.1E-08	1.6E-07	--	--	--	--
			Chrysene	1.5E-08	--	7.1E-09	2.3E-08	--	--	--	--
			Dibenz(a,h)anthracene	1.2E-07	--	5.3E-08	1.7E-07	--	--	--	--
			Fluoranthene	--	--	--	--	7.9E-06	--	3.4E-06	1.1E-05
			Indeno(1,2,3-cd)pyrene	1.1E-07	--	5.0E-08	1.6E-07	--	--	--	--
			Pyrene	--	--	--	--	1.2E-05	--	5.2E-06	1.7E-05
			Dibutyltin	--	--	--	--	3.5E-05	--	1.0E-05	4.5E-05
			Tributyltin	--	--	--	--	5.6E-05	--	1.6E-05	7.2E-05
			Total PCB Congeners	1.9E-08	--	9.3E-09	2.8E-08	4.3E-03	--	1.9E-03	6.1E-03
			Total TEQ – PCB DLC	1.2E-07	--	1.1E-08	1.3E-07	1.1E-02	--	9.8E-04	1.2E-02
			Chemical Total	8.7E-06	--	1.8E-06	1.0E-05	2.7E-01	--	5.0E-02	3.2E-01
		Exposure Point Total					1.0E-05				3.2E-01
	Exposure Medium Total						1.0E-05				3.2E-01
Medium Total							1.0E-05				3.2E-01

TABLE A-8B
Summary of Receptor Risks and Hazards - Adult and Child Recreational User, India Basin I
Appendix A - Updated Human Health Risk Assessment for Chemical Exposures

Scenario Timeframe:	Future
Receptor Population:	Recreational User
Receptor Age:	Adult and Child

				Cancer Risk				Noncancer Hazard Quotient			
Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Ingestion	Inhalation	Dermal	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total
Macoma	Macoma	Macoma (ingestion)	Aluminum	--	--	--	--	8.6E-03	--	--	8.6E-03
			Antimony	--	--	--	--	1.6E-03	--	--	1.6E-03
			Arsenic	2.5E-04	--	--	2.5E-04	3.1E-01	--	--	3.1E-01
			Barium	--	--	--	--	4.0E-04	--	--	4.0E-04
			Cadmium	5.4E-06	--	--	5.4E-06	1.3E-03	--	--	1.3E-03
			Chromium	--	--	--	--	2.9E-05	--	--	2.9E-05
			Cobalt	--	--	--	--	3.3E-02	--	--	3.3E-02
			Copper	--	--	--	--	1.6E-03	--	--	1.6E-03
			Iron	--	--	--	--	1.4E-02	--	--	1.4E-02
			Lead	--	--	--	--	--	--	--	--
			Manganese	--	--	--	--	8.5E-04	--	--	8.5E-04
			Mercury	--	--	--	--	5.6E-03	--	--	5.6E-03
			Molybdenum	--	--	--	--	2.4E-03	--	--	2.4E-03
			Nickel	--	--	--	--	2.7E-03	--	--	2.7E-03
			Selenium	--	--	--	--	4.2E-03	--	--	4.2E-03
			Silver	--	--	--	--	7.1E-04	--	--	7.1E-04
			Vanadium	--	--	--	--	6.6E-03	--	--	6.6E-03
			Zinc	--	--	--	--	1.6E-03	--	--	1.6E-03
			4,4'-DDD	1.4E-09	--	--	1.4E-09	4.1E-05	--	--	4.1E-05
			4,4'-DDE	3.5E-09	--	--	3.5E-09	7.2E-05	--	--	7.2E-05
			alpha-Chlordane	6.8E-10	--	--	6.8E-10	1.4E-05	--	--	1.4E-05
			Dieldrin	4.2E-08	--	--	4.2E-08	1.9E-04	--	--	1.9E-04
			gamma-Chlordane	5.6E-10	--	--	5.6E-10	1.1E-05	--	--	1.1E-05
			Acenaphthene	--	--	--	--	1.7E-07	--	--	1.7E-07
			Acenaphthylene	--	--	--	--	3.1E-07	--	--	3.1E-07
			Anthracene	--	--	--	--	5.9E-07	--	--	5.9E-07
			Fluorene	--	--	--	--	3.4E-07	--	--	3.4E-07
			Phenanthrene	--	--	--	--	3.0E-07	--	--	3.0E-07
			Benzo(a)anthracene	1.1E-07	--	--	1.1E-07	--	--	--	--
			Benzo(a)pyrene	4.4E-07	--	--	4.4E-07	--	--	--	--
			Benzo(b)fluoranthene	9.1E-08	--	--	9.1E-08	--	--	--	--
			Benzo(g,h,i)perylene	--	--	--	--	3.6E-06	--	--	3.6E-06
			Benzo(k)fluoranthene	8.9E-08	--	--	8.9E-08	--	--	--	--
			Chrysene	1.4E-08	--	--	1.4E-08	--	--	--	--
			Dibenz(a,h)anthracene	2.0E-08	--	--	2.0E-08	--	--	--	--
			Fluoranthene	--	--	--	--	2.6E-05	--	--	2.6E-05
			Indeno(1,2,3-cd)pyrene	2.4E-08	--	--	2.4E-08	--	--	--	--
			Pyrene	--	--	--	--	3.9E-05	--	--	3.9E-05
			Dibutyltin	--	--	--	--	1.6E-04	--	--	1.6E-04
			Tributyltin	--	--	--	--	6.4E-04	--	--	6.4E-04
			Total PCB Congeners	2.7E-07	--	--	2.7E-07	2.4E-02	--	--	2.4E-02
			Total TEQ – PCB DLC	1.3E-05	--	--	1.3E-05	5.1E-01	--	--	5.1E-01
			Chemical Total	2.7E-04	--	--	2.7E-04	9.3E-01	--	--	9.3E-01
		Exposure Point Total					2.7E-04				9.3E-01
	Exposure Medium Total						2.7E-04				9.3E-01
Medium Total							2.7E-04				9.3E-01
Receptor Total						Total Risk across All Media	2.8E-04			Total Hazard across All Media	1.3E+00

Acronyms/Abbreviations:

-- = not available or not applicable
DDD = dichlorodiphenyldichloroethane
DDE = dichlorodiphenyldichloroethylene
DDT = dichlorodiphenyltrichloroethane
PCB = polychlorinated biphenyl
TCDD = tetrachlorodibenzo-p-dioxin

TABLE A-8C

Summary of Risk Drivers - Adult and Child Recreational User, India Basin I

Appendix A - Updated Human Health Risk Assessment for Chemical Exposures

Scenario Timeframe:	Future
Receptor Population:	Recreational User
Receptor Age:	Adult and Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient			
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total
Sediment	Sediment	Sediment (Oral/Dermal)	BAP (EQ)*	1.3E-06	--	6.0E-07	1.9E-06	--	--	--	--
			Arsenic	6.7E-06	--	1.1E-06	7.8E-06	2.1E-02	--	3.0E-03	2.4E-02
			Chemical Total	8.0E-06	--	1.7E-06	9.7E-06	2.1E-02	--	3.0E-03	2.4E-02
		Exposure Point Total					9.7E-06				2.4E-02
	Exposure Medium Total						9.7E-06				2.4E-02
Medium Total							9.7E-06				2.4E-02
Macoma	Macoma	Macoma (Oral)	Arsenic	2.5E-04	--	--	2.5E-04	3.1E-01	--	--	3.1E-01
			Cadmium	5.4E-06	--	--	5.4E-06	1.3E-03	--	--	1.3E-03
			Total TEQ – PCB DLC	1.3E-05	--	--	1.3E-05	5.1E-01	--	--	5.1E-01
			Chemical Total	2.7E-04	--	--	2.7E-04	8.2E-01	--	--	8.2E-01
		Exposure Point Total					2.7E-04				8.2E-01
	Exposure Medium Total						2.7E-04				8.2E-01
Medium Total							2.7E-04				8.2E-01
Receptor Total						Total Risk across All Media	2.8E-04			Total Hazard across All Media	8.4E-01

Notes:

* Risk for benzo(a)pyrene equivalent (BAP [EQ]) is calculated by summing the risks for each of the individual potentially carcinogenic PAHs: benzo(a)anthracene, benzo(b)fluoranthene, benzo(a)pyrene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene.

Acronyms/Abbreviations:

-- = not available or not applicable

BAP (EQ) = benzo(a)pyrene equivalent

PAH = polycyclic aromatic hydrocarbon

PCB = polychlorinated biphenyl

TABLE A-9A

Calculation of RME Chemical Cancer Risks and Noncancer Hazards - Construction Worker, India Basin I

Appendix A - Updated Human Health Risk Assessment for Chemical Exposures

Scenario Timeframe:	Future
Receptor Population:	Construction Worker
Receptor Age:	Adult

							Cancer Risk Calculations					Noncancer Hazard Quotient				
					EPC		Intake/Exposure Concentration		CSF / Unit Risk			Intake/Exposure Concentration		RfD / RfC		
Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	Value	Units	Value	Units	Value	Units	Cancer Risk	Value	Units	Value	Units	Hazard Quotient
Sediment	Sediment	Sediment	Ingestion	Aluminum	7.2E+04	mg/kg	2.9E-03	mg/kg-day	--	--	--	2.0E-01	mg/kg-day	1.0E+00	mg/kg-day	2.0E-01
				Antimony	1.1E+00	mg/kg	4.4E-08	mg/kg-day	--	--	--	3.1E-06	mg/kg-day	4.0E-04	mg/kg-day	7.6E-03
				Arsenic	1.1E+01	mg/kg	2.7E-07	mg/kg-day	9.5E+00	(mg/kg-day)-1	2.5E-06	1.9E-05	mg/kg-day	3.0E-04	mg/kg-day	6.2E-02
				Barium	5.0E+02	mg/kg	2.0E-05	mg/kg-day	--	--	--	1.4E-03	mg/kg-day	2.0E-01	mg/kg-day	7.0E-03
				Cadmium	2.5E-01	mg/kg	9.9E-09	mg/kg-day	1.5E+01	(mg/kg-day)-1	1.5E-07	6.9E-07	mg/kg-day	1.0E-03	mg/kg-day	6.9E-04
				Chromium	2.7E+02	mg/kg	1.1E-05	mg/kg-day	--	--	--	7.5E-04	mg/kg-day	1.5E+00	mg/kg-day	5.0E-04
				Cobalt	1.9E+01	mg/kg	7.6E-07	mg/kg-day	--	--	--	5.3E-05	mg/kg-day	3.0E-04	mg/kg-day	1.8E-01
				Copper	8.4E+01	mg/kg	3.4E-06	mg/kg-day	--	--	--	2.4E-04	mg/kg-day	4.0E-02	mg/kg-day	5.9E-03
				Iron	4.3E+04	mg/kg	1.7E-03	mg/kg-day	--	--	--	1.2E-01	mg/kg-day	7.0E-01	mg/kg-day	1.7E-01
				Lead	1.2E+02	mg/kg	4.6E-06	mg/kg-day	--	--	--	3.3E-04	mg/kg-day	--	--	--
				Manganese	4.4E+02	mg/kg	1.8E-05	mg/kg-day	--	--	--	1.2E-03	mg/kg-day	1.4E-01	mg/kg-day	8.9E-03
				Mercury	3.6E-01	mg/kg	1.5E-08	mg/kg-day	--	--	--	1.0E-06	mg/kg-day	1.0E-04	mg/kg-day	1.0E-02
				Molybdenum	1.3E+00	mg/kg	5.2E-08	mg/kg-day	--	--	--	3.7E-06	mg/kg-day	5.0E-03	mg/kg-day	7.3E-04
				Nickel	1.8E+02	mg/kg	7.2E-06	mg/kg-day	--	--	--	5.1E-04	mg/kg-day	2.0E-02	mg/kg-day	2.5E-02
				Selenium	3.9E-01	mg/kg	1.6E-08	mg/kg-day	--	--	--	1.1E-06	mg/kg-day	5.0E-03	mg/kg-day	2.2E-04
				Silver	3.0E-01	mg/kg	1.2E-08	mg/kg-day	--	--	--	8.5E-07	mg/kg-day	5.0E-03	mg/kg-day	1.7E-04
				Vanadium	1.4E+02	mg/kg	5.7E-06	mg/kg-day	--	--	--	4.0E-04	mg/kg-day	5.0E-03	mg/kg-day	8.0E-02
				Zinc	1.3E+02	mg/kg	5.2E-06	mg/kg-day	--	--	--	3.7E-04	mg/kg-day	3.0E-01	mg/kg-day	1.2E-03
				4,4'-DDD	1.6E-03	mg/kg	6.3E-11	mg/kg-day	2.4E-01	(mg/kg-day)-1	1.5E-11	4.4E-09	mg/kg-day	5.0E-04	mg/kg-day	8.8E-06
				4,4'-DDE	1.5E-03	mg/kg	6.2E-11	mg/kg-day	3.4E-01	(mg/kg-day)-1	2.1E-11	4.4E-09	mg/kg-day	5.0E-04	mg/kg-day	8.7E-06
				4,4'-DDT	7.1E-04	mg/kg	2.9E-11	mg/kg-day	3.4E-01	(mg/kg-day)-1	9.8E-12	2.0E-09	mg/kg-day	5.0E-04	mg/kg-day	4.0E-06
				alpha-Chlordane	3.2E-04	mg/kg	1.3E-11	mg/kg-day	3.5E-01	(mg/kg-day)-1	4.6E-12	9.1E-10	mg/kg-day	5.0E-04	mg/kg-day	1.8E-06
				gamma-Chlordane	1.4E-04	mg/kg	5.7E-12	mg/kg-day	3.5E-01	(mg/kg-day)-1	2.0E-12	4.0E-10	mg/kg-day	5.0E-04	mg/kg-day	7.9E-07
				2-Methylnaphthalene	1.0E-02	mg/kg	4.1E-10	mg/kg-day	--	--	--	2.9E-08	mg/kg-day	4.0E-03	mg/kg-day	7.2E-06
				Acenaphthene	9.7E-03	mg/kg	3.9E-10	mg/kg-day	--	--	--	2.7E-08	mg/kg-day	6.0E-02	mg/kg-day	4.6E-07
				Acenaphthylene	1.2E-02	mg/kg	4.9E-10	mg/kg-day	--	--	--	3.4E-08	mg/kg-day	6.0E-02	mg/kg-day	5.7E-07
				Anthracene	2.1E-01	mg/kg	8.5E-09	mg/kg-day	--	--	--	5.9E-07	mg/kg-day	3.0E-01	mg/kg-day	2.0E-06
				Fluorene	3.0E-02	mg/kg	1.2E-09	mg/kg-day	--	--	--	8.3E-08	mg/kg-day	4.0E-02	mg/kg-day	2.1E-06
				Naphthalene	1.7E-02	mg/kg	6.7E-10	mg/kg-day	--	--	--	4.7E-08	mg/kg-day	2.0E-02	mg/kg-day	2.3E-06
				Phenanthrene	1.4E-01	mg/kg	5.5E-09	mg/kg-day	--	--	--	3.9E-07	mg/kg-day	3.0E-01	mg/kg-day	1.3E-06
				Benzo(a)anthracene	1.8E-01	mg/kg	7.2E-09	mg/kg-day	1.2E+00	(mg/kg-day)-1	8.6E-09	5.0E-07	mg/kg-day	--	--	--
				Benzo(a)pyrene	2.5E-01	mg/kg	9.9E-09	mg/kg-day	7.3E+00	(mg/kg-day)-1	7.2E-08	6.9E-07	mg/kg-day	--	--	--
				Benzo(b)fluoranthene	2.0E-01	mg/kg	8.0E-09	mg/kg-day	1.2E+00	(mg/kg-day)-1	9.6E-09	5.6E-07	mg/kg-day	--	--	--
				Benzo(g,h,i)perylene	1.9E-01	mg/kg	7.8E-09	mg/kg-day	--	--	--	5.5E-07	mg/kg-day	3.0E-02	mg/kg-day	1.8E-05
				Benzo(k)fluoranthene	1.9E-01	mg/kg	7.7E-09	mg/kg-day	1.2E+00	(mg/kg-day)-1	9.3E-09	5.4E-07	mg/kg-day	--	--	--
				Chrysene	2.7E-01	mg/kg	1.1E-08	mg/kg-day	1.2E-01	(mg/kg-day)-1	1.3E-09	7.5E-07	mg/kg-day	--	--	--
				Dibenz(a,h)anthracene	3.3E-02	mg/kg	1.3E-09	mg/kg-day	7.3E+00	(mg/kg-day)-1	9.6E-09	9.2E-08	mg/kg-day	--	--	--
				Fluoranthene	3.3E-01	mg/kg	1.3E-08	mg/kg-day	--	--	--	9.4E-07	mg/kg-day	4.0E-02	mg/kg-day	2.4E-05
				Indeno(1,2,3-cd)pyrene	1.9E-01	mg/kg	7.6E-09	mg/kg-day	1.2E+00	(mg/kg-day)-1	9.1E-09	5.3E-07	mg/kg-day	--	--	--
				Pyrene	3.8E-01	mg/kg	1.5E-08	mg/kg-day	--	--	--	1.1E-06	mg/kg-day	3.0E-02	mg/kg-day	3.6E-05
				Dibutyltin	1.1E-02	mg/kg	4.4E-10	mg/kg-day	--	--	--	3.1E-08	mg/kg-day	3.0E-04	mg/kg-day	1.0E-04
				Tributyltin	1.8E-02	mg/kg	7.1E-10	mg/kg-day	--	--	--	5.0E-08	mg/kg-day	3.0E-04	mg/kg-day	1.7E-04
				Total PCB Congeners	9.0E-02	mg/kg	3.6E-09	mg/kg-day	2.0E+00	(mg/kg-day)-1	7.2E-09	2.5E-07	mg/kg-day	2.0E-05	mg/kg-day	1.3E-02
				Total TEQ – PCB DLC	8.3E-06	mg/kg	3.3E-13	mg/kg-day	1.3E+05	(mg/kg-day)-1	4.3E-08	2.3E-11	mg/kg-day	7.0E-10	mg/kg-day	3.3E-02
			Exp. Route Total								2.8E-06					8.1E-01

TABLE A-9A

Calculation of RME Chemical Cancer Risks and Noncancer Hazards - Construction Worker, India Basin I

Appendix A - Updated Human Health Risk Assessment for Chemical Exposures

Scenario Timeframe:	Future
Receptor Population:	Construction Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations: Intake/Exposure Concentration		Cancer Risk Calculations: CSF / Unit Risk		Cancer Risk	Noncancer Hazard Quotient: Intake/Exposure Concentration		Noncancer Hazard Quotient: RfD / RfC		Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
			Dermal	Aluminum	7.2E+04	mg/kg	4.3E-04	mg/kg-day	--	--	--	3.0E-02	mg/kg-day	1.0E+00	mg/kg-day	3.0E-02
				Antimony	1.1E+00	mg/kg	6.4E-09	mg/kg-day	--	--	--	4.5E-07	mg/kg-day	6.0E-05	mg/kg-day	7.5E-03
				Arsenic	1.1E+01	mg/kg	1.9E-07	mg/kg-day	9.5E+00	(mg/kg-day)-1	1.8E-06	1.4E-05	mg/kg-day	3.0E-04	mg/kg-day	4.5E-02
				Barium	5.0E+02	mg/kg	2.9E-06	mg/kg-day	--	--	--	2.1E-04	mg/kg-day	1.4E-02	mg/kg-day	1.5E-02
				Cadmium	2.5E-01	mg/kg	1.4E-10	mg/kg-day	6.0E+02	(mg/kg-day)-1	8.7E-08	1.0E-08	mg/kg-day	2.5E-05	mg/kg-day	4.0E-04
				Chromium	2.7E+02	mg/kg	1.6E-06	mg/kg-day	--	--	--	1.1E-04	mg/kg-day	2.0E-02	mg/kg-day	5.6E-03
				Cobalt	1.9E+01	mg/kg	1.1E-07	mg/kg-day	--	--	--	7.7E-06	mg/kg-day	3.0E-04	mg/kg-day	2.6E-02
				Copper	8.4E+01	mg/kg	4.9E-07	mg/kg-day	--	--	--	3.5E-05	mg/kg-day	4.0E-02	mg/kg-day	8.6E-04
				Iron	4.3E+04	mg/kg	2.5E-04	mg/kg-day	--	--	--	1.8E-02	mg/kg-day	7.0E-01	mg/kg-day	2.5E-02
				Lead	1.2E+02	mg/kg	6.8E-07	mg/kg-day	--	--	--	4.8E-05	mg/kg-day	--	--	--
				Manganese	4.4E+02	mg/kg	2.6E-06	mg/kg-day	--	--	--	1.8E-04	mg/kg-day	1.4E-01	mg/kg-day	1.3E-03
				Mercury	3.6E-01	mg/kg	2.1E-09	mg/kg-day	--	--	--	1.5E-07	mg/kg-day	1.0E-04	mg/kg-day	1.5E-03
				Molybdenum	1.3E+00	mg/kg	7.6E-09	mg/kg-day	--	--	--	5.3E-07	mg/kg-day	5.0E-03	mg/kg-day	1.1E-04
				Nickel	1.8E+02	mg/kg	1.1E-06	mg/kg-day	--	--	--	7.4E-05	mg/kg-day	8.0E-04	mg/kg-day	9.3E-02
				Selenium	3.9E-01	mg/kg	2.3E-09	mg/kg-day	--	--	--	1.6E-07	mg/kg-day	5.0E-03	mg/kg-day	3.2E-05
				Silver	3.0E-01	mg/kg	1.8E-09	mg/kg-day	--	--	--	1.2E-07	mg/kg-day	2.0E-04	mg/kg-day	6.2E-04
				Vanadium	1.4E+02	mg/kg	8.3E-07	mg/kg-day	--	--	--	5.8E-05	mg/kg-day	1.3E-04	mg/kg-day	4.5E-01
				Zinc	1.3E+02	mg/kg	7.7E-07	mg/kg-day	--	--	--	5.4E-05	mg/kg-day	3.0E-01	mg/kg-day	1.8E-04
				4,4'-DDD	1.6E-03	mg/kg	4.6E-11	mg/kg-day	2.4E-01	(mg/kg-day)-1	1.1E-11	3.2E-09	mg/kg-day	5.0E-04	mg/kg-day	6.4E-06
				4,4'-DDE	1.5E-03	mg/kg	4.5E-11	mg/kg-day	3.4E-01	(mg/kg-day)-1	1.5E-11	3.2E-09	mg/kg-day	5.0E-04	mg/kg-day	6.4E-06
				4,4'-DDT	7.1E-04	mg/kg	2.1E-11	mg/kg-day	3.4E-01	(mg/kg-day)-1	7.1E-12	1.5E-09	mg/kg-day	5.0E-04	mg/kg-day	2.9E-06
				alpha-Chlordane	3.2E-04	mg/kg	9.5E-12	mg/kg-day	3.5E-01	(mg/kg-day)-1	3.3E-12	6.7E-10	mg/kg-day	5.0E-04	mg/kg-day	1.3E-06
				gamma-Chlordane	1.4E-04	mg/kg	4.1E-12	mg/kg-day	3.5E-01	(mg/kg-day)-1	1.4E-12	2.9E-10	mg/kg-day	5.0E-04	mg/kg-day	5.8E-07
				2-Methylnaphthalene	1.0E-02	mg/kg	9.0E-10	mg/kg-day	--	--	--	6.3E-08	mg/kg-day	4.0E-03	mg/kg-day	1.6E-05
				Acenaphthene	9.7E-03	mg/kg	8.6E-10	mg/kg-day	--	--	--	6.0E-08	mg/kg-day	6.0E-02	mg/kg-day	1.0E-06
				Acenaphthylene	1.2E-02	mg/kg	1.1E-09	mg/kg-day	--	--	--	7.6E-08	mg/kg-day	6.0E-02	mg/kg-day	1.3E-06
				Anthracene	2.1E-01	mg/kg	1.9E-08	mg/kg-day	--	--	--	1.3E-06	mg/kg-day	3.0E-01	mg/kg-day	4.3E-06
				Fluorene	3.0E-02	mg/kg	2.6E-09	mg/kg-day	--	--	--	1.8E-07	mg/kg-day	4.0E-02	mg/kg-day	4.6E-06
				Naphthalene	1.7E-02	mg/kg	1.5E-09	mg/kg-day	--	--	--	1.0E-07	mg/kg-day	2.0E-02	mg/kg-day	5.1E-06
				Phenanthrene	1.4E-01	mg/kg	1.2E-08	mg/kg-day	--	--	--	8.5E-07	mg/kg-day	3.0E-01	mg/kg-day	2.8E-06
				Benzo(a)anthracene	1.8E-01	mg/kg	1.6E-08	mg/kg-day	1.2E+00	(mg/kg-day)-1	1.9E-08	1.1E-06	mg/kg-day	--	--	--
				Benzo(a)pyrene	2.5E-01	mg/kg	2.2E-08	mg/kg-day	7.3E+00	(mg/kg-day)-1	1.6E-07	1.5E-06	mg/kg-day	--	--	--
				Benzo(b)fluoranthene	2.0E-01	mg/kg	1.8E-08	mg/kg-day	1.2E+00	(mg/kg-day)-1	2.1E-08	1.2E-06	mg/kg-day	--	--	--
				Benzo(g,h,i)perylene	1.9E-01	mg/kg	1.7E-08	mg/kg-day	--	--	--	1.2E-06	mg/kg-day	3.0E-02	mg/kg-day	4.0E-05
				Benzo(k)fluoranthene	1.9E-01	mg/kg	1.7E-08	mg/kg-day	1.2E+00	(mg/kg-day)-1	2.0E-08	1.2E-06	mg/kg-day	--	--	--
				Chrysene	2.7E-01	mg/kg	2.4E-08	mg/kg-day	1.2E-01	(mg/kg-day)-1	2.8E-09	1.6E-06	mg/kg-day	--	--	--
				Dibenz(a,h)anthracene	3.3E-02	mg/kg	2.9E-09	mg/kg-day	7.3E+00	(mg/kg-day)-1	2.1E-08	2.0E-07	mg/kg-day	--	--	--
				Fluoranthene	3.3E-01	mg/kg	3.0E-08	mg/kg-day	--	--	--	2.1E-06	mg/kg-day	4.0E-02	mg/kg-day	5.2E-05
				Indeno(1,2,3-cd)pyrene	1.9E-01	mg/kg	1.7E-08	mg/kg-day	1.2E+00	(mg/kg-day)-1	2.0E-08	1.2E-06	mg/kg-day	--	--	--
				Pyrene	3.8E-01	mg/kg	3.3E-08	mg/kg-day	--	--	--	2.3E-06	mg/kg-day	3.0E-02	mg/kg-day	7.8E-05
				Dibutyltin	1.1E-02	mg/kg	6.4E-10	mg/kg-day	--	--	--	4.5E-08	mg/kg-day	3.0E-04	mg/kg-day	1.5E-04
				Tributyltin	1.8E-02	mg/kg	1.0E-09	mg/kg-day	--	--	--	7.3E-08	mg/kg-day	3.0E-04	mg/kg-day	2.4E-04
				Total PCB Congeners	9.0E-02	mg/kg	8.0E-09	mg/kg-day	2.0E+00	(mg/kg-day)-1	1.6E-08	5.6E-07	mg/kg-day	2.0E-05	mg/kg-day	2.8E-02
				Total TEQ – PCB DLC	8.3E-06	mg/kg	1.5E-13	mg/kg-day	1.3E+05	(mg/kg-day)-1	1.9E-08	1.0E-11	mg/kg-day	7.0E-10	mg/kg-day	1.5E-02
			Exp. Route Total								2.2E-06					7.4E-01
		Exposure Point Total									5.1E-06					1.6E+00
	Exposure Medium Total										5.1E-06					1.6E+00
Medium Total											5.1E-06					1.6E+00
										Total of Receptor Risks across All Media	5.1E-06				Total of Receptor Hazards across All Media	1.6E+00

Acronyms/Abbreviations:

-- =	not available or not applicable
CSF =	cancer slope factor
DDD =	dichlorodiphenyldichloroethane
DDE =	dichlorodiphenyldichloroethylene
DDT =	dichlorodiphenyltrichloroethane
EPC =	exposure point concentration
Exp. =	exposure
M =	lifetime exposure from birth, mutagenic endpoint
(mg/kg-day)-	1/(milligram[s] per kilogram per day)
mg/kg =	milligram(s) per kilogram
mg/kg-day =	milligram(s) per kilogram per day
PCB =	polychlorinated biphenyl
RfC =	reference concentration
RfD =	reference dose
RME =	reasonable maximum exposure
TCDD =	tetrachlorodibenzo-p-dioxin

TABLE A-9B
Summary of Receptor Risks and Hazards - Construction Worker, India Basin I
Appendix A - Updated Human Health Risk Assessment for Chemical Exposures

Scenario Timeframe:	Future
Receptor Population:	Construction Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient			
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total
Sediment	Sediment	Sediment	Aluminum	--	--	--	--	2.0E-01	--	3.0E-02	2.3E-01
			Antimony	--	--	--	--	7.6E-03	--	7.5E-03	1.5E-02
			Arsenic	2.5E-06	--	1.8E-06	4.4E-06	6.2E-02	--	4.5E-02	1.1E-01
			Barium	--	--	--	--	7.0E-03	--	1.5E-02	2.2E-02
			Cadmium	1.5E-07	--	8.7E-08	2.4E-07	6.9E-04	--	4.0E-04	1.1E-03
			Chromium	--	--	--	--	5.0E-04	--	5.6E-03	6.1E-03
			Cobalt	--	--	--	--	1.8E-01	--	2.6E-02	2.0E-01
			Copper	--	--	--	--	5.9E-03	--	8.6E-04	6.8E-03
			Iron	--	--	--	--	1.7E-01	--	2.5E-02	2.0E-01
			Lead	--	--	--	--	--	--	--	--
			Manganese	--	--	--	--	8.9E-03	--	1.3E-03	1.0E-02
			Mercury	--	--	--	--	1.0E-02	--	1.5E-03	1.2E-02
			Molybdenum	--	--	--	--	7.3E-04	--	1.1E-04	8.4E-04
			Nickel	--	--	--	--	2.5E-02	--	9.3E-02	1.2E-01
			Selenium	--	--	--	--	2.2E-04	--	3.2E-05	2.5E-04
			Silver	--	--	--	--	1.7E-04	--	6.2E-04	7.9E-04
			Vanadium	--	--	--	--	8.0E-02	--	4.5E-01	5.3E-01
			Zinc	--	--	--	--	1.2E-03	--	1.8E-04	1.4E-03
			4,4'-DDE	2.1E-11	--	1.5E-11	3.7E-11	8.7E-06	--	6.4E-06	1.5E-05
			4,4'-DDT	9.8E-12	--	7.1E-12	1.7E-11	4.0E-06	--	2.9E-06	7.0E-06
			alpha-Chlordane	4.6E-12	--	3.3E-12	7.9E-12	1.8E-06	--	1.3E-06	3.2E-06
			gamma-Chlordane	2.0E-12	--	1.4E-12	3.4E-12	7.9E-07	--	5.8E-07	1.4E-06
			2-Methylnaphthalene	--	--	--	--	7.2E-06	--	1.6E-05	2.3E-05
			Acenaphthene	--	--	--	--	4.6E-07	--	1.0E-06	1.5E-06
			Acenaphthylene	--	--	--	--	5.7E-07	--	1.3E-06	1.8E-06
			Anthracene	--	--	--	--	2.0E-06	--	4.3E-06	6.3E-06
			Fluorene	--	--	--	--	2.1E-06	--	4.6E-06	6.7E-06
			Naphthalene	--	--	--	--	2.3E-06	--	5.1E-06	7.4E-06
			Phenanthrene	--	--	--	--	1.3E-06	--	2.8E-06	4.1E-06
			Benzo(a)anthracene	8.6E-09	--	1.9E-08	2.8E-08	--	--	--	--
			Benzo(a)pyrene	7.2E-08	--	1.6E-07	2.3E-07	--	--	--	--
			Benzo(b)fluoranthene	9.6E-09	--	2.1E-08	3.1E-08	--	--	--	--
			Benzo(g,h,i)perylene	--	--	--	--	1.8E-05	--	4.0E-05	5.8E-05
			Benzo(k)fluoranthene	9.3E-09	--	2.0E-08	3.0E-08	--	--	--	--
			Chrysene	1.3E-09	--	2.8E-09	4.1E-09	--	--	--	--
			Dibenz(a,h)anthracene	9.6E-09	--	2.1E-08	3.1E-08	--	--	--	--
			Fluoranthene	--	--	--	--	2.4E-05	--	5.2E-05	7.5E-05
			Indeno(1,2,3-cd)pyrene	9.1E-09	--	2.0E-08	2.9E-08	--	--	--	--
			Pyrene	--	--	--	--	3.6E-05	--	7.8E-05	1.1E-04
			Dibutyltin	--	--	--	--	1.0E-04	--	1.5E-04	2.5E-04
			Tributyltin	--	--	--	--	1.7E-04	--	2.4E-04	4.1E-04
			Total PCB Congeners	7.2E-09	--	1.6E-08	2.3E-08	1.3E-02	--	2.8E-02	4.1E-02
			Total TEQ – PCB DLC	4.3E-08	--	1.9E-08	6.3E-08	3.3E-02	--	1.5E-02	4.8E-02
			Chemical Total	2.8E-06	--	2.2E-06	5.1E-06	8.1E-01	--	7.4E-01	1.6E+00
		Exposure Point Total					5.1E-06				1.6E+00
	Exposure Medium Total						5.1E-06				1.6E+00
Medium Total							5.1E-06				1.6E+00
Receptor Total						Total Risk across All Media	5.1E-06			Total Hazard across All Media	1.6E+00

TABLE A-9B

Summary of Receptor Risks and Hazards - Construction Worker, India Basin I

Appendix A - Updated Human Health Risk Assessment for Chemical Exposures

Scenario Timeframe:	Future
Receptor Population:	Construction Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk: Ingestion	Cancer Risk: Inhalation	Cancer Risk: Dermal	Cancer Risk: Exposure Routes Total	Noncancer Hazard Quotient: Ingestion	Noncancer Hazard Quotient: Inhalation	Noncancer Hazard Quotient: Dermal	Noncancer Hazard Quotient: Exposure Routes Total

Acronyms/Abbreviations:

-- = not available or not applicable
DDD = dichlorodiphenyldichloroethane
DDE = dichlorodiphenyldichloroethylene
DDT = dichlorodiphenyltrichloroethane
PCB = polychlorinated biphenyl
TCDD = tetrachlorodibenzo-p-dioxin

TABLE A-9C

Summary of Risk Drivers - Construction Worker, India Basin I

Appendix A - Updated Human Health Risk Assessment for Chemical Exposures

Scenario Timeframe:	Future
Receptor Population:	Construction Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk: Ingestion	Cancer Risk: Inhalation	Cancer Risk: Dermal	Cancer Risk: Exposure Routes Total	Noncancer Hazard Quotient: Ingestion	Noncancer Hazard Quotient: Inhalation	Noncancer Hazard Quotient: Dermal	Noncancer Hazard Quotient: Exposure Routes Total
Sediment	Sediment	Sediment	Arsenic	2.5E-06	--	1.8E-06	4.4E-06	6.2E-02	--	4.5E-02	1.1E-01
			Chemical Total	--	--	--	4.4E-06	--	--	--	1.1E-01
		Exposure Point Total					4.4E-06				1.1E-01
	Exposure Medium Total						4.4E-06				1.1E-01
Medium Total							4.4E-06				1.1E-01
Receptor Total						Total Risk across All Media	4.4E-06			Total Hazard across All Media	1.1E-01

Acronyms/Abbreviations:

-- = not available or not applicable

TABLE A-10A
Calculation of RME Chemical Cancer Risks and Noncancer Hazards - Adult and Child Recreational User, Oil Reclamation Area
Appendix A - Updated Human Health Risk Assessment for Chemical Exposures

Scenario Timeframe:	Future
Receptor Population:	Recreational User
Receptor Age:	Adult and Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern		EPC Value	EPC Units	Cancer Risk Calculations: Intake/Exposure Concentration Value	Intake/Exposure Concentration Units	CSF / Unit Risk Value	CSF / Unit Risk Units	Cancer Risk	Noncancer Hazard Quotient: Intake/Exposure Concentration Value	Intake/Exposure Concentration Units	RfD / RfC Value	RfD / RfC Units	Hazard Quotient
Sediment	Sediment	Sediment	Ingestion	Aluminum		7.2E+04	mg/kg	7.7E-03	mg/kg-day	--	--	--	6.8E-02	mg/kg-day	1.0E+00	mg/kg-day	6.8E-02
				Antimony		2.8E+00	mg/kg	3.0E-07	mg/kg-day	--	--	--	2.6E-06	mg/kg-day	4.0E-04	mg/kg-day	6.6E-03
				Arsenic		1.3E+01	mg/kg	8.1E-07	mg/kg-day	9.5E+00	(mg/kg-day)-1	7.7E-06	7.2E-06	mg/kg-day	3.0E-04	mg/kg-day	2.4E-02
				Barium		4.4E+02	mg/kg	4.7E-05	mg/kg-day	--	--	--	4.2E-04	mg/kg-day	2.0E-01	mg/kg-day	2.1E-03
				Cadmium		3.9E-01	mg/kg	4.1E-08	mg/kg-day	1.5E+01	(mg/kg-day)-1	6.2E-07	3.7E-07	mg/kg-day	1.0E-03	mg/kg-day	3.7E-04
				Chromium		4.3E+02	mg/kg	4.6E-05	mg/kg-day	--	--	--	4.1E-04	mg/kg-day	1.5E+00	mg/kg-day	2.7E-04
				Cobalt		2.1E+01	mg/kg	2.2E-06	mg/kg-day	--	--	--	2.0E-05	mg/kg-day	3.0E-04	mg/kg-day	6.6E-02
				Copper		8.4E+01	mg/kg	9.0E-06	mg/kg-day	--	--	--	8.0E-05	mg/kg-day	4.0E-02	mg/kg-day	2.0E-03
				Iron		4.7E+04	mg/kg	5.1E-03	mg/kg-day	--	--	--	4.5E-02	mg/kg-day	7.0E-01	mg/kg-day	6.4E-02
				Lead		5.4E+01	mg/kg	5.8E-06	mg/kg-day	--	--	--	5.2E-05	mg/kg-day	--	--	--
				Manganese		5.7E+02	mg/kg	6.1E-05	mg/kg-day	--	--	--	5.4E-04	mg/kg-day	1.4E-01	mg/kg-day	3.9E-03
				Mercury		5.2E-01	mg/kg	5.5E-08	mg/kg-day	--	--	--	4.9E-07	mg/kg-day	1.0E-04	mg/kg-day	4.9E-03
				Molybdenum		1.6E+00	mg/kg	1.7E-07	mg/kg-day	--	--	--	1.6E-06	mg/kg-day	5.0E-03	mg/kg-day	3.1E-04
				Nickel		1.4E+02	mg/kg	1.4E-05	mg/kg-day	--	--	--	1.3E-04	mg/kg-day	2.0E-02	mg/kg-day	6.4E-03
				Selenium		3.8E-01	mg/kg	4.0E-08	mg/kg-day	--	--	--	3.6E-07	mg/kg-day	5.0E-03	mg/kg-day	7.2E-05
				Silver		4.3E-01	mg/kg	4.6E-08	mg/kg-day	--	--	--	4.1E-07	mg/kg-day	5.0E-03	mg/kg-day	8.1E-05
				Vanadium		1.6E+02	mg/kg	1.7E-05	mg/kg-day	--	--	--	1.6E-04	mg/kg-day	5.0E-03	mg/kg-day	3.1E-02
				Zinc		1.6E+02	mg/kg	1.7E-05	mg/kg-day	--	--	--	1.5E-04	mg/kg-day	3.0E-01	mg/kg-day	5.1E-04
				4,4'-DDD		2.7E-03	mg/kg	2.8E-10	mg/kg-day	2.4E-01	(mg/kg-day)-1	6.8E-11	2.5E-09	mg/kg-day	5.0E-04	mg/kg-day	5.1E-06
				4,4'-DDE		1.3E-03	mg/kg	1.4E-10	mg/kg-day	3.4E-01	(mg/kg-day)-1	4.8E-11	1.2E-09	mg/kg-day	5.0E-04	mg/kg-day	2.5E-06
				4,4'-DDT		6.6E-04	mg/kg	7.0E-11	mg/kg-day	3.4E-01	(mg/kg-day)-1	2.4E-11	6.3E-10	mg/kg-day	5.0E-04	mg/kg-day	1.3E-06
				alpha-Chlordane		3.6E-04	mg/kg	3.9E-11	mg/kg-day	3.5E-01	(mg/kg-day)-1	1.4E-11	3.4E-10	mg/kg-day	5.0E-04	mg/kg-day	6.9E-07
				Dieldrin		4.4E-04	mg/kg	4.7E-11	mg/kg-day	1.6E+01	(mg/kg-day)-1	7.5E-10	4.2E-10	mg/kg-day	5.0E-05	mg/kg-day	8.4E-06
				gamma-Chlordane		3.8E-04	mg/kg	4.1E-11	mg/kg-day	3.5E-01	(mg/kg-day)-1	1.4E-11	3.6E-10	mg/kg-day	5.0E-04	mg/kg-day	7.2E-07
				2-Methylnaphthalene		8.7E-03	mg/kg	9.2E-10	mg/kg-day	--	--	--	8.2E-09	mg/kg-day	4.0E-03	mg/kg-day	2.1E-06
				Acenaphthene		5.8E-03	mg/kg	6.2E-10	mg/kg-day	--	--	--	5.5E-09	mg/kg-day	6.0E-02	mg/kg-day	9.1E-08
				Acenaphthylene		9.1E-03	mg/kg	9.7E-10	mg/kg-day	--	--	--	8.6E-09	mg/kg-day	6.0E-02	mg/kg-day	1.4E-07
				Anthracene		4.2E-02	mg/kg	4.5E-09	mg/kg-day	--	--	--	4.0E-08	mg/kg-day	3.0E-01	mg/kg-day	1.3E-07
				Fluorene		8.9E-03	mg/kg	9.5E-10	mg/kg-day	--	--	--	8.5E-09	mg/kg-day	4.0E-02	mg/kg-day	2.1E-07
				Naphthalene		1.5E-02	mg/kg	1.6E-09	mg/kg-day	--	--	--	1.4E-08	mg/kg-day	2.0E-02	mg/kg-day	7.2E-07
				Phenanthrene		1.0E-01	mg/kg	1.1E-08	mg/kg-day	--	--	--	9.8E-08	mg/kg-day	3.0E-01	mg/kg-day	3.3E-07
				Benzo(a)anthracene	M	1.2E-01	mg/kg	5.8E-08	mg/kg-day	1.2E+00	(mg/kg-day)-1	7.0E-08	1.1E-07	mg/kg-day	--	--	--
				Benzo(a)pyrene	M	2.0E-01	mg/kg	9.5E-08	mg/kg-day	7.3E+00	(mg/kg-day)-1	6.9E-07	1.9E-07	mg/kg-day	--	--	--
				Benzo(b)fluoranthene	M	1.3E-01	mg/kg	6.5E-08	mg/kg-day	1.2E+00	(mg/kg-day)-1	7.8E-08	1.3E-07	mg/kg-day	--	--	--
				Benzo(g,h,i)perylene		1.8E-01	mg/kg	1.9E-08	mg/kg-day	--	--	--	1.7E-07	mg/kg-day	3.0E-02	mg/kg-day	5.7E-06
				Benzo(k)fluoranthene	M	1.4E-01	mg/kg	6.8E-08	mg/kg-day	1.2E+00	(mg/kg-day)-1	8.2E-08	1.3E-07	mg/kg-day	--	--	--
				Chrysene	M	2.0E-01	mg/kg	9.5E-08	mg/kg-day	1.2E-01	(mg/kg-day)-1	1.1E-08	1.9E-07	mg/kg-day	--	--	--
				Dibenz(a,h)anthracene	M	2.1E-02	mg/kg	1.0E-08	mg/kg-day	7.3E+00	(mg/kg-day)-1	7.4E-08	2.0E-08	mg/kg-day	--	--	--
				Fluoranthene		2.4E-01	mg/kg	2.6E-08	mg/kg-day	--	--	--	2.3E-07	mg/kg-day	4.0E-02	mg/kg-day	5.7E-06
				Indeno(1,2,3-cd)pyrene	M	1.6E-01	mg/kg	7.9E-08	mg/kg-day	1.2E+00	(mg/kg-day)-1	9.5E-08	1.5E-07	mg/kg-day	--	--	--
				Pyrene		3.0E-01	mg/kg	3.2E-08	mg/kg-day	--	--	--	2.8E-07	mg/kg-day	3.0E-02	mg/kg-day	9.5E-06
				Monobutyltin		2.7E-03	mg/kg	2.9E-10	mg/kg-day	--	--	--	2.6E-09	mg/kg-day	3.0E-04	mg/kg-day	8.5E-06
				Dibutyltin		1.6E-02	mg/kg	1.7E-09	mg/kg-day	--	--	--	1.5E-08	mg/kg-day	3.0E-04	mg/kg-day	5.1E-05
				Tributyltin		4.1E-02	mg/kg	4.3E-09	mg/kg-day	--	--	--	3.9E-08	mg/kg-day	3.0E-04	mg/kg-day	1.3E-04
				Total PCB Congeners		3.4E-01	mg/kg	3.6E-08	mg/kg-day	2.0E+00	(mg/kg-day)-1	7.2E-08	3.2E-07	mg/kg-day	2.0E-05	mg/kg-day	1.6E-02
				Total TEQ – PCB DLC		8.5E-06	mg/kg	9.1E-13	mg/kg-day	1.3E+05	(mg/kg-day)-1	1.2E-07	8.1E-12	mg/kg-day	7.0E-10	mg/kg-day	1.2E-02
			Exp. Route Total									9.6E-06					3.1E-01

TABLE A-10A

Calculation of RME Chemical Cancer Risks and Noncancer Hazards - Adult and Child Recreational User, Oil Reclamation Area

Appendix A - Updated Human Health Risk Assessment for Chemical Exposures

Scenario Timeframe:	Future
Receptor Population:	Recreational User
Receptor Age:	Adult and Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC Value	EPC Units	Cancer Risk Calculations: Intake/Exposure Concentration Value	Intake/Exposure Concentration Units	CSF / Unit Risk Value	CSF / Unit Risk Units	Cancer Risk	Noncancer Hazard Quotient: Intake/Exposure Concentration Value	Intake/Exposure Concentration Units	RfD / RfC Value	RfD / RfC Units	Hazard Quotient
Sediment	Sediment	Sediment	Dermal	Aluminum	7.2E+04	mg/kg	2.5E-04	mg/kg-day	--	--	--	2.0E-03	mg/kg-day	1.0E+00	mg/kg-day	2.0E-03
				Antimony	2.8E+00	mg/kg	9.5E-09	mg/kg-day	--	--	--	7.6E-08	mg/kg-day	6.0E-05	mg/kg-day	1.3E-03
				Arsenic	1.3E+01	mg/kg	1.3E-07	mg/kg-day	9.5E+00	(mg/kg-day)-1	1.2E-06	1.0E-06	mg/kg-day	3.0E-04	mg/kg-day	3.5E-03
				Barium	4.4E+02	mg/kg	1.5E-06	mg/kg-day	--	--	--	1.2E-05	mg/kg-day	1.4E-02	mg/kg-day	8.7E-04
				Cadmium	3.9E-01	mg/kg	1.3E-10	mg/kg-day	6.0E+02	(mg/kg-day)-1	8.0E-08	1.1E-09	mg/kg-day	2.5E-05	mg/kg-day	4.3E-05
				Chromium	4.3E+02	mg/kg	1.5E-06	mg/kg-day	--	--	--	1.2E-05	mg/kg-day	2.0E-02	mg/kg-day	6.1E-04
				Cobalt	2.1E+01	mg/kg	7.1E-08	mg/kg-day	--	--	--	5.7E-07	mg/kg-day	3.0E-04	mg/kg-day	1.9E-03
				Copper	8.4E+01	mg/kg	2.9E-07	mg/kg-day	--	--	--	2.3E-06	mg/kg-day	4.0E-02	mg/kg-day	5.8E-05
				Iron	4.7E+04	mg/kg	1.6E-04	mg/kg-day	--	--	--	1.3E-03	mg/kg-day	7.0E-01	mg/kg-day	1.9E-03
				Lead	5.4E+01	mg/kg	1.9E-07	mg/kg-day	--	--	--	1.5E-06	mg/kg-day	--	--	--
				Manganese	5.7E+02	mg/kg	2.0E-06	mg/kg-day	--	--	--	1.6E-05	mg/kg-day	1.4E-01	mg/kg-day	1.1E-04
				Mercury	5.2E-01	mg/kg	1.8E-09	mg/kg-day	--	--	--	1.4E-08	mg/kg-day	1.0E-04	mg/kg-day	1.4E-04
				Molybdenum	1.6E+00	mg/kg	5.6E-09	mg/kg-day	--	--	--	4.5E-08	mg/kg-day	5.0E-03	mg/kg-day	9.0E-06
				Nickel	1.4E+02	mg/kg	4.6E-07	mg/kg-day	--	--	--	3.7E-06	mg/kg-day	8.0E-04	mg/kg-day	4.7E-03
				Selenium	3.8E-01	mg/kg	1.3E-09	mg/kg-day	--	--	--	1.0E-08	mg/kg-day	5.0E-03	mg/kg-day	2.1E-06
				Silver	4.3E-01	mg/kg	1.5E-09	mg/kg-day	--	--	--	1.2E-08	mg/kg-day	2.0E-04	mg/kg-day	5.9E-05
				Vanadium	1.6E+02	mg/kg	5.6E-07	mg/kg-day	--	--	--	4.5E-06	mg/kg-day	1.3E-04	mg/kg-day	3.5E-02
				Zinc	1.6E+02	mg/kg	5.6E-07	mg/kg-day	--	--	--	4.5E-06	mg/kg-day	3.0E-01	mg/kg-day	1.5E-05
				4,4'-DDD	2.7E-03	mg/kg	4.6E-11	mg/kg-day	2.4E-01	(mg/kg-day)-1	1.1E-11	3.7E-10	mg/kg-day	5.0E-04	mg/kg-day	7.3E-07
				4,4'-DDE	1.3E-03	mg/kg	2.2E-11	mg/kg-day	3.4E-01	(mg/kg-day)-1	7.6E-12	1.8E-10	mg/kg-day	5.0E-04	mg/kg-day	3.6E-07
				4,4'-DDT	6.6E-04	mg/kg	1.1E-11	mg/kg-day	3.4E-01	(mg/kg-day)-1	3.8E-12	9.1E-11	mg/kg-day	5.0E-04	mg/kg-day	1.8E-07
				alpha-Chlordane	3.6E-04	mg/kg	6.2E-12	mg/kg-day	3.5E-01	(mg/kg-day)-1	2.2E-12	5.0E-11	mg/kg-day	5.0E-04	mg/kg-day	1.0E-07
				Dieldrin	4.4E-04	mg/kg	1.5E-11	mg/kg-day	1.6E+01	(mg/kg-day)-1	2.4E-10	1.2E-10	mg/kg-day	5.0E-05	mg/kg-day	2.4E-06
				gamma-Chlordane	3.8E-04	mg/kg	6.5E-12	mg/kg-day	3.5E-01	(mg/kg-day)-1	2.3E-12	5.2E-11	mg/kg-day	5.0E-04	mg/kg-day	1.0E-07
				2-Methylnaphthalene	8.7E-03	mg/kg	4.5E-10	mg/kg-day	--	--	--	3.6E-09	mg/kg-day	4.0E-03	mg/kg-day	8.9E-07
				Acenaphthene	5.8E-03	mg/kg	3.0E-10	mg/kg-day	--	--	--	2.4E-09	mg/kg-day	6.0E-02	mg/kg-day	4.0E-08
				Acenaphthylene	9.1E-03	mg/kg	4.7E-10	mg/kg-day	--	--	--	3.7E-09	mg/kg-day	6.0E-02	mg/kg-day	6.2E-08
				Anthracene	4.2E-02	mg/kg	2.2E-09	mg/kg-day	--	--	--	1.8E-08	mg/kg-day	3.0E-01	mg/kg-day	5.8E-08
				Fluorene	8.9E-03	mg/kg	4.6E-10	mg/kg-day	--	--	--	3.7E-09	mg/kg-day	4.0E-02	mg/kg-day	9.2E-08
				Naphthalene	1.5E-02	mg/kg	7.8E-10	mg/kg-day	--	--	--	6.3E-09	mg/kg-day	2.0E-02	mg/kg-day	3.1E-07
				Phenanthrene	1.0E-01	mg/kg	5.3E-09	mg/kg-day	--	--	--	4.3E-08	mg/kg-day	3.0E-01	mg/kg-day	1.4E-07
				Benzo(a)anthracene M	1.2E-01	mg/kg	2.7E-08	mg/kg-day	1.2E+00	(mg/kg-day)-1	3.2E-08	5.0E-08	mg/kg-day	--	--	--
				Benzo(a)pyrene M	2.0E-01	mg/kg	4.3E-08	mg/kg-day	7.3E+00	(mg/kg-day)-1	3.2E-07	8.1E-08	mg/kg-day	--	--	--
				Benzo(b)fluoranthene M	1.3E-01	mg/kg	3.0E-08	mg/kg-day	1.2E+00	(mg/kg-day)-1	3.6E-08	5.5E-08	mg/kg-day	--	--	--
				Benzo(g,h,i)perylene	1.8E-01	mg/kg	9.3E-09	mg/kg-day	--	--	--	7.4E-08	mg/kg-day	3.0E-02	mg/kg-day	2.5E-06
				Benzo(k)fluoranthene M	1.4E-01	mg/kg	3.1E-08	mg/kg-day	1.2E+00	(mg/kg-day)-1	3.7E-08	5.8E-08	mg/kg-day	--	--	--
				Chrysene M	2.0E-01	mg/kg	4.3E-08	mg/kg-day	1.2E-01	(mg/kg-day)-1	5.2E-09	8.1E-08	mg/kg-day	--	--	--
				Dibenz(a,h)anthracene M	2.1E-02	mg/kg	4.6E-09	mg/kg-day	7.3E+00	(mg/kg-day)-1	3.4E-08	8.7E-09	mg/kg-day	--	--	--
				Fluoranthene	2.4E-01	mg/kg	1.2E-08	mg/kg-day	--	--	--	9.9E-08	mg/kg-day	4.0E-02	mg/kg-day	2.5E-06
				Indeno(1,2,3-cd)pyrene M	1.6E-01	mg/kg	3.6E-08	mg/kg-day	1.2E+00	(mg/kg-day)-1	4.3E-08	6.7E-08	mg/kg-day	--	--	--
				Pyrene	3.0E-01	mg/kg	1.5E-08	mg/kg-day	--	--	--	1.2E-07	mg/kg-day	3.0E-02	mg/kg-day	4.1E-06
				Monobutyltin	2.7E-03	mg/kg	9.2E-11	mg/kg-day	--	--	--	7.4E-10	mg/kg-day	3.0E-04	mg/kg-day	2.5E-06
				Dibutyltin	1.6E-02	mg/kg	5.5E-10	mg/kg-day	--	--	--	4.4E-09	mg/kg-day	3.0E-04	mg/kg-day	1.5E-05
				Tributyltin	4.1E-02	mg/kg	1.4E-09	mg/kg-day	--	--	--	1.1E-08	mg/kg-day	3.0E-04	mg/kg-day	3.7E-05
				Total PCB Congeners	3.4E-01	mg/kg	1.7E-08	mg/kg-day	2.0E+00	(mg/kg-day)-1	3.5E-08	1.4E-07	mg/kg-day	2.0E-05	mg/kg-day	7.0E-03
				Total TEQ – PCB DLC	8.5E-06	mg/kg	8.7E-14	mg/kg-day	1.3E+05	(mg/kg-day)-1	1.1E-08	7.0E-13	mg/kg-day	7.0E-10	mg/kg-day	1.0E-03
			Exp. Route Total								1.9E-06					6.0E-02
		Exposure Point Total									1.2E-05					3.7E-01
	Exposure Medium Total										1.2E-05					3.7E-01
Medium Total											1.2E-05					3.7E-01

TABLE A-10A

Calculation of RME Chemical Cancer Risks and Noncancer Hazards - Adult and Child Recreational User, Oil Reclamation Area

Appendix A - Updated Human Health Risk Assessment for Chemical Exposures

Scenario Timeframe:	Future
Receptor Population:	Recreational User
Receptor Age:	Adult and Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations: Intake/Exposure Concentration		CSF / Unit Risk		Cancer Risk	Noncancer Hazard Quotient: Intake/Exposure Concentration		RfD / RfC		Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
Macoma[a]	Macoma	Macoma	Ingestion	Aluminum	4.3E+02	mg/kg	3.3E-03	mg/kg-day	--	--	--	1.2E-02	mg/kg-day	1.0E+00	mg/kg-day	1.2E-02
				Antimony	4.4E-02	mg/kg	3.4E-07	mg/kg-day	--	--	--	1.2E-06	mg/kg-day	4.0E-04	mg/kg-day	2.9E-03
				Arsenic	3.9E+00	mg/kg	3.0E-05	mg/kg-day	9.5E+00	(mg/kg-day)-1	2.8E-04	1.0E-04	mg/kg-day	3.0E-04	mg/kg-day	3.5E-01
				Barium	3.7E+00	mg/kg	2.8E-05	mg/kg-day	--	--	--	9.8E-05	mg/kg-day	2.0E-01	mg/kg-day	4.9E-04
				Cadmium	2.0E-01	mg/kg	1.5E-06	mg/kg-day	1.5E+01	(mg/kg-day)-1	2.3E-05	5.3E-06	mg/kg-day	1.0E-03	mg/kg-day	5.3E-03
				Chromium	4.7E+00	mg/kg	3.6E-05	mg/kg-day	--	--	--	1.2E-04	mg/kg-day	1.5E+00	mg/kg-day	8.3E-05
				Cobalt	4.6E-01	mg/kg	3.5E-06	mg/kg-day	--	--	--	1.2E-05	mg/kg-day	3.0E-04	mg/kg-day	4.0E-02
				Copper	3.6E+00	mg/kg	2.8E-05	mg/kg-day	--	--	--	9.7E-05	mg/kg-day	4.0E-02	mg/kg-day	2.4E-03
				Iron	6.0E+02	mg/kg	4.6E-03	mg/kg-day	--	--	--	1.6E-02	mg/kg-day	7.0E-01	mg/kg-day	2.3E-02
				Lead	1.1E+00	mg/kg	8.1E-06	mg/kg-day	--	--	--	2.8E-05	mg/kg-day	--	--	--
				Manganese	8.0E+00	mg/kg	6.1E-05	mg/kg-day	--	--	--	2.1E-04	mg/kg-day	1.4E-01	mg/kg-day	1.5E-03
				Mercury	2.5E-02	mg/kg	1.9E-07	mg/kg-day	--	--	--	6.5E-07	mg/kg-day	1.0E-04	mg/kg-day	6.5E-03
				Molybdenum	5.1E-01	mg/kg	3.9E-06	mg/kg-day	--	--	--	1.4E-05	mg/kg-day	5.0E-03	mg/kg-day	2.7E-03
				Nickel	1.9E+00	mg/kg	1.5E-05	mg/kg-day	--	--	--	5.1E-05	mg/kg-day	2.0E-02	mg/kg-day	2.6E-03
				Selenium	8.7E-01	mg/kg	6.6E-06	mg/kg-day	--	--	--	2.3E-05	mg/kg-day	5.0E-03	mg/kg-day	4.6E-03
				Silver	3.7E-02	mg/kg	2.8E-07	mg/kg-day	--	--	--	9.9E-07	mg/kg-day	5.0E-03	mg/kg-day	2.0E-04
				Vanadium	2.0E+00	mg/kg	1.5E-05	mg/kg-day	--	--	--	5.3E-05	mg/kg-day	5.0E-03	mg/kg-day	1.1E-02
				Zinc	1.9E+01	mg/kg	1.4E-04	mg/kg-day	--	--	--	5.0E-04	mg/kg-day	3.0E-01	mg/kg-day	1.7E-03
				4,4'-DDD	1.2E-03	mg/kg	8.8E-09	mg/kg-day	2.4E-01	(mg/kg-day)-1	2.1E-09	3.1E-08	mg/kg-day	5.0E-04	mg/kg-day	6.2E-05
				4,4'-DDE	2.2E-03	mg/kg	1.7E-08	mg/kg-day	3.4E-01	(mg/kg-day)-1	5.7E-09	5.9E-08	mg/kg-day	5.0E-04	mg/kg-day	1.2E-04
				4,4'-DDT	7.0E-05	mg/kg	5.3E-10	mg/kg-day	3.4E-01	(mg/kg-day)-1	1.8E-10	1.9E-09	mg/kg-day	5.0E-04	mg/kg-day	3.7E-06
				alpha-Chlordane	2.8E-04	mg/kg	2.1E-09	mg/kg-day	3.5E-01	(mg/kg-day)-1	7.4E-10	7.4E-09	mg/kg-day	5.0E-04	mg/kg-day	1.5E-05
				Dieldrin	2.6E-04	mg/kg	2.0E-09	mg/kg-day	1.6E+01	(mg/kg-day)-1	3.2E-08	7.0E-09	mg/kg-day	5.0E-05	mg/kg-day	1.4E-04
				gamma-Chlordane	3.3E-04	mg/kg	2.5E-09	mg/kg-day	3.5E-01	(mg/kg-day)-1	8.9E-10	8.9E-09	mg/kg-day	5.0E-04	mg/kg-day	1.8E-05
				Acenaphthene	1.7E-04	mg/kg	1.3E-09	mg/kg-day	--	--	--	4.6E-09	mg/kg-day	6.0E-02	mg/kg-day	7.7E-08
				Acenaphthylene	4.3E-04	mg/kg	3.3E-09	mg/kg-day	--	--	--	1.1E-08	mg/kg-day	6.0E-02	mg/kg-day	1.9E-07
				Anthracene	1.4E-03	mg/kg	1.0E-08	mg/kg-day	--	--	--	3.6E-08	mg/kg-day	3.0E-01	mg/kg-day	1.2E-07
				Fluorene	2.6E-04	mg/kg	2.0E-09	mg/kg-day	--	--	--	6.9E-09	mg/kg-day	4.0E-02	mg/kg-day	1.7E-07
				Phenanthrene	2.6E-03	mg/kg	2.0E-08	mg/kg-day	--	--	--	6.9E-08	mg/kg-day	3.0E-01	mg/kg-day	2.3E-07
				Benzo(a)anthracene	4.8E-03	mg/kg	3.6E-08	mg/kg-day	1.2E+00	(mg/kg-day)-1	4.4E-08	1.3E-07	mg/kg-day	--	--	--
				Benzo(a)pyrene	6.6E-03	mg/kg	5.0E-08	mg/kg-day	7.3E+00	(mg/kg-day)-1	3.6E-07	1.7E-07	mg/kg-day	--	--	--
				Benzo(b)fluoranthene	6.8E-03	mg/kg	5.1E-08	mg/kg-day	1.2E+00	(mg/kg-day)-1	6.2E-08	1.8E-07	mg/kg-day	--	--	--
				Benzo(g,h,i)perylene	4.5E-03	mg/kg	3.4E-08	mg/kg-day	--	--	--	1.2E-07	mg/kg-day	3.0E-02	mg/kg-day	4.0E-06
				Benzo(k)fluoranthene	8.3E-03	mg/kg	6.3E-08	mg/kg-day	1.2E+00	(mg/kg-day)-1	7.5E-08	2.2E-07	mg/kg-day	--	--	--
				Chrysene	9.1E-03	mg/kg	6.9E-08	mg/kg-day	1.2E-01	(mg/kg-day)-1	8.3E-09	2.4E-07	mg/kg-day	--	--	--
				Dibenz(a,h)anthracene	2.8E-04	mg/kg	2.1E-09	mg/kg-day	7.3E+00	(mg/kg-day)-1	1.5E-08	7.4E-09	mg/kg-day	--	--	--
				Fluoranthene	1.7E-02	mg/kg	1.3E-07	mg/kg-day	--	--	--	4.6E-07	mg/kg-day	4.0E-02	mg/kg-day	1.2E-05
				Indeno(1,2,3-cd)pyrene	2.7E-03	mg/kg	2.0E-08	mg/kg-day	1.2E+00	(mg/kg-day)-1	2.4E-08	7.1E-08	mg/kg-day	--	--	--
				Pyrene	2.0E-02	mg/kg	1.5E-07	mg/kg-day	--	--	--	5.2E-07	mg/kg-day	3.0E-02	mg/kg-day	1.7E-05
				Dibutyltin	3.7E-03	mg/kg	2.8E-08	mg/kg-day	--	--	--	9.9E-08	mg/kg-day	3.0E-04	mg/kg-day	3.3E-04
				Tributyltin	3.2E-02	mg/kg	2.4E-07	mg/kg-day	--	--	--	8.5E-07	mg/kg-day	3.0E-04	mg/kg-day	2.8E-03
				Total PCB Congeners	1.7E-01	mg/kg	1.3E-06	mg/kg-day	2.0E+00	(mg/kg-day)-1	2.6E-06	4.6E-06	mg/kg-day	2.0E-05	mg/kg-day	2.3E-01
				Total TEQ – PCB DLC	5.6E-06	mg/kg	4.3E-11	mg/kg-day	1.3E+05	(mg/kg-day)-1	5.5E-06	1.5E-10	mg/kg-day	7.0E-10	mg/kg-day	2.1E-01
				Total TEQ – TCDD DLC	7.8E-07	mg/kg	5.9E-12	mg/kg-day	1.3E+05	(mg/kg-day)-1	7.7E-07	2.1E-11	mg/kg-day	7.0E-10	mg/kg-day	3.0E-02
			Exp. Route Total								3.1E-04					9.4E-01
		Exposure Point Total									3.1E-04					9.4E-01
	Exposure Medium Total										3.1E-04					9.4E-01
Medium Total											3.1E-04					9.4E-01
										Total of Receptor Risks across All Media	3.3E-04				Total of Receptor Hazards across All Media	1.3E+00

TABLE A-10A

Calculation of RME Chemical Cancer Risks and Noncancer Hazards - Adult and Child Recreational User, Oil Reclamation Area

Appendix A - Updated Human Health Risk Assessment for Chemical Exposures

Scenario Timeframe:	Future
Receptor Population:	Recreational User
Receptor Age:	Adult and Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Noncancer Hazard Quotient				
							Intake/Exposure Concentration		CSF / Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD / RfC		Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	

Notes:

[a] Macoma ingestion risks are evaluated for the adult receptor only.

Acronyms/Abbreviations:

-- =	not available or not applicable	(mg/kg-day)-1 =	1/(milligram[s] per kilogram per day)
CSF =	cancer slope factor	mg/kg =	milligram(s) per kilogram
DDD =	dichlorodiphenyldichloroethane	mg/kg-day =	milligram(s) per kilogram per day
DDE =	dichlorodiphenyldichloroethylene	PCB =	polychlorinated biphenyl
DDT =	dichlorodiphenyltrichloroethane	RfC =	reference concentration
EPC =	exposure point concentration	RfD =	reference dose
Exp. =	exposure	RME =	reasonable maximum exposure
M =	lifetime exposure from birth, mutagenic endpoint	TCDD =	tetrachlorodibenzo-p-dioxin

TABLE A-10B
Summary of Receptor Risks and Hazards - Adult and Child Recreational User, Oil Reclamation Area
Appendix A - Updated Human Health Risk Assessment for Chemical Exposures

Scenario Timeframe:	Future
Receptor Population:	Recreational User
Receptor Age:	Adult and Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk: Ingestion	Cancer Risk: Inhalation	Cancer Risk: Dermal	Cancer Risk: Exposure Routes Total	Noncancer Hazard Quotient: Ingestion	Noncancer Hazard Quotient: Inhalation	Noncancer Hazard Quotient: Dermal	Noncancer Hazard Quotient: Exposure Routes Total
Sediment	Sediment	Sediment	Aluminum	--	--	--	--	6.8E-02	--	2.0E-03	7.0E-02
			Antimony	--	--	--	--	6.6E-03	--	1.3E-03	7.8E-03
			Arsenic	7.7E-06	--	1.2E-06	9.0E-06	2.4E-02	--	3.5E-03	2.8E-02
			Barium	--	--	--	--	2.1E-03	--	8.7E-04	3.0E-03
			Cadmium	6.2E-07	--	8.0E-08	7.0E-07	3.7E-04	--	4.3E-05	4.1E-04
			Chromium	--	--	--	--	2.7E-04	--	6.1E-04	8.8E-04
			Cobalt	--	--	--	--	6.6E-02	--	1.9E-03	6.8E-02
			Copper	--	--	--	--	2.0E-03	--	5.8E-05	2.1E-03
			Iron	--	--	--	--	6.4E-02	--	1.9E-03	6.6E-02
			Lead	--	--	--	--	--	--	--	--
			Manganese	--	--	--	--	3.9E-03	--	1.1E-04	4.0E-03
			Mercury	--	--	--	--	4.9E-03	--	1.4E-04	5.1E-03
			Molybdenum	--	--	--	--	3.1E-04	--	9.0E-06	3.2E-04
			Nickel	--	--	--	--	6.4E-03	--	4.7E-03	1.1E-02
			Selenium	--	--	--	--	7.2E-05	--	2.1E-06	7.4E-05
			Silver	--	--	--	--	8.1E-05	--	5.9E-05	1.4E-04
			Vanadium	--	--	--	--	3.1E-02	--	3.5E-02	6.6E-02
			Zinc	--	--	--	--	5.1E-04	--	1.5E-05	5.3E-04
			4,4'-DDD	6.8E-11	--	1.1E-11	7.9E-11	5.1E-06	--	7.3E-07	5.8E-06
			4,4'-DDE	4.8E-11	--	7.6E-12	5.5E-11	2.5E-06	--	3.6E-07	2.8E-06
			4,4'-DDT	2.4E-11	--	3.8E-12	2.8E-11	1.3E-06	--	1.8E-07	1.4E-06
			alpha-Chlordane	1.4E-11	--	2.2E-12	1.6E-11	6.9E-07	--	1.0E-07	7.9E-07
			Dieldrin	7.5E-10	--	2.4E-10	9.9E-10	8.4E-06	--	2.4E-06	1.1E-05
			gamma-Chlordane	1.4E-11	--	2.3E-12	1.6E-11	7.2E-07	--	1.0E-07	8.3E-07
			2-Methylnaphthalene	--	--	--	--	2.1E-06	--	8.9E-07	2.9E-06
			Acenaphthene	--	--	--	--	9.1E-08	--	4.0E-08	1.3E-07
			Acenaphthylene	--	--	--	--	1.4E-07	--	6.2E-08	2.1E-07
			Anthracene	--	--	--	--	1.3E-07	--	5.8E-08	1.9E-07
			Fluorene	--	--	--	--	2.1E-07	--	9.2E-08	3.0E-07
			Naphthalene	--	--	--	--	7.2E-07	--	3.1E-07	1.0E-06
			Phenanthrene	--	--	--	--	3.3E-07	--	1.4E-07	4.7E-07
			Benzo(a)anthracene	7.0E-08	--	3.2E-08	1.0E-07	--	--	--	--
			Benzo(a)pyrene	6.9E-07	--	3.2E-07	1.0E-06	--	--	--	--
			Benzo(b)fluoranthene	7.8E-08	--	3.6E-08	1.1E-07	--	--	--	--
			Benzo(g,h,i)perylene	--	--	--	--	5.7E-06	--	2.5E-06	8.2E-06
			Benzo(k)fluoranthene	8.2E-08	--	3.7E-08	1.2E-07	--	--	--	--
			Chrysene	1.1E-08	--	5.2E-09	1.7E-08	--	--	--	--
			Dibenz(a,h)anthracene	7.4E-08	--	3.4E-08	1.1E-07	--	--	--	--
			Fluoranthene	--	--	--	--	5.7E-06	--	2.5E-06	8.1E-06
			Indeno(1,2,3-cd)pyrene	9.5E-08	--	4.3E-08	1.4E-07	--	--	--	--
			Pyrene	--	--	--	--	9.5E-06	--	4.1E-06	1.4E-05
			Monobutyltin	--	--	--	--	8.5E-06	--	2.5E-06	1.1E-05
			Dibutyltin	--	--	--	--	5.1E-05	--	1.5E-05	6.6E-05
			Tributyltin	--	--	--	--	1.3E-04	--	3.7E-05	1.7E-04
			Total PCB Congeners	7.2E-08	--	3.5E-08	1.1E-07	1.6E-02	--	7.0E-03	2.3E-02
			Total TEQ – PCB DLC	1.2E-07	--	1.1E-08	1.3E-07	1.2E-02	--	1.0E-03	1.3E-02
			Chemical Total	9.6E-06	--	1.9E-06	1.2E-05	3.1E-01	--	6.0E-02	3.7E-01
		Exposure Point Total					1.2E-05				3.7E-01
	Exposure Medium Total						1.2E-05				3.7E-01
Medium Total							1.2E-05				3.7E-01

TABLE A-10B
Summary of Receptor Risks and Hazards - Adult and Child Recreational User, Oil Reclamation Area
Appendix A - Updated Human Health Risk Assessment for Chemical Exposures

Scenario Timeframe:	Future
Receptor Population:	Recreational User
Receptor Age:	Adult and Child

				Cancer Risk				Noncancer Hazard Quotient			
Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Ingestion	Inhalation	Dermal	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total
Macoma	Macoma	Macoma (ingestion)	Aluminum	--	--	--	--	1.2E-02	--	--	1.2E-02
			Antimony	--	--	--	--	2.9E-03	--	--	2.9E-03
			Arsenic	2.8E-04	--	--	2.8E-04	3.5E-01	--	--	3.5E-01
			Barium	--	--	--	--	4.9E-04	--	--	4.9E-04
			Cadmium	2.3E-05	--	--	2.3E-05	5.3E-03	--	--	5.3E-03
			Chromium	--	--	--	--	8.3E-05	--	--	8.3E-05
			Cobalt	--	--	--	--	4.0E-02	--	--	4.0E-02
			Copper	--	--	--	--	2.4E-03	--	--	2.4E-03
			Iron	--	--	--	--	2.3E-02	--	--	2.3E-02
			Lead	--	--	--	--	--	--	--	--
			Manganese	--	--	--	--	1.5E-03	--	--	1.5E-03
			Mercury	--	--	--	--	6.5E-03	--	--	6.5E-03
			Molybdenum	--	--	--	--	2.7E-03	--	--	2.7E-03
			Nickel	--	--	--	--	2.6E-03	--	--	2.6E-03
			Selenium	--	--	--	--	4.6E-03	--	--	4.6E-03
			Silver	--	--	--	--	2.0E-04	--	--	2.0E-04
			Vanadium	--	--	--	--	1.1E-02	--	--	1.1E-02
			Zinc	--	--	--	--	1.7E-03	--	--	1.7E-03
			4,4'-DDD	2.1E-09	--	--	2.1E-09	6.2E-05	--	--	6.2E-05
			4,4'-DDE	5.7E-09	--	--	5.7E-09	1.2E-04	--	--	1.2E-04
			4,4'-DDT	1.8E-10	--	--	1.8E-10	3.7E-06	--	--	3.7E-06
			alpha-Chlordane	7.4E-10	--	--	7.4E-10	1.5E-05	--	--	1.5E-05
			Dieldrin	3.2E-08	--	--	3.2E-08	1.4E-04	--	--	1.4E-04
			gamma-Chlordane	8.9E-10	--	--	8.9E-10	1.8E-05	--	--	1.8E-05
			Acenaphthene	--	--	--	--	7.7E-08	--	--	7.7E-08
			Acenaphthylene	--	--	--	--	1.9E-07	--	--	1.9E-07
			Anthracene	--	--	--	--	1.2E-07	--	--	1.2E-07
			Fluorene	--	--	--	--	1.7E-07	--	--	1.7E-07
			Phenanthrene	--	--	--	--	2.3E-07	--	--	2.3E-07
			Benzo(a)anthracene	4.4E-08	--	--	4.4E-08	--	--	--	--
			Benzo(a)pyrene	3.6E-07	--	--	3.6E-07	--	--	--	--
			Benzo(b)fluoranthene	6.2E-08	--	--	6.2E-08	--	--	--	--
			Benzo(g,h,i)perylene	--	--	--	--	4.0E-06	--	--	4.0E-06
			Benzo(k)fluoranthene	7.5E-08	--	--	7.5E-08	--	--	--	--
			Chrysene	8.3E-09	--	--	8.3E-09	--	--	--	--
			Dibenz(a,h)anthracene	1.5E-08	--	--	1.5E-08	--	--	--	--
			Fluoranthene	--	--	--	--	1.2E-05	--	--	1.2E-05
			Indeno(1,2,3-cd)pyrene	2.4E-08	--	--	2.4E-08	--	--	--	--
			Pyrene	--	--	--	--	1.7E-05	--	--	1.7E-05
			Dibutyltin	--	--	--	--	3.3E-04	--	--	3.3E-04
			Tributyltin	--	--	--	--	2.8E-03	--	--	2.8E-03
			Total PCB Congeners	2.6E-06	--	--	2.6E-06	2.3E-01	--	--	2.3E-01
			Total TEQ – PCB DLC	5.5E-06	--	--	5.5E-06	2.1E-01	--	--	2.1E-01
			Chemical Total	3.1E-04	--	--	3.1E-04	9.1E-01	--	--	9.1E-01
		Exposure Point Total					3.1E-04				9.1E-01
	Exposure Medium Total						3.1E-04				9.1E-01
Medium Total							3.1E-04				9.1E-01
Receptor Total						Total Risk across All Media	3.2E-04			Total Hazard across All Media	1.3E+00

Acronyms/Abbreviations:

-- =	not available or not applicable	DDT =	dichlorodiphenyltrichloroethane
DDD =	dichlorodiphenyldichloroethane	PCB =	polychlorinated biphenyl
DDE =	dichlorodiphenyldichloroethylene	TCDD =	tetrachlorodibenzo-p-dioxin

TABLE A-10C
Summary of Risk Drivers - Adult and Child Recreational User, Oil Reclamation Area
Appendix A - Updated Human Health Risk Assessment for Chemical Exposures

Scenario Timeframe:	Future
Receptor Population:	Recreational User
Receptor Age:	Adult and Chilc

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient			
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total
Sediment	Sediment	Sediment	BAP (EQ)*	9.4E-07	--	4.7E-07	1.4E-06	--	--	--	--
		(Oral/Dermal)	Arsenic	7.7E-06	--	1.2E-06	9.0E-06	2.4E-02	--	3.5E-03	2.8E-02
			Chemical Total	8.7E-06	--	1.7E-06	1.0E-05	2.4E-02	--	3.5E-03	2.8E-02
		Exposure Point Total					1.0E-05				2.8E-02
	Exposure Medium Total						1.0E-05				2.8E-02
Medium Total							1.0E-05				2.8E-02
Macoma	Macoma	Macoma	Arsenic	2.8E-04	--	--	2.8E-04	3.5E-01	--	--	3.5E-01
		(Oral)	Cadmium	2.3E-05	--	--	2.3E-05	5.3E-03	--	--	5.3E-03
			Total PCB Congeners	2.6E-06	--	--	2.6E-06	2.3E-01	--	--	2.3E-01
			Total TEQ – PCB DLC	5.5E-06	--	--	5.5E-06	2.1E-01	--	--	2.1E-01
			Total TEQ – TCDD DLC	7.7E-07	--	--	7.7E-07	3.0E-02	--	--	3.0E-02
			Chemical Total	3.1E-04	--	--	3.1E-04	8.2E-01	--	--	8.2E-01
		Exposure Point Total					3.1E-04				8.2E-01
	Exposure Medium Total						3.1E-04				8.2E-01
Medium Total							3.1E-04				8.2E-01
Receptor Total				Total Risk across All Media			3.2E-04	Total Hazard across All Media			8.5E-01

Notes:

* Risk for benzo(a)pyrene equivalent (BAP [EQ]) is calculated by summing the risks for each of the individual potentially carcinogenic PAHs: benzo(a)anthracene, benzo(b)fluoranthene, benzo(a)pyrene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene.

Acronyms/Abbreviations:

-- = not available or not applicable
BAP (EQ) = benzo(a)pyrene equivalent
PAH = polycyclic aromatic hydrocarbon
PCB = polychlorinated biphenyl

TABLE A-11A

Calculation of RME Chemical Cancer Risks and Noncancer Hazards - Construction Worker, Oil Reclamation Area

Appendix A - Updated Human Health Risk Assessment for Chemical Exposures

Scenario Timeframe:	Future
Receptor Population:	Construction Worker
Receptor Age:	Adult

							Cancer Risk Calculations					Noncancer Hazard Quotient				
					EPC		Intake/Exposure Concentration		CSF / Unit Risk			Intake/Exposure Concentration		RfD / RfC		
Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	Value	Units	Value	Units	Value	Units	Cancer Risk	Value	Units	Value	Units	Hazard Quotient
Sediment	Sediment	Sediment	Ingestion	Aluminum	7.2E+04	mg/kg	2.9E-03	mg/kg-day	--	--	--	2.0E-01	mg/kg-day	1.0E+00	mg/kg-day	2.0E-01
				Antimony	2.8E+00	mg/kg	1.1E-07	mg/kg-day	--	--	--	7.8E-06	mg/kg-day	4.0E-04	mg/kg-day	2.0E-02
				Arsenic	1.3E+01	mg/kg	3.1E-07	mg/kg-day	9.5E+00	(mg/kg-day)-1	2.9E-06	2.1E-05	mg/kg-day	3.0E-04	mg/kg-day	7.2E-02
				Barium	4.4E+02	mg/kg	1.8E-05	mg/kg-day	--	--	--	1.2E-03	mg/kg-day	2.0E-01	mg/kg-day	6.2E-03
				Cadmium	3.9E-01	mg/kg	1.6E-08	mg/kg-day	1.5E+01	(mg/kg-day)-1	2.3E-07	1.1E-06	mg/kg-day	1.0E-03	mg/kg-day	1.1E-03
				Chromium	4.3E+02	mg/kg	1.7E-05	mg/kg-day	--	--	--	1.2E-03	mg/kg-day	1.5E+00	mg/kg-day	8.1E-04
				Cobalt	2.1E+01	mg/kg	8.4E-07	mg/kg-day	--	--	--	5.9E-05	mg/kg-day	3.0E-04	mg/kg-day	2.0E-01
				Copper	8.4E+01	mg/kg	3.4E-06	mg/kg-day	--	--	--	2.4E-04	mg/kg-day	4.0E-02	mg/kg-day	6.0E-03
				Iron	4.7E+04	mg/kg	1.9E-03	mg/kg-day	--	--	--	1.3E-01	mg/kg-day	7.0E-01	mg/kg-day	1.9E-01
				Lead	5.4E+01	mg/kg	2.2E-06	mg/kg-day	--	--	--	1.5E-04	mg/kg-day	--	--	--
				Manganese	5.7E+02	mg/kg	2.3E-05	mg/kg-day	--	--	--	1.6E-03	mg/kg-day	1.4E-01	mg/kg-day	1.2E-02
				Mercury	5.2E-01	mg/kg	2.1E-08	mg/kg-day	--	--	--	1.5E-06	mg/kg-day	1.0E-04	mg/kg-day	1.5E-02
				Molybdenum	1.6E+00	mg/kg	6.6E-08	mg/kg-day	--	--	--	4.6E-06	mg/kg-day	5.0E-03	mg/kg-day	9.2E-04
				Nickel	1.4E+02	mg/kg	5.5E-06	mg/kg-day	--	--	--	3.8E-04	mg/kg-day	2.0E-02	mg/kg-day	1.9E-02
				Selenium	3.8E-01	mg/kg	1.5E-08	mg/kg-day	--	--	--	1.1E-06	mg/kg-day	5.0E-03	mg/kg-day	2.1E-04
				Silver	4.3E-01	mg/kg	1.7E-08	mg/kg-day	--	--	--	1.2E-06	mg/kg-day	5.0E-03	mg/kg-day	2.4E-04
				Vanadium	1.6E+02	mg/kg	6.6E-06	mg/kg-day	--	--	--	4.6E-04	mg/kg-day	5.0E-03	mg/kg-day	9.2E-02
				Zinc	1.6E+02	mg/kg	6.5E-06	mg/kg-day	--	--	--	4.6E-04	mg/kg-day	3.0E-01	mg/kg-day	1.5E-03
				4,4'-DDD	2.7E-03	mg/kg	1.1E-10	mg/kg-day	2.4E-01	(mg/kg-day)-1	2.6E-11	7.5E-09	mg/kg-day	5.0E-04	mg/kg-day	1.5E-05
				4,4'-DDE	1.3E-03	mg/kg	5.3E-11	mg/kg-day	3.4E-01	(mg/kg-day)-1	1.8E-11	3.7E-09	mg/kg-day	5.0E-04	mg/kg-day	7.4E-06
				4,4'-DDT	6.6E-04	mg/kg	2.7E-11	mg/kg-day	3.4E-01	(mg/kg-day)-1	9.0E-12	1.9E-09	mg/kg-day	5.0E-04	mg/kg-day	3.7E-06
				alpha-Chlordane	3.6E-04	mg/kg	1.5E-11	mg/kg-day	3.5E-01	(mg/kg-day)-1	5.1E-12	1.0E-09	mg/kg-day	5.0E-04	mg/kg-day	2.0E-06
				Dieldrin	4.4E-04	mg/kg	1.8E-11	mg/kg-day	1.6E+01	(mg/kg-day)-1	2.8E-10	1.2E-09	mg/kg-day	5.0E-05	mg/kg-day	2.5E-05
				gamma-Chlordane	3.8E-04	mg/kg	1.5E-11	mg/kg-day	3.5E-01	(mg/kg-day)-1	5.4E-12	1.1E-09	mg/kg-day	5.0E-04	mg/kg-day	2.1E-06
				2-Methylnaphthalene	8.7E-03	mg/kg	3.5E-10	mg/kg-day	--	--	--	2.4E-08	mg/kg-day	4.0E-03	mg/kg-day	6.1E-06
				Acenaphthene	5.8E-03	mg/kg	2.3E-10	mg/kg-day	--	--	--	1.6E-08	mg/kg-day	6.0E-02	mg/kg-day	2.7E-07
				Acenaphthylene	9.1E-03	mg/kg	3.7E-10	mg/kg-day	--	--	--	2.6E-08	mg/kg-day	6.0E-02	mg/kg-day	4.3E-07
				Anthracene	4.2E-02	mg/kg	1.7E-09	mg/kg-day	--	--	--	1.2E-07	mg/kg-day	3.0E-01	mg/kg-day	4.0E-07
				Fluorene	8.9E-03	mg/kg	3.6E-10	mg/kg-day	--	--	--	2.5E-08	mg/kg-day	4.0E-02	mg/kg-day	6.3E-07
				Naphthalene	1.5E-02	mg/kg	6.1E-10	mg/kg-day	--	--	--	4.3E-08	mg/kg-day	2.0E-02	mg/kg-day	2.1E-06
				Phenanthrene	1.0E-01	mg/kg	4.2E-09	mg/kg-day	--	--	--	2.9E-07	mg/kg-day	3.0E-01	mg/kg-day	9.7E-07
				Benzo(a)anthracene	1.2E-01	mg/kg	4.8E-09	mg/kg-day	1.2E+00	(mg/kg-day)-1	5.8E-09	3.4E-07	mg/kg-day	--	--	--
				Benzo(a)pyrene	2.0E-01	mg/kg	7.9E-09	mg/kg-day	7.3E+00	(mg/kg-day)-1	5.8E-08	5.5E-07	mg/kg-day	--	--	--
				Benzo(b)fluoranthene	1.3E-01	mg/kg	5.4E-09	mg/kg-day	1.2E+00	(mg/kg-day)-1	6.5E-09	3.8E-07	mg/kg-day	--	--	--
				Benzo(g,h,i)perylene	1.8E-01	mg/kg	7.3E-09	mg/kg-day	--	--	--	5.1E-07	mg/kg-day	3.0E-02	mg/kg-day	1.7E-05
				Benzo(k)fluoranthene	1.4E-01	mg/kg	5.7E-09	mg/kg-day	1.2E+00	(mg/kg-day)-1	6.8E-09	4.0E-07	mg/kg-day	--	--	--
				Chrysene	2.0E-01	mg/kg	7.9E-09	mg/kg-day	1.2E-01	(mg/kg-day)-1	9.4E-10	5.5E-07	mg/kg-day	--	--	--
				Dibenz(a,h)anthracene	2.1E-02	mg/kg	8.5E-10	mg/kg-day	7.3E+00	(mg/kg-day)-1	6.2E-09	5.9E-08	mg/kg-day	--	--	--
				Fluoranthene	2.4E-01	mg/kg	9.6E-09	mg/kg-day	--	--	--	6.8E-07	mg/kg-day	4.0E-02	mg/kg-day	1.7E-05
				Indeno(1,2,3-cd)pyrene	1.6E-01	mg/kg	6.6E-09	mg/kg-day	1.2E+00	(mg/kg-day)-1	7.9E-09	4.6E-07	mg/kg-day	--	--	--
				Pyrene	3.0E-01	mg/kg	1.2E-08	mg/kg-day	--	--	--	8.4E-07	mg/kg-day	3.0E-02	mg/kg-day	2.8E-05
				Monobutyltin	2.7E-03	mg/kg	1.1E-10	mg/kg-day	--	--	--	7.6E-09	mg/kg-day	3.0E-04	mg/kg-day	2.5E-05
				Dibutyltin	1.6E-02	mg/kg	6.5E-10	mg/kg-day	--	--	--	4.5E-08	mg/kg-day	3.0E-04	mg/kg-day	1.5E-04
				Tributyltin	4.1E-02	mg/kg	1.6E-09	mg/kg-day	--	--	--	1.1E-07	mg/kg-day	3.0E-04	mg/kg-day	3.8E-04
				Total PCB Congeners	3.4E-01	mg/kg	1.4E-08	mg/kg-day	2.0E+00	(mg/kg-day)-1	2.7E-08	9.6E-07	mg/kg-day	2.0E-05	mg/kg-day	4.8E-02
				Total TEQ – PCB DLC	8.5E-06	mg/kg	3.4E-13	mg/kg-day	1.3E+05	(mg/kg-day)-1	4.5E-08	2.4E-11	mg/kg-day	7.0E-10	mg/kg-day	3.4E-02
			Exp. Route Total								3.3E-06					9.2E-01

TABLE A-11A

Calculation of RME Chemical Cancer Risks and Noncancer Hazards - Construction Worker, Oil Reclamation Area

Appendix A - Updated Human Health Risk Assessment for Chemical Exposures

Scenario Timeframe:	Future
Receptor Population:	Construction Worker
Receptor Age:	Adult

							Cancer Risk Calculations					Noncancer Hazard Quotient				
					EPC		Intake/Exposure Concentration		CSF / Unit Risk			Intake/Exposure Concentration		RfD / RfC		
Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	Value	Units	Value	Units	Value	Units	Cancer Risk	Value	Units	Value	Units	Hazard Quotient
Sediment	Sediment	Sediment	Dermal	Aluminum	7.2E+04	mg/kg	4.2E-04	mg/kg-day	--	--	--	3.0E-02	mg/kg-day	1.0E+00	mg/kg-day	3.0E-02
				Antimony	2.8E+00	mg/kg	1.6E-08	mg/kg-day	--	--	--	1.1E-06	mg/kg-day	6.0E-05	mg/kg-day	1.9E-02
				Arsenic	1.3E+01	mg/kg	2.2E-07	mg/kg-day	9.5E+00	(mg/kg-day)-1	2.1E-06	1.6E-05	mg/kg-day	3.0E-04	mg/kg-day	5.2E-02
				Barium	4.4E+02	mg/kg	2.6E-06	mg/kg-day	--	--	--	1.8E-04	mg/kg-day	1.4E-02	mg/kg-day	1.3E-02
				Cadmium	3.9E-01	mg/kg	2.3E-10	mg/kg-day	6.0E+02	(mg/kg-day)-1	1.4E-07	1.6E-08	mg/kg-day	2.5E-05	mg/kg-day	6.4E-04
				Chromium	4.3E+02	mg/kg	2.5E-06	mg/kg-day	--	--	--	1.8E-04	mg/kg-day	2.0E-02	mg/kg-day	9.1E-03
				Cobalt	2.1E+01	mg/kg	1.2E-07	mg/kg-day	--	--	--	8.6E-06	mg/kg-day	3.0E-04	mg/kg-day	2.9E-02
				Copper	8.4E+01	mg/kg	5.0E-07	mg/kg-day	--	--	--	3.5E-05	mg/kg-day	4.0E-02	mg/kg-day	8.7E-04
				Iron	4.7E+04	mg/kg	2.8E-04	mg/kg-day	--	--	--	2.0E-02	mg/kg-day	7.0E-01	mg/kg-day	2.8E-02
				Lead	5.4E+01	mg/kg	3.2E-07	mg/kg-day	--	--	--	2.3E-05	mg/kg-day	--	--	--
				Manganese	5.7E+02	mg/kg	3.4E-06	mg/kg-day	--	--	--	2.4E-04	mg/kg-day	1.4E-01	mg/kg-day	1.7E-03
				Mercury	5.2E-01	mg/kg	3.1E-09	mg/kg-day	--	--	--	2.1E-07	mg/kg-day	1.0E-04	mg/kg-day	2.1E-03
				Molybdenum	1.6E+00	mg/kg	9.6E-09	mg/kg-day	--	--	--	6.7E-07	mg/kg-day	5.0E-03	mg/kg-day	1.3E-04
				Nickel	1.4E+02	mg/kg	8.0E-07	mg/kg-day	--	--	--	5.6E-05	mg/kg-day	8.0E-04	mg/kg-day	7.0E-02
				Selenium	3.8E-01	mg/kg	2.2E-09	mg/kg-day	--	--	--	1.6E-07	mg/kg-day	5.0E-03	mg/kg-day	3.1E-05
				Silver	4.3E-01	mg/kg	2.5E-09	mg/kg-day	--	--	--	1.8E-07	mg/kg-day	2.0E-04	mg/kg-day	8.8E-04
				Vanadium	1.6E+02	mg/kg	9.6E-07	mg/kg-day	--	--	--	6.7E-05	mg/kg-day	1.3E-04	mg/kg-day	5.2E-01
				Zinc	1.6E+02	mg/kg	9.6E-07	mg/kg-day	--	--	--	6.7E-05	mg/kg-day	3.0E-01	mg/kg-day	2.2E-04
				4,4'-DDD	2.7E-03	mg/kg	7.8E-11	mg/kg-day	2.4E-01	(mg/kg-day)-1	1.9E-11	5.5E-09	mg/kg-day	5.0E-04	mg/kg-day	1.1E-05
				4,4'-DDE	1.3E-03	mg/kg	3.9E-11	mg/kg-day	3.4E-01	(mg/kg-day)-1	1.3E-11	2.7E-09	mg/kg-day	5.0E-04	mg/kg-day	5.4E-06
				4,4'-DDT	6.6E-04	mg/kg	1.9E-11	mg/kg-day	3.4E-01	(mg/kg-day)-1	6.6E-12	1.4E-09	mg/kg-day	5.0E-04	mg/kg-day	2.7E-06
				alpha-Chlordane	3.6E-04	mg/kg	1.1E-11	mg/kg-day	3.5E-01	(mg/kg-day)-1	3.7E-12	7.5E-10	mg/kg-day	5.0E-04	mg/kg-day	1.5E-06
				Dieldrin	4.4E-04	mg/kg	2.6E-11	mg/kg-day	1.6E+01	(mg/kg-day)-1	4.2E-10	1.8E-09	mg/kg-day	5.0E-05	mg/kg-day	3.6E-05
				gamma-Chlordane	3.8E-04	mg/kg	1.1E-11	mg/kg-day	3.5E-01	(mg/kg-day)-1	3.9E-12	7.8E-10	mg/kg-day	5.0E-04	mg/kg-day	1.6E-06
				2-Methylnaphthalene	8.7E-03	mg/kg	7.7E-10	mg/kg-day	--	--	--	5.4E-08	mg/kg-day	4.0E-03	mg/kg-day	1.3E-05
				Acenaphthene	5.8E-03	mg/kg	5.1E-10	mg/kg-day	--	--	--	3.6E-08	mg/kg-day	6.0E-02	mg/kg-day	5.9E-07
				Acenaphthylene	9.1E-03	mg/kg	8.0E-10	mg/kg-day	--	--	--	5.6E-08	mg/kg-day	6.0E-02	mg/kg-day	9.4E-07
				Anthracene	4.2E-02	mg/kg	3.8E-09	mg/kg-day	--	--	--	2.6E-07	mg/kg-day	3.0E-01	mg/kg-day	8.8E-07
				Fluorene	8.9E-03	mg/kg	7.9E-10	mg/kg-day	--	--	--	5.5E-08	mg/kg-day	4.0E-02	mg/kg-day	1.4E-06
				Naphthalene	1.5E-02	mg/kg	1.3E-09	mg/kg-day	--	--	--	9.4E-08	mg/kg-day	2.0E-02	mg/kg-day	4.7E-06
				Phenanthrene	1.0E-01	mg/kg	9.1E-09	mg/kg-day	--	--	--	6.4E-07	mg/kg-day	3.0E-01	mg/kg-day	2.1E-06
				Benzo(a)anthracene	1.2E-01	mg/kg	1.1E-08	mg/kg-day	1.2E+00	(mg/kg-day)-1	1.3E-08	7.4E-07	mg/kg-day	--	--	--
				Benzo(a)pyrene	2.0E-01	mg/kg	1.7E-08	mg/kg-day	7.3E+00	(mg/kg-day)-1	1.3E-07	1.2E-06	mg/kg-day	--	--	--
				Benzo(b)fluoranthene	1.3E-01	mg/kg	1.2E-08	mg/kg-day	1.2E+00	(mg/kg-day)-1	1.4E-08	8.3E-07	mg/kg-day	--	--	--
				Benzo(g,h,i)perylene	1.8E-01	mg/kg	1.6E-08	mg/kg-day	--	--	--	1.1E-06	mg/kg-day	3.0E-02	mg/kg-day	3.7E-05
				Benzo(k)fluoranthene	1.4E-01	mg/kg	1.2E-08	mg/kg-day	1.2E+00	(mg/kg-day)-1	1.5E-08	8.7E-07	mg/kg-day	--	--	--
				Chrysene	2.0E-01	mg/kg	1.7E-08	mg/kg-day	1.2E-01	(mg/kg-day)-1	2.1E-09	1.2E-06	mg/kg-day	--	--	--
				Dibenz(a,h)anthracene	2.1E-02	mg/kg	1.9E-09	mg/kg-day	7.3E+00	(mg/kg-day)-1	1.4E-08	1.3E-07	mg/kg-day	--	--	--
				Fluoranthene	2.4E-01	mg/kg	2.1E-08	mg/kg-day	--	--	--	1.5E-06	mg/kg-day	4.0E-02	mg/kg-day	3.7E-05
				Indeno(1,2,3-cd)pyrene	1.6E-01	mg/kg	1.4E-08	mg/kg-day	1.2E+00	(mg/kg-day)-1	1.7E-08	1.0E-06	mg/kg-day	--	--	--
				Pyrene	3.0E-01	mg/kg	2.6E-08	mg/kg-day	--	--	--	1.9E-06	mg/kg-day	3.0E-02	mg/kg-day	6.2E-05
				Monobutyltin	2.7E-03	mg/kg	1.6E-10	mg/kg-day	--	--	--	1.1E-08	mg/kg-day	3.0E-04	mg/kg-day	3.7E-05
				Dibutyltin	1.6E-02	mg/kg	9.5E-10	mg/kg-day	--	--	--	6.7E-08	mg/kg-day	3.0E-04	mg/kg-day	2.2E-04
				Tributyltin	4.1E-02	mg/kg	2.4E-09	mg/kg-day	--	--	--	1.7E-07	mg/kg-day	3.0E-04	mg/kg-day	5.6E-04
				Total PCB Congeners	3.4E-01	mg/kg	3.0E-08	mg/kg-day	2.0E+00	(mg/kg-day)-1	6.0E-08	2.1E-06	mg/kg-day	2.0E-05	mg/kg-day	1.1E-01
				Total TEQ – PCB DLC	8.5E-06	mg/kg	1.5E-13	mg/kg-day	1.3E+05	(mg/kg-day)-1	2.0E-08	1.1E-11	mg/kg-day	7.0E-10	mg/kg-day	1.5E-02
			Exp. Route Total								2.6E-06					9.0E-01
		Exposure Point Total									5.9E-06					1.8E+00
	Exposure Medium Total										5.9E-06					1.8E+00
Medium Total											5.9E-06					1.8E+00
										Total of Receptor Risks across All Media	5.9E-06				Total of Receptor Hazards across All Media	1.8E+00

TABLE A-11A
Calculation of RME Chemical Cancer Risks and Noncancer Hazards - Construction Worker, Oil Reclamation Area
Appendix A - Updated Human Health Risk Assessment for Chemical Exposures

Scenario Timeframe:	Future
Receptor Population:	Construction Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Noncancer Hazard Quotient				
							Intake/Exposure Concentration		CSF / Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD / RfC		Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	

Acronyms/Abbreviations:

-- = not available or not applicable
CSF = cancer slope factor
DDD = dichlorodiphenyldichloroethane
DDE = dichlorodiphenyldichloroethylene
DDT = dichlorodiphenyltrichloroethane
EPC = exposure point concentration
Exp. = exposure
M = lifetime exposure from birth, mutagenic endpoint
(mg/kg-day)- 1/(milligram[s] per kilogram per day)
mg/kg = milligram(s) per kilogram
mg/kg-day = milligram(s) per kilogram per day
PCB = polychlorinated biphenyl
RfC = reference concentration
RfD = reference dose
RME = reasonable maximum exposure
TCDD = tetrachlorodibenzo-p-dioxin

TABLE A-11B
Summary of Receptor Risks and Hazards - Construction Worker, Oil Reclamation Area
Appendix A - Updated Human Health Risk Assessment for Chemical Exposures

Scenario Timeframe:	Future
Receptor Population:	Construction Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk Ingestion	Cancer Risk Inhalation	Cancer Risk Dermal	Cancer Risk Exposure Routes Total	Noncancer Hazard Quotient Ingestion	Noncancer Hazard Quotient Inhalation	Noncancer Hazard Quotient Dermal	Noncancer Hazard Quotient Exposure Routes Total
Sediment	Sediment	Sediment	Aluminum	--	--	--	--	2.0E-01	--	3.0E-02	2.3E-01
			Antimony	--	--	--	--	2.0E-02	--	1.9E-02	3.9E-02
			Arsenic	2.9E-06	--	2.1E-06	5.1E-06	7.2E-02	--	5.2E-02	1.2E-01
			Barium	--	--	--	--	6.2E-03	--	1.3E-02	1.9E-02
			Cadmium	2.3E-07	--	1.4E-07	3.7E-07	1.1E-03	--	6.4E-04	1.7E-03
			Chromium	--	--	--	--	8.1E-04	--	9.1E-03	9.9E-03
			Cobalt	--	--	--	--	2.0E-01	--	2.9E-02	2.2E-01
			Copper	--	--	--	--	6.0E-03	--	8.7E-04	6.8E-03
			Iron	--	--	--	--	1.9E-01	--	2.8E-02	2.2E-01
			Lead	--	--	--	--	--	--	--	--
			Manganese	--	--	--	--	1.2E-02	--	1.7E-03	1.3E-02
			Mercury	--	--	--	--	1.5E-02	--	2.1E-03	1.7E-02
			Molybdenum	--	--	--	--	9.2E-04	--	1.3E-04	1.1E-03
			Nickel	--	--	--	--	1.9E-02	--	7.0E-02	8.9E-02
			Selenium	--	--	--	--	2.1E-04	--	3.1E-05	2.4E-04
			Silver	--	--	--	--	2.4E-04	--	8.8E-04	1.1E-03
			Vanadium	--	--	--	--	9.2E-02	--	5.2E-01	6.1E-01
			Zinc	--	--	--	--	1.5E-03	--	2.2E-04	1.7E-03
			4,4'-DDD	2.6E-11	--	1.9E-11	4.5E-11	1.5E-05	--	1.1E-05	2.6E-05
			4,4'-DDE	1.8E-11	--	1.3E-11	3.1E-11	7.4E-06	--	5.4E-06	1.3E-05
			4,4'-DDT	9.0E-12	--	6.6E-12	1.6E-11	3.7E-06	--	2.7E-06	6.4E-06
			alpha-Chlordane	5.1E-12	--	3.7E-12	8.8E-12	2.0E-06	--	1.5E-06	3.5E-06
			Dieldrin	2.8E-10	--	4.2E-10	7.0E-10	2.5E-05	--	3.6E-05	6.1E-05
			gamma-Chlordane	5.4E-12	--	3.9E-12	9.3E-12	2.1E-06	--	1.6E-06	3.7E-06
			2-Methylnaphthalene	--	--	--	--	6.1E-06	--	1.3E-05	2.0E-05
			Acenaphthene	--	--	--	--	2.7E-07	--	5.9E-07	8.7E-07
			Acenaphthylene	--	--	--	--	4.3E-07	--	9.4E-07	1.4E-06
			Anthracene	--	--	--	--	4.0E-07	--	8.8E-07	1.3E-06
			Fluorene	--	--	--	--	6.3E-07	--	1.4E-06	2.0E-06
			Naphthalene	--	--	--	--	2.1E-06	--	4.7E-06	6.9E-06
			Phenanthrene	--	--	--	--	9.7E-07	--	2.1E-06	3.1E-06
			Benzo(a)anthracene	5.8E-09	--	1.3E-08	1.9E-08	--	--	--	--
			Benzo(a)pyrene	5.8E-08	--	1.3E-07	1.8E-07	--	--	--	--
			Benzo(b)fluoranthene	6.5E-09	--	1.4E-08	2.1E-08	--	--	--	--
			Benzo(g,h,i)perylene	--	--	--	--	1.7E-05	--	3.7E-05	5.4E-05
			Benzo(k)fluoranthene	6.8E-09	--	1.5E-08	2.2E-08	--	--	--	--
			Chrysene	9.4E-10	--	2.1E-09	3.0E-09	--	--	--	--
			Dibenz(a,h)anthracene	6.2E-09	--	1.4E-08	2.0E-08	--	--	--	--
			Fluoranthene	--	--	--	--	1.7E-05	--	3.7E-05	5.4E-05
			Indeno(1,2,3-cd)pyrene	7.9E-09	--	1.7E-08	2.5E-08	--	--	--	--
			Pyrene	--	--	--	--	2.8E-05	--	6.2E-05	9.0E-05
			Monobutyltin	--	--	--	--	2.5E-05	--	3.7E-05	6.2E-05
			Dibutyltin	--	--	--	--	1.5E-04	--	2.2E-04	3.7E-04
			Tributyltin	--	--	--	--	3.8E-04	--	5.6E-04	9.4E-04
			Total PCB Congeners	2.7E-08	--	6.0E-08	8.7E-08	4.8E-02	--	1.1E-01	1.5E-01
			Chemical Total	3.3E-06	--	2.5E-06	5.8E-06	8.8E-01	--	8.8E-01	1.8E+00
		Exposure Point Total					5.8E-06				1.8E+00
	Exposure Medium Total						5.8E-06				1.8E+00
Medium Total							5.8E-06				1.8E+00
Receptor Total						Total Risk across All Media	5.8E-06			Total Hazard across All Media	1.8E+00

Acronyms/Abbreviations:

-- =	not available or not applicable	DDT =	dichlorodiphenyltrichloroethane
DDD =	dichlorodiphenyldichloroethane	PCB =	polychlorinated biphenyl
DDE =	dichlorodiphenyldichloroethylene	TCDD =	tetrachlorodibenzo-p-dioxin

TABLE A-11C
Summary of Risk Drivers - Construction Worker, Oil Reclamation Area
Appendix A - Updated Human Health Risk Assessment for Chemical Exposures

Scenario Timeframe:	Future
Receptor Population:	Construction Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk: Ingestion	Cancer Risk: Inhalation	Cancer Risk: Dermal	Cancer Risk: Exposure Routes Total	Noncancer Hazard Quotient: Ingestion	Noncancer Hazard Quotient: Inhalation	Noncancer Hazard Quotient: Dermal	Noncancer Hazard Quotient: Exposure Routes Total
Sediment	Sediment	Sediment	Arsenic	2.9E-06	--	2.1E-06	5.1E-06	7.2E-02	--	5.2E-02	1.2E-01
			Chemical Total	--	--	--	5.1E-06	--	--	--	1.2E-01
		Exposure Point Total					5.1E-06				1.2E-01
	Exposure Medium Total						5.1E-06				1.2E-01
Medium Total							5.1E-06				1.2E-01
Receptor Total						Total Risk across All Media	5.1E-06			Total Hazard across All Media	1.2E-01

Acronyms/Abbreviations:

-- = not available or not applicable

TABLE A-12A

Calculation of RME Chemical Cancer Risks and Noncancer Hazards - Adult and Child Recreational User, Point Avisadero Area

Appendix A - Updated Human Health Risk Assessment for Chemical Exposures

Scenario Timeframe:	Future
Receptor Population:	Recreational User
Receptor Age:	Adult and Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC Value	EPC Units	Cancer Risk Calculations: Intake/Exposure Concentration Value	Intake/Exposure Concentration Units	CSF / Unit Risk Value	CSF / Unit Risk Units	Cancer Risk	Noncancer Hazard Quotient: Intake/Exposure Concentration Value	Intake/Exposure Concentration Units	RfD / RfC Value	RfD / RfC Units	Hazard Quotient
Sediment	Sediment	Sediment	Ingestion	Aluminum	6.8E+04	mg/kg	7.3E-03	mg/kg-day	--	--	--	6.5E-02	mg/kg-day	1.0E+00	mg/kg-day	6.5E-02
				Antimony	5.4E+00	mg/kg	5.8E-07	mg/kg-day	--	--	--	5.2E-06	mg/kg-day	4.0E-04	mg/kg-day	1.3E-02
				Arsenic	1.2E+01	mg/kg	8.0E-07	mg/kg-day	9.5E+00	(mg/kg-day)-1	7.6E-06	7.1E-06	mg/kg-day	3.0E-04	mg/kg-day	2.4E-02
				Barium	4.8E+02	mg/kg	5.1E-05	mg/kg-day	--	--	--	4.5E-04	mg/kg-day	2.0E-01	mg/kg-day	2.3E-03
				Cadmium	3.2E-01	mg/kg	3.5E-08	mg/kg-day	1.5E+01	(mg/kg-day)-1	5.2E-07	3.1E-07	mg/kg-day	1.0E-03	mg/kg-day	3.1E-04
				Chromium	2.6E+02	mg/kg	2.7E-05	mg/kg-day	--	--	--	2.4E-04	mg/kg-day	1.5E+00	mg/kg-day	1.6E-04
				Cobalt	1.8E+01	mg/kg	1.9E-06	mg/kg-day	--	--	--	1.7E-05	mg/kg-day	3.0E-04	mg/kg-day	5.7E-02
				Copper	4.2E+02	mg/kg	4.5E-05	mg/kg-day	--	--	--	4.0E-04	mg/kg-day	4.0E-02	mg/kg-day	1.0E-02
				Iron	4.2E+04	mg/kg	4.5E-03	mg/kg-day	--	--	--	4.0E-02	mg/kg-day	7.0E-01	mg/kg-day	5.7E-02
				Lead	1.0E+02	mg/kg	1.1E-05	mg/kg-day	--	--	--	9.8E-05	mg/kg-day	--	--	--
				Manganese	5.2E+02	mg/kg	5.5E-05	mg/kg-day	--	--	--	4.9E-04	mg/kg-day	1.4E-01	mg/kg-day	3.5E-03
				Mercury	2.5E+00	mg/kg	2.7E-07	mg/kg-day	--	--	--	2.4E-06	mg/kg-day	1.0E-04	mg/kg-day	2.4E-02
				Molybdenum	1.0E+00	mg/kg	1.1E-07	mg/kg-day	--	--	--	9.8E-07	mg/kg-day	5.0E-03	mg/kg-day	2.0E-04
				Nickel	1.3E+02	mg/kg	1.4E-05	mg/kg-day	--	--	--	1.2E-04	mg/kg-day	2.0E-02	mg/kg-day	6.2E-03
				Selenium	4.3E-01	mg/kg	4.6E-08	mg/kg-day	--	--	--	4.1E-07	mg/kg-day	5.0E-03	mg/kg-day	8.1E-05
				Silver	3.0E-01	mg/kg	3.2E-08	mg/kg-day	--	--	--	2.8E-07	mg/kg-day	5.0E-03	mg/kg-day	5.6E-05
				Vanadium	1.4E+02	mg/kg	1.5E-05	mg/kg-day	--	--	--	1.3E-04	mg/kg-day	5.0E-03	mg/kg-day	2.6E-02
				Zinc	1.5E+02	mg/kg	1.6E-05	mg/kg-day	--	--	--	1.4E-04	mg/kg-day	3.0E-01	mg/kg-day	4.7E-04
				2,4'-DDD	8.4E-04	mg/kg	9.0E-11	mg/kg-day	2.4E-01	(mg/kg-day)-1	2.2E-11	8.0E-10	mg/kg-day	5.0E-04	mg/kg-day	1.6E-06
				4,4'-DDD	1.3E-03	mg/kg	1.4E-10	mg/kg-day	2.4E-01	(mg/kg-day)-1	3.3E-11	1.2E-09	mg/kg-day	5.0E-04	mg/kg-day	2.4E-06
				4,4'-DDE	1.2E-03	mg/kg	1.3E-10	mg/kg-day	3.4E-01	(mg/kg-day)-1	4.4E-11	1.1E-09	mg/kg-day	5.0E-04	mg/kg-day	2.3E-06
				4,4'-DDT	3.6E-04	mg/kg	3.8E-11	mg/kg-day	3.4E-01	(mg/kg-day)-1	1.3E-11	3.4E-10	mg/kg-day	5.0E-04	mg/kg-day	6.7E-07
				alpha-Chlordane	1.5E-04	mg/kg	1.6E-11	mg/kg-day	3.5E-01	(mg/kg-day)-1	5.6E-12	1.4E-10	mg/kg-day	5.0E-04	mg/kg-day	2.8E-07
				2-Methylnaphthalene	1.2E-02	mg/kg	1.3E-09	mg/kg-day	--	--	--	1.1E-08	mg/kg-day	4.0E-03	mg/kg-day	2.9E-06
				Acenaphthene	4.5E-02	mg/kg	4.8E-09	mg/kg-day	--	--	--	4.3E-08	mg/kg-day	6.0E-02	mg/kg-day	7.2E-07
				Acenaphthylene	3.1E-02	mg/kg	3.3E-09	mg/kg-day	--	--	--	3.0E-08	mg/kg-day	6.0E-02	mg/kg-day	4.9E-07
				Anthracene	1.8E-01	mg/kg	1.9E-08	mg/kg-day	--	--	--	1.7E-07	mg/kg-day	3.0E-01	mg/kg-day	5.7E-07
				Fluorene	4.0E-02	mg/kg	4.3E-09	mg/kg-day	--	--	--	3.8E-08	mg/kg-day	4.0E-02	mg/kg-day	9.5E-07
				Naphthalene	2.5E-02	mg/kg	2.7E-09	mg/kg-day	--	--	--	2.4E-08	mg/kg-day	2.0E-02	mg/kg-day	1.2E-06
				Phenanthrene	4.1E-01	mg/kg	4.4E-08	mg/kg-day	--	--	--	3.9E-07	mg/kg-day	3.0E-01	mg/kg-day	1.3E-06
				Benzo(a)anthracene M	3.6E-01	mg/kg	1.8E-07	mg/kg-day	1.2E+00	(mg/kg-day)-1	2.1E-07	3.5E-07	mg/kg-day	--	--	--
				Benzo(a)pyrene M	4.8E-01	mg/kg	2.3E-07	mg/kg-day	7.3E+00	(mg/kg-day)-1	1.7E-06	4.6E-07	mg/kg-day	--	--	--
				Benzo(b)fluoranthene M	3.3E-01	mg/kg	1.6E-07	mg/kg-day	1.2E+00	(mg/kg-day)-1	1.9E-07	3.1E-07	mg/kg-day	--	--	--
				Benzo(g,h,i)perylene	3.6E-01	mg/kg	3.8E-08	mg/kg-day	--	--	--	3.4E-07	mg/kg-day	3.0E-02	mg/kg-day	1.1E-05
				Benzo(k)fluoranthene M	3.3E-01	mg/kg	1.6E-07	mg/kg-day	1.2E+00	(mg/kg-day)-1	1.9E-07	3.1E-07	mg/kg-day	--	--	--
				Chrysene M	4.2E-01	mg/kg	2.1E-07	mg/kg-day	1.2E-01	(mg/kg-day)-1	2.5E-08	4.0E-07	mg/kg-day	--	--	--
				Dibenz(a,h)anthracene M	5.7E-02	mg/kg	2.8E-08	mg/kg-day	7.3E+00	(mg/kg-day)-1	2.0E-07	5.4E-08	mg/kg-day	--	--	--
				Fluoranthene	7.5E-01	mg/kg	8.0E-08	mg/kg-day	--	--	--	7.1E-07	mg/kg-day	4.0E-02	mg/kg-day	1.8E-05
				Indeno(1,2,3-cd)pyrene M	3.5E-01	mg/kg	1.7E-07	mg/kg-day	1.2E+00	(mg/kg-day)-1	2.0E-07	3.3E-07	mg/kg-day	--	--	--
				Pyrene	8.9E-01	mg/kg	9.5E-08	mg/kg-day	--	--	--	8.5E-07	mg/kg-day	3.0E-02	mg/kg-day	2.8E-05
				Dibutyltin	2.4E-02	mg/kg	2.6E-09	mg/kg-day	--	--	--	2.3E-08	mg/kg-day	3.0E-04	mg/kg-day	7.6E-05
				Tributyltin	8.2E-02	mg/kg	8.8E-09	mg/kg-day	--	--	--	7.8E-08	mg/kg-day	3.0E-04	mg/kg-day	2.6E-04
				Total PCB Congeners	1.7E+00	mg/kg	1.8E-07	mg/kg-day	2.0E+00	(mg/kg-day)-1	3.6E-07	1.6E-06	mg/kg-day	2.0E-05	mg/kg-day	8.1E-02
				Total TEQ – PCB DLC	7.4E-06	mg/kg	7.9E-13	mg/kg-day	1.3E+05	(mg/kg-day)-1	1.0E-07	7.1E-12	mg/kg-day	7.0E-10	mg/kg-day	1.0E-02
			Exp. Route Total								1.1E-05					3.8E-01

TABLE A-12A
Calculation of RME Chemical Cancer Risks and Noncancer Hazards - Adult and Child Recreational User, Point Avisadero Area
Appendix A - Updated Human Health Risk Assessment for Chemical Exposures

Scenario Timeframe:	Future
Receptor Population:	Recreational User
Receptor Age:	Adult and Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC Value	EPC Units	Cancer Risk Calculations: Intake/Exposure Concentration Value	Intake/Exposure Concentration Units	CSF / Unit Risk Value	CSF / Unit Risk Units	Cancer Risk	Noncancer Hazard Quotient: Intake/Exposure Concentration Value	Intake/Exposure Concentration Units	RfD / RfC Value	RfD / RfC Units	Hazard Quotient
Sediment	Sediment	Sediment	Dermal	Aluminum	6.8E+04	mg/kg	2.4E-04	mg/kg-day	--	--	--	1.9E-03	mg/kg-day	1.0E+00	mg/kg-day	1.9E-03
				Antimony	5.4E+00	mg/kg	1.9E-08	mg/kg-day	--	--	--	1.5E-07	mg/kg-day	6.0E-05	mg/kg-day	2.5E-03
				Arsenic	1.2E+01	mg/kg	1.3E-07	mg/kg-day	9.5E+00	(mg/kg-day)-1	1.2E-06	1.0E-06	mg/kg-day	3.0E-04	mg/kg-day	3.4E-03
				Barium	4.8E+02	mg/kg	1.6E-06	mg/kg-day	--	--	--	1.3E-05	mg/kg-day	1.4E-02	mg/kg-day	9.4E-04
				Cadmium	3.2E-01	mg/kg	1.1E-10	mg/kg-day	6.0E+02	(mg/kg-day)-1	6.7E-08	8.9E-10	mg/kg-day	2.5E-05	mg/kg-day	3.6E-05
				Chromium	2.6E+02	mg/kg	8.8E-07	mg/kg-day	--	--	--	7.1E-06	mg/kg-day	2.0E-02	mg/kg-day	3.6E-04
				Cobalt	1.8E+01	mg/kg	6.2E-08	mg/kg-day	--	--	--	5.0E-07	mg/kg-day	3.0E-04	mg/kg-day	1.7E-03
				Copper	4.2E+02	mg/kg	1.5E-06	mg/kg-day	--	--	--	1.2E-05	mg/kg-day	4.0E-02	mg/kg-day	2.9E-04
				Iron	4.2E+04	mg/kg	1.4E-04	mg/kg-day	--	--	--	1.2E-03	mg/kg-day	7.0E-01	mg/kg-day	1.6E-03
				Lead	1.0E+02	mg/kg	3.6E-07	mg/kg-day	--	--	--	2.9E-06	mg/kg-day	--	--	--
				Manganese	5.2E+02	mg/kg	1.8E-06	mg/kg-day	--	--	--	1.4E-05	mg/kg-day	1.4E-01	mg/kg-day	1.0E-04
				Mercury	2.5E+00	mg/kg	8.7E-09	mg/kg-day	--	--	--	7.0E-08	mg/kg-day	1.0E-04	mg/kg-day	7.0E-04
				Molybdenum	1.0E+00	mg/kg	3.5E-09	mg/kg-day	--	--	--	2.8E-08	mg/kg-day	5.0E-03	mg/kg-day	5.7E-06
				Nickel	1.3E+02	mg/kg	4.5E-07	mg/kg-day	--	--	--	3.6E-06	mg/kg-day	8.0E-04	mg/kg-day	4.5E-03
				Selenium	4.3E-01	mg/kg	1.5E-09	mg/kg-day	--	--	--	1.2E-08	mg/kg-day	5.0E-03	mg/kg-day	2.4E-06
				Silver	3.0E-01	mg/kg	1.0E-09	mg/kg-day	--	--	--	8.1E-09	mg/kg-day	2.0E-04	mg/kg-day	4.1E-05
				Vanadium	1.4E+02	mg/kg	4.7E-07	mg/kg-day	--	--	--	3.8E-06	mg/kg-day	1.3E-04	mg/kg-day	2.9E-02
				Zinc	1.5E+02	mg/kg	5.1E-07	mg/kg-day	--	--	--	4.1E-06	mg/kg-day	3.0E-01	mg/kg-day	1.4E-05
				2,4'-DDD	8.4E-04	mg/kg	1.4E-11	mg/kg-day	2.4E-01	(mg/kg-day)-1	3.5E-12	1.2E-10	mg/kg-day	5.0E-04	mg/kg-day	2.3E-07
				4,4'-DDD	1.3E-03	mg/kg	2.2E-11	mg/kg-day	2.4E-01	(mg/kg-day)-1	5.2E-12	1.7E-10	mg/kg-day	5.0E-04	mg/kg-day	3.5E-07
				4,4'-DDE	1.2E-03	mg/kg	2.1E-11	mg/kg-day	3.4E-01	(mg/kg-day)-1	7.0E-12	1.7E-10	mg/kg-day	5.0E-04	mg/kg-day	3.3E-07
				4,4'-DDT	3.6E-04	mg/kg	6.1E-12	mg/kg-day	3.4E-01	(mg/kg-day)-1	2.1E-12	4.9E-11	mg/kg-day	5.0E-04	mg/kg-day	9.8E-08
				alpha-Chlordane	1.5E-04	mg/kg	2.6E-12	mg/kg-day	3.5E-01	(mg/kg-day)-1	9.0E-13	2.1E-11	mg/kg-day	5.0E-04	mg/kg-day	4.1E-08
				2-Methylnaphthalene	1.2E-02	mg/kg	6.2E-10	mg/kg-day	--	--	--	5.0E-09	mg/kg-day	4.0E-03	mg/kg-day	1.2E-06
				Acenaphthene	4.5E-02	mg/kg	2.3E-09	mg/kg-day	--	--	--	1.9E-08	mg/kg-day	6.0E-02	mg/kg-day	3.1E-07
				Acenaphthylene	3.1E-02	mg/kg	1.6E-09	mg/kg-day	--	--	--	1.3E-08	mg/kg-day	6.0E-02	mg/kg-day	2.1E-07
				Anthracene	1.8E-01	mg/kg	9.2E-09	mg/kg-day	--	--	--	7.4E-08	mg/kg-day	3.0E-01	mg/kg-day	2.5E-07
				Fluorene	4.0E-02	mg/kg	2.1E-09	mg/kg-day	--	--	--	1.6E-08	mg/kg-day	4.0E-02	mg/kg-day	4.1E-07
				Naphthalene	2.5E-02	mg/kg	1.3E-09	mg/kg-day	--	--	--	1.0E-08	mg/kg-day	2.0E-02	mg/kg-day	5.2E-07
				Phenanthrene	4.1E-01	mg/kg	2.1E-08	mg/kg-day	--	--	--	1.7E-07	mg/kg-day	3.0E-01	mg/kg-day	5.7E-07
				Benzo(a)anthracene M	3.6E-01	mg/kg	8.0E-08	mg/kg-day	1.2E+00	(mg/kg-day)-1	9.7E-08	1.5E-07	mg/kg-day	--	--	--
				Benzo(a)pyrene M	4.8E-01	mg/kg	1.1E-07	mg/kg-day	7.3E+00	(mg/kg-day)-1	7.8E-07	2.0E-07	mg/kg-day	--	--	--
				Benzo(b)fluoranthene M	3.3E-01	mg/kg	7.2E-08	mg/kg-day	1.2E+00	(mg/kg-day)-1	8.6E-08	1.3E-07	mg/kg-day	--	--	--
				Benzo(g,h,i)perylene	3.6E-01	mg/kg	1.8E-08	mg/kg-day	--	--	--	1.5E-07	mg/kg-day	3.0E-02	mg/kg-day	4.9E-06
				Benzo(k)fluoranthene M	3.3E-01	mg/kg	7.3E-08	mg/kg-day	1.2E+00	(mg/kg-day)-1	8.7E-08	1.4E-07	mg/kg-day	--	--	--
				Chrysene M	4.2E-01	mg/kg	9.4E-08	mg/kg-day	1.2E-01	(mg/kg-day)-1	1.1E-08	1.8E-07	mg/kg-day	--	--	--
				Dibenz(a,h)anthracene M	5.7E-02	mg/kg	1.3E-08	mg/kg-day	7.3E+00	(mg/kg-day)-1	9.2E-08	2.4E-08	mg/kg-day	--	--	--
				Fluoranthene	7.5E-01	mg/kg	3.9E-08	mg/kg-day	--	--	--	3.1E-07	mg/kg-day	4.0E-02	mg/kg-day	7.7E-06
				Indeno(1,2,3-cd)pyrene M	3.5E-01	mg/kg	7.8E-08	mg/kg-day	1.2E+00	(mg/kg-day)-1	9.3E-08	1.5E-07	mg/kg-day	--	--	--
				Pyrene	8.9E-01	mg/kg	4.6E-08	mg/kg-day	--	--	--	3.7E-07	mg/kg-day	3.0E-02	mg/kg-day	1.2E-05
				Dibutyltin	2.4E-02	mg/kg	8.2E-10	mg/kg-day	--	--	--	6.6E-09	mg/kg-day	3.0E-04	mg/kg-day	2.2E-05
				Tributyltin	8.2E-02	mg/kg	2.8E-09	mg/kg-day	--	--	--	2.3E-08	mg/kg-day	3.0E-04	mg/kg-day	7.6E-05
				Total PCB Congeners	1.7E+00	mg/kg	8.7E-08	mg/kg-day	2.0E+00	(mg/kg-day)-1	1.7E-07	7.0E-07	mg/kg-day	2.0E-05	mg/kg-day	3.5E-02
				Total TEQ – PCB DLC	7.4E-06	mg/kg	7.7E-14	mg/kg-day	1.3E+05	(mg/kg-day)-1	1.0E-08	6.1E-13	mg/kg-day	7.0E-10	mg/kg-day	8.8E-04
			Exp. Route Total								2.7E-06					8.3E-02
		Exposure Point Total									1.4E-05					4.6E-01
	Exposure Medium Total										1.4E-05					4.6E-01
Medium Total											1.4E-05					4.6E-01

TABLE A-12A

Calculation of RME Chemical Cancer Risks and Noncancer Hazards - Adult and Child Recreational User, Point Avisadero Area

Appendix A - Updated Human Health Risk Assessment for Chemical Exposures

Scenario Timeframe:	Future
Receptor Population:	Recreational User
Receptor Age:	Adult and Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC Value	EPC Units	Cancer Risk Calculations: Intake/Exposure Concentration Value	Intake/Exposure Concentration Units	CSF / Unit Risk Value	CSF / Unit Risk Units	Cancer Risk	Noncancer Hazard Quotient: Intake/Exposure Concentration Value	Intake/Exposure Concentration Units	RfD / RfC Value	RfD / RfC Units	Hazard Quotient
Macoma[a]	Macoma	Macoma	Ingestion	Aluminum	3.2E+02	mg/kg	2.4E-03	mg/kg-day	--	--	--	8.4E-03	mg/kg-day	1.0E+00	mg/kg-day	8.4E-03
				Antimony	2.6E-02	mg/kg	2.0E-07	mg/kg-day	--	--	--	6.9E-07	mg/kg-day	4.0E-04	mg/kg-day	1.7E-03
				Arsenic	3.5E+00	mg/kg	2.7E-05	mg/kg-day	9.5E+00	(mg/kg-day)-1	2.6E-04	9.4E-05	mg/kg-day	3.0E-04	mg/kg-day	3.1E-01
				Barium	3.3E+00	mg/kg	2.5E-05	mg/kg-day	--	--	--	8.8E-05	mg/kg-day	2.0E-01	mg/kg-day	4.4E-04
				Cadmium	5.0E-02	mg/kg	3.8E-07	mg/kg-day	1.5E+01	(mg/kg-day)-1	5.7E-06	1.3E-06	mg/kg-day	1.0E-03	mg/kg-day	1.3E-03
				Chromium	3.3E+00	mg/kg	2.5E-05	mg/kg-day	--	--	--	8.8E-05	mg/kg-day	1.5E+00	mg/kg-day	5.8E-05
				Cobalt	4.2E-01	mg/kg	3.2E-06	mg/kg-day	--	--	--	1.1E-05	mg/kg-day	3.0E-04	mg/kg-day	3.8E-02
				Copper	1.5E+01	mg/kg	1.1E-04	mg/kg-day	--	--	--	4.0E-04	mg/kg-day	4.0E-02	mg/kg-day	1.0E-02
				Iron	4.8E+02	mg/kg	3.7E-03	mg/kg-day	--	--	--	1.3E-02	mg/kg-day	7.0E-01	mg/kg-day	1.8E-02
				Lead	5.5E-01	mg/kg	4.2E-06	mg/kg-day	--	--	--	1.5E-05	mg/kg-day	--	--	--
				Manganese	7.5E+00	mg/kg	5.7E-05	mg/kg-day	--	--	--	2.0E-04	mg/kg-day	1.4E-01	mg/kg-day	1.4E-03
				Mercury	3.5E-01	mg/kg	2.6E-06	mg/kg-day	--	--	--	9.3E-06	mg/kg-day	1.0E-04	mg/kg-day	9.3E-02
				Molybdenum	4.6E-01	mg/kg	3.5E-06	mg/kg-day	--	--	--	1.2E-05	mg/kg-day	5.0E-03	mg/kg-day	2.4E-03
				Nickel	1.5E+00	mg/kg	1.2E-05	mg/kg-day	--	--	--	4.1E-05	mg/kg-day	2.0E-02	mg/kg-day	2.0E-03
				Selenium	7.1E-01	mg/kg	5.4E-06	mg/kg-day	--	--	--	1.9E-05	mg/kg-day	5.0E-03	mg/kg-day	3.8E-03
				Silver	2.6E-02	mg/kg	2.0E-07	mg/kg-day	--	--	--	6.9E-07	mg/kg-day	5.0E-03	mg/kg-day	1.4E-04
				Vanadium	1.5E+00	mg/kg	1.2E-05	mg/kg-day	--	--	--	4.1E-05	mg/kg-day	5.0E-03	mg/kg-day	8.2E-03
				Zinc	1.8E+01	mg/kg	1.4E-04	mg/kg-day	--	--	--	4.8E-04	mg/kg-day	3.0E-01	mg/kg-day	1.6E-03
				4,4'-DDD	5.4E-04	mg/kg	4.1E-09	mg/kg-day	2.4E-01	(mg/kg-day)-1	9.8E-10	1.4E-08	mg/kg-day	5.0E-04	mg/kg-day	2.9E-05
				4,4'-DDE	1.1E-03	mg/kg	8.1E-09	mg/kg-day	3.4E-01	(mg/kg-day)-1	2.7E-09	2.8E-08	mg/kg-day	5.0E-04	mg/kg-day	5.6E-05
				4,4'-DDT	2.6E-04	mg/kg	2.0E-09	mg/kg-day	3.4E-01	(mg/kg-day)-1	6.7E-10	6.9E-09	mg/kg-day	5.0E-04	mg/kg-day	1.4E-05
				alpha-Chlordane	1.2E-04	mg/kg	9.4E-10	mg/kg-day	3.5E-01	(mg/kg-day)-1	3.3E-10	3.3E-09	mg/kg-day	5.0E-04	mg/kg-day	6.6E-06
				Dieldrin	1.6E-04	mg/kg	1.2E-09	mg/kg-day	1.6E+01	(mg/kg-day)-1	1.9E-08	4.2E-09	mg/kg-day	5.0E-05	mg/kg-day	8.5E-05
				gamma-Chlordane	1.3E-04	mg/kg	1.0E-09	mg/kg-day	3.5E-01	(mg/kg-day)-1	3.5E-10	3.5E-09	mg/kg-day	5.0E-04	mg/kg-day	7.0E-06
				Acenaphthene	3.0E-04	mg/kg	2.3E-09	mg/kg-day	--	--	--	8.0E-09	mg/kg-day	6.0E-02	mg/kg-day	1.3E-07
				Acenaphthylene	5.2E-04	mg/kg	4.0E-09	mg/kg-day	--	--	--	1.4E-08	mg/kg-day	6.0E-02	mg/kg-day	2.3E-07
				Anthracene	3.2E-03	mg/kg	2.4E-08	mg/kg-day	--	--	--	8.5E-08	mg/kg-day	3.0E-01	mg/kg-day	2.8E-07
				Fluorene	4.5E-04	mg/kg	3.4E-09	mg/kg-day	--	--	--	1.2E-08	mg/kg-day	4.0E-02	mg/kg-day	3.0E-07
				Phenanthrene	3.3E-03	mg/kg	2.5E-08	mg/kg-day	--	--	--	8.8E-08	mg/kg-day	3.0E-01	mg/kg-day	2.9E-07
				Benzo(a)anthracene	6.1E-03	mg/kg	4.6E-08	mg/kg-day	1.2E+00	(mg/kg-day)-1	5.6E-08	1.6E-07	mg/kg-day	--	--	--
				Benzo(a)pyrene	5.4E-03	mg/kg	4.1E-08	mg/kg-day	7.3E+00	(mg/kg-day)-1	3.0E-07	1.4E-07	mg/kg-day	--	--	--
				Benzo(b)fluoranthene	5.3E-03	mg/kg	4.0E-08	mg/kg-day	1.2E+00	(mg/kg-day)-1	4.8E-08	1.4E-07	mg/kg-day	--	--	--
				Benzo(g,h,i)perylene	3.1E-03	mg/kg	2.4E-08	mg/kg-day	--	--	--	8.4E-08	mg/kg-day	3.0E-02	mg/kg-day	2.8E-06
				Benzo(k)fluoranthene	6.3E-03	mg/kg	4.8E-08	mg/kg-day	1.2E+00	(mg/kg-day)-1	5.7E-08	1.7E-07	mg/kg-day	--	--	--
				Chrysene	7.8E-03	mg/kg	6.0E-08	mg/kg-day	1.2E-01	(mg/kg-day)-1	7.2E-09	2.1E-07	mg/kg-day	--	--	--
				Dibenz(a,h)anthracene	2.1E-04	mg/kg	1.6E-09	mg/kg-day	7.3E+00	(mg/kg-day)-1	1.2E-08	5.7E-09	mg/kg-day	--	--	--
				Fluoranthene	2.0E-02	mg/kg	1.5E-07	mg/kg-day	--	--	--	5.4E-07	mg/kg-day	4.0E-02	mg/kg-day	1.3E-05
				Indeno(1,2,3-cd)pyrene	2.1E-03	mg/kg	1.6E-08	mg/kg-day	1.2E+00	(mg/kg-day)-1	1.9E-08	5.5E-08	mg/kg-day	--	--	--
				Pyrene	2.5E-02	mg/kg	1.9E-07	mg/kg-day	--	--	--	6.6E-07	mg/kg-day	3.0E-02	mg/kg-day	2.2E-05
				Monobutyltin	1.6E-03	mg/kg	1.2E-08	mg/kg-day	--	--	--	4.3E-08	mg/kg-day	3.0E-04	mg/kg-day	1.4E-04
				Dibutyltin	8.2E-03	mg/kg	6.2E-08	mg/kg-day	--	--	--	2.2E-07	mg/kg-day	3.0E-04	mg/kg-day	7.3E-04
				Tributyltin	8.1E-02	mg/kg	6.1E-07	mg/kg-day	--	--	--	2.1E-06	mg/kg-day	3.0E-04	mg/kg-day	7.2E-03
				Total PCB Congeners	2.8E-02	mg/kg	2.1E-07	mg/kg-day	2.0E+00	(mg/kg-day)-1	4.3E-07	7.5E-07	mg/kg-day	2.0E-05	mg/kg-day	3.7E-02
				Total TEQ – PCB DLC	8.2E-06	mg/kg	6.2E-11	mg/kg-day	1.3E+05	(mg/kg-day)-1	8.1E-06	2.2E-10	mg/kg-day	7.0E-10	mg/kg-day	3.1E-01
			Exp. Route Total								2.7E-04					8.6E-01
		Exposure Point Total									2.7E-04					8.6E-01
	Exposure Medium Total										2.7E-04					8.6E-01
Medium Total											2.7E-04					8.6E-01
										Total of Receptor Risks across All Media	2.8E-04				Total of Receptor Hazards across All Media	1.3E+00

TABLE A-12A

Calculation of RME Chemical Cancer Risks and Noncancer Hazards - Adult and Child Recreational User, Point Avisadero Area

Appendix A - Updated Human Health Risk Assessment for Chemical Exposures

Scenario Timeframe:	Future
Receptor Population:	Recreational User
Receptor Age:	Adult and Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Noncancer Hazard Quotient				
							Intake/Exposure Concentration		CSF / Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD / RfC		Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	

Notes:

[a] Macoma ingestion risks are evaluated for the adult receptor only.

Acronyms/Abbreviations:

-- =	not available or not applicable
CSF =	cancer slope factor
DDD =	dichlorodiphenyldichloroethane
DDE =	dichlorodiphenyldichloroethylene
DDT =	dichlorodiphenyltrichloroethane
EPC =	exposure point concentration
Exp. =	exposure
M =	lifetime exposure from birth, mutagenic endpoint
(mg/kg-day)-1 =	1/(milligram[s] per kilogram per day)
mg/kg =	milligram(s) per kilogram
mg/kg-day =	milligram(s) per kilogram per day
PCB =	polychlorinated biphenyl
RfC =	reference concentration
RfD =	reference dose
RME =	reasonable maximum exposure
TCDD =	tetrachlorodibenzo-p-dioxin

TABLE A-12B
Summary of Receptor Risks and Hazards - Adult and Child Recreational User, Point Avisadero Area
Appendix A - Updated Human Health Risk Assessment for Chemical Exposures

Scenario Timeframe:	Future
Receptor Population:	Recreational User
Receptor Age:	Adult and Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient			
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total
Sediment	Sediment	Sediment	Aluminum	--	--	--	--	6.5E-02	--	1.9E-03	6.7E-02
			Antimony	--	--	--	--	1.3E-02	--	2.5E-03	1.5E-02
			Arsenic	7.6E-06	--	1.2E-06	8.8E-06	2.4E-02	--	3.4E-03	2.7E-02
			Barium	--	--	--	--	2.3E-03	--	9.4E-04	3.2E-03
			Cadmium	5.2E-07	--	6.7E-08	5.8E-07	3.1E-04	--	3.6E-05	3.4E-04
			Chromium	--	--	--	--	1.6E-04	--	3.6E-04	5.2E-04
			Cobalt	--	--	--	--	5.7E-02	--	1.7E-03	5.9E-02
			Copper	--	--	--	--	1.0E-02	--	2.9E-04	1.0E-02
			Iron	--	--	--	--	5.7E-02	--	1.6E-03	5.9E-02
			Lead	--	--	--	--	--	--	--	--
			Manganese	--	--	--	--	3.5E-03	--	1.0E-04	3.6E-03
			Mercury	--	--	--	--	2.4E-02	--	7.0E-04	2.5E-02
			Molybdenum	--	--	--	--	2.0E-04	--	5.7E-06	2.0E-04
			Nickel	--	--	--	--	6.2E-03	--	4.5E-03	1.1E-02
			Selenium	--	--	--	--	8.1E-05	--	2.4E-06	8.4E-05
			Silver	--	--	--	--	5.6E-05	--	4.1E-05	9.7E-05
			Vanadium	--	--	--	--	2.6E-02	--	2.9E-02	5.5E-02
			Zinc	--	--	--	--	4.7E-04	--	1.4E-05	4.8E-04
			2,4'-DDD	2.2E-11	--	3.5E-12	2.5E-11	1.6E-06	--	2.3E-07	1.8E-06
			4,4'-DDD	3.3E-11	--	5.2E-12	3.8E-11	2.4E-06	--	3.5E-07	2.8E-06
			4,4'-DDE	4.4E-11	--	7.0E-12	5.1E-11	2.3E-06	--	3.3E-07	2.6E-06
			4,4'-DDT	1.3E-11	--	2.1E-12	1.5E-11	6.7E-07	--	9.8E-08	7.7E-07
			alpha-Chlordane	5.6E-12	--	9.0E-13	6.5E-12	2.8E-07	--	4.1E-08	3.3E-07
			2-Methylnaphthalene	--	--	--	--	2.9E-06	--	1.2E-06	4.1E-06
			Acenaphthene	--	--	--	--	7.2E-07	--	3.1E-07	1.0E-06
			Acenaphthylene	--	--	--	--	4.9E-07	--	2.1E-07	7.1E-07
			Anthracene	--	--	--	--	5.7E-07	--	2.5E-07	8.1E-07
			Fluorene	--	--	--	--	9.5E-07	--	4.1E-07	1.4E-06
			Naphthalene	--	--	--	--	1.2E-06	--	5.2E-07	1.7E-06
			Phenanthrene	--	--	--	--	1.3E-06	--	5.7E-07	1.9E-06
			Benzo(a)anthracene	2.1E-07	--	9.7E-08	3.1E-07	--	--	--	--
			Benzo(a)pyrene	1.7E-06	--	7.8E-07	2.5E-06	--	--	--	--
			Benzo(b)fluoranthene	1.9E-07	--	8.6E-08	2.8E-07	--	--	--	--
			Benzo(g,h,i)perylene	--	--	--	--	1.1E-05	--	4.9E-06	1.6E-05
			Benzo(k)fluoranthene	1.9E-07	--	8.7E-08	2.8E-07	--	--	--	--
			Chrysene	2.5E-08	--	1.1E-08	3.6E-08	--	--	--	--
			Dibenz(a,h)anthracene	2.0E-07	--	9.2E-08	2.9E-07	--	--	--	--
			Fluoranthene	--	--	--	--	1.8E-05	--	7.7E-06	2.6E-05
			Indeno(1,2,3-cd)pyrene	2.0E-07	--	9.3E-08	3.0E-07	--	--	--	--
			Pyrene	--	--	--	--	2.8E-05	--	1.2E-05	4.0E-05
			Dibutyltin	--	--	--	--	7.6E-05	--	2.2E-05	9.8E-05
			Tributyltin	--	--	--	--	2.6E-04	--	7.6E-05	3.4E-04
			Total PCB Congeners	3.6E-07	--	1.7E-07	5.4E-07	8.1E-02	--	3.5E-02	1.2E-01
			Total TEQ – PCB DLC	1.0E-07	--	1.0E-08	1.1E-07	1.0E-02	--	8.8E-04	1.1E-02
			Chemical Total	1.1E-05	--	2.7E-06	1.4E-05	3.8E-01	--	8.3E-02	4.6E-01
		Exposure Point Total					1.4E-05				4.6E-01
	Exposure Medium Total						1.4E-05				4.6E-01
Medium Total							1.4E-05				4.6E-01

TABLE A-12B
Summary of Receptor Risks and Hazards - Adult and Child Recreational User, Point Avisadero Area
Appendix A - Updated Human Health Risk Assessment for Chemical Exposures

Scenario Timeframe:	Future
Receptor Population:	Recreational User
Receptor Age:	Adult and Child

				Cancer Risk				Noncancer Hazard Quotient			
Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Ingestion	Inhalation	Dermal	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total
Macoma	Macoma	Macoma (ingestion)	Aluminum	--	--	--	--	8.4E-03	--	--	8.4E-03
			Antimony	--	--	--	--	1.7E-03	--	--	1.7E-03
			Arsenic	2.6E-04	--	--	2.6E-04	3.1E-01	--	--	3.1E-01
			Barium	--	--	--	--	4.4E-04	--	--	4.4E-04
			Cadmium	5.7E-06	--	--	5.7E-06	1.3E-03	--	--	1.3E-03
			Chromium	--	--	--	--	5.8E-05	--	--	5.8E-05
			Cobalt	--	--	--	--	3.8E-02	--	--	3.8E-02
			Copper	--	--	--	--	1.0E-02	--	--	1.0E-02
			Iron	--	--	--	--	1.8E-02	--	--	1.8E-02
			Lead	--	--	--	--	--	--	--	--
			Manganese	--	--	--	--	1.4E-03	--	--	1.4E-03
			Mercury	--	--	--	--	9.3E-02	--	--	9.3E-02
			Molybdenum	--	--	--	--	2.4E-03	--	--	2.4E-03
			Nickel	--	--	--	--	2.0E-03	--	--	2.0E-03
			Selenium	--	--	--	--	3.8E-03	--	--	3.8E-03
			Silver	--	--	--	--	1.4E-04	--	--	1.4E-04
			Vanadium	--	--	--	--	8.2E-03	--	--	8.2E-03
			Zinc	--	--	--	--	1.6E-03	--	--	1.6E-03
			4,4'-DDD	9.8E-10	--	--	9.8E-10	2.9E-05	--	--	2.9E-05
			4,4'-DDE	2.7E-09	--	--	2.7E-09	5.6E-05	--	--	5.6E-05
			4,4'-DDT	6.7E-10	--	--	6.7E-10	1.4E-05	--	--	1.4E-05
			alpha-Chlordane	3.3E-10	--	--	3.3E-10	6.6E-06	--	--	6.6E-06
			Dieldrin	1.9E-08	--	--	1.9E-08	8.5E-05	--	--	8.5E-05
			gamma-Chlordane	3.5E-10	--	--	3.5E-10	7.0E-06	--	--	7.0E-06
			Acenaphthene	--	--	--	--	1.3E-07	--	--	1.3E-07
			Acenaphthylene	--	--	--	--	2.3E-07	--	--	2.3E-07
			Anthracene	--	--	--	--	2.8E-07	--	--	2.8E-07
			Fluorene	--	--	--	--	3.0E-07	--	--	3.0E-07
			Phenanthrene	--	--	--	--	2.9E-07	--	--	2.9E-07
			Benzo(a)anthracene	5.6E-08	--	--	5.6E-08	--	--	--	--
			Benzo(a)pyrene	3.0E-07	--	--	3.0E-07	--	--	--	--
			Benzo(b)fluoranthene	4.8E-08	--	--	4.8E-08	--	--	--	--
			Benzo(g,h,i)perylene	--	--	--	--	2.8E-06	--	--	2.8E-06
			Benzo(k)fluoranthene	5.7E-08	--	--	5.7E-08	--	--	--	--
			Chrysene	7.2E-09	--	--	7.2E-09	--	--	--	--
			Dibenz(a,h)anthracene	1.2E-08	--	--	1.2E-08	--	--	--	--
			Fluoranthene	--	--	--	--	1.3E-05	--	--	1.3E-05
			Indeno(1,2,3-cd)pyrene	1.9E-08	--	--	1.9E-08	--	--	--	--
			Pyrene	--	--	--	--	2.2E-05	--	--	2.2E-05
			Monobutyltin	--	--	--	--	1.4E-04	--	--	1.4E-04
			Dibutyltin	--	--	--	--	7.3E-04	--	--	7.3E-04
			Tributyltin	--	--	--	--	7.2E-03	--	--	7.2E-03
			Total PCB Congeners	4.3E-07	--	--	4.3E-07	3.7E-02	--	--	3.7E-02
			Total TEQ – PCB DLC	8.1E-06	--	--	8.1E-06	3.1E-01	--	--	3.1E-01
			Chemical Total	2.7E-04	--	--	2.7E-04	8.6E-01	--	--	8.6E-01
		Exposure Point Total					2.7E-04				8.6E-01
	Exposure Medium Total						2.7E-04				8.6E-01
Medium Total							2.7E-04				8.6E-01
Receptor Total						Total Risk across All Media	2.8E-04			Total Hazard across All Media	1.3E+00

TABLE A-12B
Summary of Receptor Risks and Hazards - Adult and Child Recreational User, Point Avisadero Area
Appendix A - Updated Human Health Risk Assessment for Chemical Exposures

Scenario Timeframe:	Future
Receptor Population:	Recreational User
Receptor Age:	Adult and Child

				Cancer Risk				Noncancer Hazard Quotient			
Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Ingestion	Inhalation	Dermal	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total

Acronyms/Abbreviations:

-- =	not available or not applicable
DDD =	dichlorodiphenyldichloroethane
DDE =	dichlorodiphenyldichloroethylene
DDT =	dichlorodiphenyltrichloroethane
PCB =	polychlorinated biphenyl
TCDD =	tetrachlorodibenzo-p-dioxin

Summary of Risk Drivers - Adult and Child Recreational User, Point Avisadero Area
Appendix A - Updated Human Health Risk Assessment for Chemical Exposures

Scenario Timeframe:	Future
Receptor Population:	Recreational User
Receptor Age:	Adult and Chilc

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk Ingestion	Cancer Risk Inhalation	Cancer Risk Dermal	Cancer Risk Exposure Routes Total	Noncancer Hazard Quotient Ingestion	Noncancer Hazard Quotient Inhalation	Noncancer Hazard Quotient Dermal	Noncancer Hazard Quotient Exposure Routes Total
Sediment	Sediment	Sediment	BAP (EQ)*	2.5E-06	--	1.2E-06	3.7E-06	--	--	--	--
		(Oral/Dermal)	Arsenic	7.6E-06	--	1.2E-06	8.8E-06	2.4E-02	--	3.4E-03	2.7E-02
			Total PCB Congeners	3.6E-07	--	1.7E-07	5.4E-07	8.1E-02	--	3.5E-02	1.2E-01
			Chemical Total	1.0E-05	--	2.4E-06	1.2E-05	2.4E-02	--	3.4E-03	2.7E-02
		Exposure Point Total					1.2E-05				2.7E-02
	Exposure Medium Total						1.2E-05				2.7E-02
Medium Total							1.2E-05				2.7E-02
Macoma	Macoma	Macoma	Arsenic	2.6E-04	--	--	2.6E-04	3.1E-01	--	--	3.1E-01
		(Oral)	Cadmium	5.7E-06	--	--	5.7E-06	1.3E-03	--	--	1.3E-03
			Total TEQ – PCB DLC	8.1E-06	--	--	8.1E-06	3.1E-01	--	--	3.1E-01
			Chemical Total	2.7E-04	--	--	2.7E-04	6.3E-01	--	--	6.3E-01
		Exposure Point Total					2.7E-04				6.3E-01
	Exposure Medium Total						2.7E-04				6.3E-01
Medium Total							2.7E-04				6.3E-01
Receptor Total						Total Risk across All Media	2.8E-04			Total Hazard across All Media	6.5E-01

Notes:

* Risk for benzo(a)pyrene equivalent (BAP [EQ]) is calculated by summing the risks for each of the individual potentially carcinogenic PAHs: benzo(a)anthracene, benzo(b)fluoranthene, benzo(a)pyrene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene.

Acronyms/Abbreviations:

-- =	not available or not applicable	PAH =	polycyclic aromatic hydrocarbon
BAP (EQ) =	benzo(a)pyrene equivalent	PCB =	polychlorinated biphenyl

TABLE A-13A
Calculation of RME Chemical Cancer Risks and Noncancer Hazards - Construction Worker, Point Avisadero Area
Appendix A - Updated Human Health Risk Assessment for Chemical Exposures

Scenario Timeframe:	Future
Receptor Population:	Construction Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations: Intake/Exposure Concentration		CSF / Unit Risk		Cancer Risk	Noncancer Hazard Quotient: Intake/Exposure Concentration		RfD / RfC		Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
Sediment	Sediment	Sediment	Ingestion	Aluminum	6.8E+04	mg/kg	2.8E-03	mg/kg-day	--	--	--	1.9E-01	mg/kg-day	1.0E+00	mg/kg-day	1.9E-01
				Antimony	5.4E+00	mg/kg	2.2E-07	mg/kg-day	--	--	--	1.5E-05	mg/kg-day	4.0E-04	mg/kg-day	3.8E-02
				Arsenic	1.2E+01	mg/kg	3.0E-07	mg/kg-day	9.5E+00	(mg/kg-day)-1	2.9E-06	2.1E-05	mg/kg-day	3.0E-04	mg/kg-day	7.0E-02
				Barium	4.8E+02	mg/kg	1.9E-05	mg/kg-day	--	--	--	1.3E-03	mg/kg-day	2.0E-01	mg/kg-day	6.7E-03
				Cadmium	3.2E-01	mg/kg	1.3E-08	mg/kg-day	1.5E+01	(mg/kg-day)-1	2.0E-07	9.1E-07	mg/kg-day	1.0E-03	mg/kg-day	9.1E-04
				Chromium	2.6E+02	mg/kg	1.0E-05	mg/kg-day	--	--	--	7.2E-04	mg/kg-day	1.5E+00	mg/kg-day	4.8E-04
				Cobalt	1.8E+01	mg/kg	7.3E-07	mg/kg-day	--	--	--	5.1E-05	mg/kg-day	3.0E-04	mg/kg-day	1.7E-01
				Copper	4.2E+02	mg/kg	1.7E-05	mg/kg-day	--	--	--	1.2E-03	mg/kg-day	4.0E-02	mg/kg-day	3.0E-02
				Iron	4.2E+04	mg/kg	1.7E-03	mg/kg-day	--	--	--	1.2E-01	mg/kg-day	7.0E-01	mg/kg-day	1.7E-01
				Lead	1.0E+02	mg/kg	4.2E-06	mg/kg-day	--	--	--	2.9E-04	mg/kg-day	--	--	--
				Manganese	5.2E+02	mg/kg	2.1E-05	mg/kg-day	--	--	--	1.5E-03	mg/kg-day	1.4E-01	mg/kg-day	1.0E-02
				Mercury	2.5E+00	mg/kg	1.0E-07	mg/kg-day	--	--	--	7.2E-06	mg/kg-day	1.0E-04	mg/kg-day	7.2E-02
				Molybdenum	1.0E+00	mg/kg	4.2E-08	mg/kg-day	--	--	--	2.9E-06	mg/kg-day	5.0E-03	mg/kg-day	5.8E-04
				Nickel	1.3E+02	mg/kg	5.2E-06	mg/kg-day	--	--	--	3.7E-04	mg/kg-day	2.0E-02	mg/kg-day	1.8E-02
				Selenium	4.3E-01	mg/kg	1.7E-08	mg/kg-day	--	--	--	1.2E-06	mg/kg-day	5.0E-03	mg/kg-day	2.4E-04
				Silver	3.0E-01	mg/kg	1.2E-08	mg/kg-day	--	--	--	8.3E-07	mg/kg-day	5.0E-03	mg/kg-day	1.7E-04
				Vanadium	1.4E+02	mg/kg	5.6E-06	mg/kg-day	--	--	--	3.9E-04	mg/kg-day	5.0E-03	mg/kg-day	7.8E-02
				Zinc	1.5E+02	mg/kg	6.0E-06	mg/kg-day	--	--	--	4.2E-04	mg/kg-day	3.0E-01	mg/kg-day	1.4E-03
				2,4'-DDD	8.4E-04	mg/kg	3.4E-11	mg/kg-day	2.4E-01	(mg/kg-day)-1	8.1E-12	2.4E-09	mg/kg-day	5.0E-04	mg/kg-day	4.7E-06
				4,4'-DDD	1.3E-03	mg/kg	5.1E-11	mg/kg-day	2.4E-01	(mg/kg-day)-1	1.2E-11	3.6E-09	mg/kg-day	5.0E-04	mg/kg-day	7.2E-06
				4,4'-DDE	1.2E-03	mg/kg	4.8E-11	mg/kg-day	3.4E-01	(mg/kg-day)-1	1.6E-11	3.4E-09	mg/kg-day	5.0E-04	mg/kg-day	6.8E-06
				4,4'-DDT	3.6E-04	mg/kg	1.4E-11	mg/kg-day	3.4E-01	(mg/kg-day)-1	4.9E-12	1.0E-09	mg/kg-day	5.0E-04	mg/kg-day	2.0E-06
				alpha-Chlordane	1.5E-04	mg/kg	6.0E-12	mg/kg-day	3.5E-01	(mg/kg-day)-1	2.1E-12	4.2E-10	mg/kg-day	5.0E-04	mg/kg-day	8.4E-07
				2-Methylnaphthalene	1.2E-02	mg/kg	4.9E-10	mg/kg-day	--	--	--	3.4E-08	mg/kg-day	4.0E-03	mg/kg-day	8.5E-06
				Acenaphthene	4.5E-02	mg/kg	1.8E-09	mg/kg-day	--	--	--	1.3E-07	mg/kg-day	6.0E-02	mg/kg-day	2.1E-06
				Acenaphthylene	3.1E-02	mg/kg	1.3E-09	mg/kg-day	--	--	--	8.8E-08	mg/kg-day	6.0E-02	mg/kg-day	1.5E-06
				Anthracene	1.8E-01	mg/kg	7.2E-09	mg/kg-day	--	--	--	5.1E-07	mg/kg-day	3.0E-01	mg/kg-day	1.7E-06
				Fluorene	4.0E-02	mg/kg	1.6E-09	mg/kg-day	--	--	--	1.1E-07	mg/kg-day	4.0E-02	mg/kg-day	2.8E-06
				Naphthalene	2.5E-02	mg/kg	1.0E-09	mg/kg-day	--	--	--	7.1E-08	mg/kg-day	2.0E-02	mg/kg-day	3.5E-06
				Phenanthrene	4.1E-01	mg/kg	1.7E-08	mg/kg-day	--	--	--	1.2E-06	mg/kg-day	3.0E-01	mg/kg-day	3.9E-06
				Benzo(a)anthracene	3.6E-01	mg/kg	1.5E-08	mg/kg-day	1.2E+00	(mg/kg-day)-1	1.8E-08	1.0E-06	mg/kg-day	--	--	--
				Benzo(a)pyrene	4.8E-01	mg/kg	1.9E-08	mg/kg-day	7.3E+00	(mg/kg-day)-1	1.4E-07	1.4E-06	mg/kg-day	--	--	--
				Benzo(b)fluoranthene	3.3E-01	mg/kg	1.3E-08	mg/kg-day	1.2E+00	(mg/kg-day)-1	1.6E-08	9.2E-07	mg/kg-day	--	--	--
				Benzo(g,h,i)perylene	3.6E-01	mg/kg	1.4E-08	mg/kg-day	--	--	--	1.0E-06	mg/kg-day	3.0E-02	mg/kg-day	3.4E-05
				Benzo(k)fluoranthene	3.3E-01	mg/kg	1.3E-08	mg/kg-day	1.2E+00	(mg/kg-day)-1	1.6E-08	9.3E-07	mg/kg-day	--	--	--
				Chrysene	4.2E-01	mg/kg	1.7E-08	mg/kg-day	1.2E-01	(mg/kg-day)-1	2.1E-09	1.2E-06	mg/kg-day	--	--	--
				Dibenz(a,h)anthracene	5.7E-02	mg/kg	2.3E-09	mg/kg-day	7.3E+00	(mg/kg-day)-1	1.7E-08	1.6E-07	mg/kg-day	--	--	--
				Fluoranthene	7.5E-01	mg/kg	3.0E-08	mg/kg-day	--	--	--	2.1E-06	mg/kg-day	4.0E-02	mg/kg-day	5.3E-05
				Indeno(1,2,3-cd)pyrene	3.5E-01	mg/kg	1.4E-08	mg/kg-day	1.2E+00	(mg/kg-day)-1	1.7E-08	9.9E-07	mg/kg-day	--	--	--
				Pyrene	8.9E-01	mg/kg	3.6E-08	mg/kg-day	--	--	--	2.5E-06	mg/kg-day	3.0E-02	mg/kg-day	8.4E-05
				Dibutyltin	2.4E-02	mg/kg	9.7E-10	mg/kg-day	--	--	--	6.8E-08	mg/kg-day	3.0E-04	mg/kg-day	2.3E-04
				Tributyltin	8.2E-02	mg/kg	3.3E-09	mg/kg-day	--	--	--	2.3E-07	mg/kg-day	3.0E-04	mg/kg-day	7.8E-04
				Total PCB Congeners	1.7E+00	mg/kg	6.8E-08	mg/kg-day	2.0E+00	(mg/kg-day)-1	1.4E-07	4.8E-06	mg/kg-day	2.0E-05	mg/kg-day	2.4E-01
				Total TEQ – PCB DLC	7.4E-06	mg/kg	3.0E-13	mg/kg-day	1.3E+05	(mg/kg-day)-1	3.9E-08	2.1E-11	mg/kg-day	7.0E-10	mg/kg-day	3.0E-02
			Exp. Route Total								3.5E-06					1.1E+00

TABLE A-13A
Calculation of RME Chemical Cancer Risks and Noncancer Hazards - Construction Worker, Point Avisadero Area
Appendix A - Updated Human Health Risk Assessment for Chemical Exposures

Scenario Timeframe:	Future
Receptor Population:	Construction Worker
Receptor Age:	Adult

							Cancer Risk Calculations					Noncancer Hazard Quotient				
					EPC		Intake/Exposure Concentration		CSF / Unit Risk			Intake/Exposure Concentration		RfD / RfC		
Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	Value	Units	Value	Units	Value	Units	Cancer Risk	Value	Units	Value	Units	Hazard Quotient
Sediment	Sediment	Sediment	Dermal	Aluminum	6.8E+04	mg/kg	4.0E-04	mg/kg-day	--	--	--	2.8E-02	mg/kg-day	1.0E+00	mg/kg-day	2.8E-02
				Antimony	5.4E+00	mg/kg	3.2E-08	mg/kg-day	--	--	--	2.2E-06	mg/kg-day	6.0E-05	mg/kg-day	3.7E-02
				Arsenic	1.2E+01	mg/kg	2.2E-07	mg/kg-day	9.5E+00	(mg/kg-day)-1	2.1E-06	1.5E-05	mg/kg-day	3.0E-04	mg/kg-day	5.2E-02
				Barium	4.8E+02	mg/kg	2.8E-06	mg/kg-day	--	--	--	2.0E-04	mg/kg-day	1.4E-02	mg/kg-day	1.4E-02
				Cadmium	3.2E-01	mg/kg	1.9E-10	mg/kg-day	6.0E+02	(mg/kg-day)-1	1.1E-07	1.3E-08	mg/kg-day	2.5E-05	mg/kg-day	5.3E-04
				Chromium	2.6E+02	mg/kg	1.5E-06	mg/kg-day	--	--	--	1.1E-04	mg/kg-day	2.0E-02	mg/kg-day	5.4E-03
				Cobalt	1.8E+01	mg/kg	1.1E-07	mg/kg-day	--	--	--	7.5E-06	mg/kg-day	3.0E-04	mg/kg-day	2.5E-02
				Copper	4.2E+02	mg/kg	2.5E-06	mg/kg-day	--	--	--	1.8E-04	mg/kg-day	4.0E-02	mg/kg-day	4.4E-03
				Iron	4.2E+04	mg/kg	2.5E-04	mg/kg-day	--	--	--	1.7E-02	mg/kg-day	7.0E-01	mg/kg-day	2.5E-02
				Lead	1.0E+02	mg/kg	6.1E-07	mg/kg-day	--	--	--	4.3E-05	mg/kg-day	--	--	--
				Manganese	5.2E+02	mg/kg	3.1E-06	mg/kg-day	--	--	--	2.1E-04	mg/kg-day	1.4E-01	mg/kg-day	1.5E-03
				Mercury	2.5E+00	mg/kg	1.5E-08	mg/kg-day	--	--	--	1.0E-06	mg/kg-day	1.0E-04	mg/kg-day	1.0E-02
				Molybdenum	1.0E+00	mg/kg	6.1E-09	mg/kg-day	--	--	--	4.3E-07	mg/kg-day	5.0E-03	mg/kg-day	8.5E-05
				Nickel	1.3E+02	mg/kg	7.7E-07	mg/kg-day	--	--	--	5.4E-05	mg/kg-day	8.0E-04	mg/kg-day	6.7E-02
				Selenium	4.3E-01	mg/kg	2.5E-09	mg/kg-day	--	--	--	1.8E-07	mg/kg-day	5.0E-03	mg/kg-day	3.5E-05
				Silver	3.0E-01	mg/kg	1.7E-09	mg/kg-day	--	--	--	1.2E-07	mg/kg-day	2.0E-04	mg/kg-day	6.1E-04
				Vanadium	1.4E+02	mg/kg	8.1E-07	mg/kg-day	--	--	--	5.7E-05	mg/kg-day	1.3E-04	mg/kg-day	4.4E-01
				Zinc	1.5E+02	mg/kg	8.8E-07	mg/kg-day	--	--	--	6.1E-05	mg/kg-day	3.0E-01	mg/kg-day	2.0E-04
				2,4'-DDD	8.4E-04	mg/kg	2.5E-11	mg/kg-day	2.4E-01	(mg/kg-day)-1	5.9E-12	1.7E-09	mg/kg-day	5.0E-04	mg/kg-day	3.5E-06
				4,4'-DDD	1.3E-03	mg/kg	3.7E-11	mg/kg-day	2.4E-01	(mg/kg-day)-1	9.0E-12	2.6E-09	mg/kg-day	5.0E-04	mg/kg-day	5.2E-06
				4,4'-DDE	1.2E-03	mg/kg	3.5E-11	mg/kg-day	3.4E-01	(mg/kg-day)-1	1.2E-11	2.5E-09	mg/kg-day	5.0E-04	mg/kg-day	5.0E-06
				4,4'-DDT	3.6E-04	mg/kg	1.0E-11	mg/kg-day	3.4E-01	(mg/kg-day)-1	3.6E-12	7.3E-10	mg/kg-day	5.0E-04	mg/kg-day	1.5E-06
				alpha-Chlordane	1.5E-04	mg/kg	4.4E-12	mg/kg-day	3.5E-01	(mg/kg-day)-1	1.5E-12	3.1E-10	mg/kg-day	5.0E-04	mg/kg-day	6.2E-07
				2-Methylnaphthalene	1.2E-02	mg/kg	1.1E-09	mg/kg-day	--	--	--	7.5E-08	mg/kg-day	4.0E-03	mg/kg-day	1.9E-05
				Acenaphthene	4.5E-02	mg/kg	4.0E-09	mg/kg-day	--	--	--	2.8E-07	mg/kg-day	6.0E-02	mg/kg-day	4.7E-06
				Acenaphthylene	3.1E-02	mg/kg	2.8E-09	mg/kg-day	--	--	--	1.9E-07	mg/kg-day	6.0E-02	mg/kg-day	3.2E-06
				Anthracene	1.8E-01	mg/kg	1.6E-08	mg/kg-day	--	--	--	1.1E-06	mg/kg-day	3.0E-01	mg/kg-day	3.7E-06
				Fluorene	4.0E-02	mg/kg	3.5E-09	mg/kg-day	--	--	--	2.5E-07	mg/kg-day	4.0E-02	mg/kg-day	6.2E-06
				Naphthalene	2.5E-02	mg/kg	2.2E-09	mg/kg-day	--	--	--	1.6E-07	mg/kg-day	2.0E-02	mg/kg-day	7.8E-06
				Phenanthrene	4.1E-01	mg/kg	3.6E-08	mg/kg-day	--	--	--	2.5E-06	mg/kg-day	3.0E-01	mg/kg-day	8.5E-06
				Benzo(a)anthracene	3.6E-01	mg/kg	3.2E-08	mg/kg-day	1.2E+00	(mg/kg-day)-1	3.9E-08	2.3E-06	mg/kg-day	--	--	--
				Benzo(a)pyrene	4.8E-01	mg/kg	4.3E-08	mg/kg-day	7.3E+00	(mg/kg-day)-1	3.1E-07	3.0E-06	mg/kg-day	--	--	--
				Benzo(b)fluoranthene	3.3E-01	mg/kg	2.9E-08	mg/kg-day	1.2E+00	(mg/kg-day)-1	3.5E-08	2.0E-06	mg/kg-day	--	--	--
				Benzo(g,h,i)perylene	3.6E-01	mg/kg	3.2E-08	mg/kg-day	--	--	--	2.2E-06	mg/kg-day	3.0E-02	mg/kg-day	7.4E-05
				Benzo(k)fluoranthene	3.3E-01	mg/kg	2.9E-08	mg/kg-day	1.2E+00	(mg/kg-day)-1	3.5E-08	2.0E-06	mg/kg-day	--	--	--
				Chrysene	4.2E-01	mg/kg	3.8E-08	mg/kg-day	1.2E-01	(mg/kg-day)-1	4.5E-09	2.6E-06	mg/kg-day	--	--	--
				Dibenz(a,h)anthracene	5.7E-02	mg/kg	5.1E-09	mg/kg-day	7.3E+00	(mg/kg-day)-1	3.7E-08	3.5E-07	mg/kg-day	--	--	--
				Fluoranthene	7.5E-01	mg/kg	6.6E-08	mg/kg-day	--	--	--	4.6E-06	mg/kg-day	4.0E-02	mg/kg-day	1.2E-04
				Indeno(1,2,3-cd)pyrene	3.5E-01	mg/kg	3.1E-08	mg/kg-day	1.2E+00	(mg/kg-day)-1	3.7E-08	2.2E-06	mg/kg-day	--	--	--
				Pyrene	8.9E-01	mg/kg	7.9E-08	mg/kg-day	--	--	--	5.5E-06	mg/kg-day	3.0E-02	mg/kg-day	1.8E-04
				Dibutyltin	2.4E-02	mg/kg	1.4E-09	mg/kg-day	--	--	--	9.9E-08	mg/kg-day	3.0E-04	mg/kg-day	3.3E-04
				Tributyltin	8.2E-02	mg/kg	4.9E-09	mg/kg-day	--	--	--	3.4E-07	mg/kg-day	3.0E-04	mg/kg-day	1.1E-03
				Total PCB Congeners	1.7E+00	mg/kg	1.5E-07	mg/kg-day	2.0E+00	(mg/kg-day)-1	3.0E-07	1.1E-05	mg/kg-day	2.0E-05	mg/kg-day	5.3E-01
				Total TEQ – PCB DLC	7.4E-06	mg/kg	1.3E-13	mg/kg-day	1.3E+05	(mg/kg-day)-1	1.7E-08	9.2E-12	mg/kg-day	7.0E-10	mg/kg-day	1.3E-02
			Exp. Route Total								3.0E-06					1.2E+00
		Exposure Point Total									6.5E-06					2.4E+00
	Exposure Medium Total										6.5E-06					2.4E+00
Medium Total											6.5E-06					2.4E+00
										Total of Receptor Risks across All Media	6.5E-06				Total of Receptor Hazards across All Media	2.4E+00

TABLE A-13A
Calculation of RME Chemical Cancer Risks and Noncancer Hazards - Construction Worker, Point Avisadero Area
Appendix A - Updated Human Health Risk Assessment for Chemical Exposures

Scenario Timeframe:	Future
Receptor Population:	Construction Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Noncancer Hazard Quotient				
							Intake/Exposure Concentration		CSF / Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD / RfC		Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	

Acronyms/Abbreviations:

-- =	not available or not applicable	(mg/kg-day)-	1/(milligram[s] per kilogram per day)
CSF =	cancer slope factor	mg/kg =	milligram(s) per kilogram
DDD =	dichlorodiphenyldichloroethane	mg/kg-day =	milligram(s) per kilogram per day
DDE =	dichlorodiphenyldichloroethylene	PCB =	polychlorinated biphenyl
DDT =	dichlorodiphenyltrichloroethane	RfC =	reference concentration
EPC =	exposure point concentration	RfD =	reference dose
Exp. =	exposure	RME =	reasonable maximum exposure
M =	lifetime exposure from birth, mutagenic endpoint	TCDD =	tetrachlorodibenzo-p-dioxin

TABLE A-13B

Summary of Receptor Risks and Hazards - Construction Worker, Point Avisadero Area

Appendix A - Updated Human Health Risk Assessment for Chemical Exposures

Scenario Timeframe:	Future
Receptor Population:	Construction Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient			
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total
Sediment	Sediment	Sediment	Aluminum	--	--	--	--	1.9E-01	--	2.8E-02	2.2E-01
			Antimony	--	--	--	--	3.8E-02	--	3.7E-02	7.6E-02
			Arsenic	2.9E-06	--	2.1E-06	5.0E-06	7.0E-02	--	5.2E-02	1.2E-01
			Barium	--	--	--	--	6.7E-03	--	1.4E-02	2.1E-02
			Cadmium	2.0E-07	--	1.1E-07	3.1E-07	9.1E-04	--	5.3E-04	1.4E-03
			Chromium	--	--	--	--	4.8E-04	--	5.4E-03	5.9E-03
			Cobalt	--	--	--	--	1.7E-01	--	2.5E-02	1.9E-01
			Copper	--	--	--	--	3.0E-02	--	4.4E-03	3.4E-02
			Iron	--	--	--	--	1.7E-01	--	2.5E-02	1.9E-01
			Lead	--	--	--	--	--	--	--	--
			Manganese	--	--	--	--	1.0E-02	--	1.5E-03	1.2E-02
			Mercury	--	--	--	--	7.2E-02	--	1.0E-02	8.2E-02
			Molybdenum	--	--	--	--	5.8E-04	--	8.5E-05	6.7E-04
			Nickel	--	--	--	--	1.8E-02	--	6.7E-02	8.5E-02
			Selenium	--	--	--	--	2.4E-04	--	3.5E-05	2.8E-04
			Silver	--	--	--	--	1.7E-04	--	6.1E-04	7.8E-04
			Vanadium	--	--	--	--	7.8E-02	--	4.4E-01	5.2E-01
			Zinc	--	--	--	--	1.4E-03	--	2.0E-04	1.6E-03
			2,4'-DDD	8.1E-12	--	5.9E-12	1.4E-11	4.7E-06	--	3.5E-06	8.2E-06
			4,4'-DDD	1.2E-11	--	9.0E-12	2.1E-11	7.2E-06	--	5.2E-06	1.2E-05
			4,4'-DDE	1.6E-11	--	1.2E-11	2.9E-11	6.8E-06	--	5.0E-06	1.2E-05
			4,4'-DDT	4.9E-12	--	3.6E-12	8.4E-12	2.0E-06	--	1.5E-06	3.5E-06
			alpha-Chlordane	2.1E-12	--	1.5E-12	3.7E-12	8.4E-07	--	6.2E-07	1.5E-06
			2-Methylnaphthalene	--	--	--	--	8.5E-06	--	1.9E-05	2.7E-05
			Acenaphthene	--	--	--	--	2.1E-06	--	4.7E-06	6.8E-06
			Acenaphthylene	--	--	--	--	1.5E-06	--	3.2E-06	4.7E-06
			Anthracene	--	--	--	--	1.7E-06	--	3.7E-06	5.4E-06
			Fluorene	--	--	--	--	2.8E-06	--	6.2E-06	9.0E-06
			Naphthalene	--	--	--	--	3.5E-06	--	7.8E-06	1.1E-05
			Phenanthrene	--	--	--	--	3.9E-06	--	8.5E-06	1.2E-05
			Benzo(a)anthracene	1.8E-08	--	3.9E-08	5.6E-08	--	--	--	--
			Benzo(a)pyrene	1.4E-07	--	3.1E-07	4.5E-07	--	--	--	--
			Benzo(b)fluoranthene	1.6E-08	--	3.5E-08	5.0E-08	--	--	--	--
			Benzo(g,h,i)perylene	--	--	--	--	3.4E-05	--	7.4E-05	1.1E-04
			Benzo(k)fluoranthene	1.6E-08	--	3.5E-08	5.1E-08	--	--	--	--
			Chrysene	2.1E-09	--	4.5E-09	6.6E-09	--	--	--	--
			Dibenz(a,h)anthracene	1.7E-08	--	3.7E-08	5.4E-08	--	--	--	--
			Fluoranthene	--	--	--	--	5.3E-05	--	1.2E-04	1.7E-04
			Indeno(1,2,3-cd)pyrene	1.7E-08	--	3.7E-08	5.4E-08	--	--	--	--
			Pyrene	--	--	--	--	8.4E-05	--	1.8E-04	2.7E-04
			Dibutyltin	--	--	--	--	2.3E-04	--	3.3E-04	5.6E-04
			Tributyltin	--	--	--	--	7.8E-04	--	1.1E-03	1.9E-03
			Total PCB Congeners	1.4E-07	--	3.0E-07	4.4E-07	2.4E-01	--	5.3E-01	7.7E-01
			Total TEQ – PCB DLC	3.9E-08	--	1.7E-08	5.6E-08	3.0E-02	--	1.3E-02	4.3E-02
			Chemical Total	3.5E-06	--	3.0E-06	6.5E-06	1.1E+00	--	1.2E+00	2.4E+00
		Exposure Point Total					6.5E-06				2.4E+00
	Exposure Medium Total						6.5E-06				2.4E+00
Medium Total							6.5E-06				2.4E+00
Receptor Total						Total Risk across All Media	6.5E-06			Total Hazard across All Media	2.4E+00

TABLE A-13B
Summary of Receptor Risks and Hazards - Construction Worker, Point Avisadero Area
Appendix A - Updated Human Health Risk Assessment for Chemical Exposures

Scenario Timeframe:	Future
Receptor Population:	Construction Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient			
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total

Acronyms/Abbreviations:

-- = not available or not applicable
DDD = dichlorodiphenyldichloroethane
DDE = dichlorodiphenyldichloroethylene
DDT = dichlorodiphenyltrichloroethane
PCB = polychlorinated biphenyl
TCDD = tetrachlorodibenzo-p-dioxin

TABLE A-13C
Summary of Risk Drivers - Construction Worker, Point Avisadero Area
Appendix A - Updated Human Health Risk Assessment for Chemical Exposures

Scenario Timeframe:	Future
Receptor Population:	Construction Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk: Ingestion	Cancer Risk: Inhalation	Cancer Risk: Dermal	Cancer Risk: Exposure Routes Total	Noncancer Hazard Quotient: Ingestion	Noncancer Hazard Quotient: Inhalation	Noncancer Hazard Quotient: Dermal	Noncancer Hazard Quotient: Exposure Routes Total
Sediment	Sediment	Sediment	Arsenic	2.9E-06	--	2.1E-06	5.0E-06	7.0E-02	--	5.2E-02	1.2E-01
			Chemical Total	--	--	--	5.0E-06	--	--	--	1.2E-01
		Exposure Point Total					5.0E-06				1.2E-01
	Exposure Medium Total						5.0E-06				1.2E-01
Medium Total							5.0E-06				1.2E-01
Receptor Total						Total Risk across All Media	5.0E-06			Total Hazard across All Media	1.2E-01

Acronyms/Abbreviations:
-- = not available or not applicable

TABLE A-14A
Calculation of RME Chemical Cancer Risks and Noncancer Hazards - Adult and Child Recreational User, South Basin Area X
Appendix A - Updated Human Health Risk Assessment for Chemical Exposures

Scenario Timeframe:	Future
Receptor Population:	Recreational User
Receptor Age:	Adult and Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC Value	EPC Units	Cancer Risk Calculations: Intake/Exposure Concentration Value	Intake/Exposure Concentration Units	CSF / Unit Risk Value	CSF / Unit Risk Units	Cancer Risk	Noncancer Hazard Quotient: Intake/Exposure Concentration Value	Intake/Exposure Concentration Units	RfD / RfC Value	RfD / RfC Units	Hazard Quotient
Sediment	Sediment	Sediment	Ingestion	Aluminum	6.8E+04	mg/kg	7.3E-03	mg/kg-day	--	--	--	6.5E-02	mg/kg-day	1.0E+00	mg/kg-day	6.5E-02
				Antimony	4.3E+00	mg/kg	4.6E-07	mg/kg-day	--	--	--	4.1E-06	mg/kg-day	4.0E-04	mg/kg-day	1.0E-02
				Arsenic	1.1E+01	mg/kg	7.3E-07	mg/kg-day	9.5E+00	(mg/kg-day)-1	6.9E-06	6.5E-06	mg/kg-day	3.0E-04	mg/kg-day	2.2E-02
				Barium	5.6E+02	mg/kg	6.0E-05	mg/kg-day	--	--	--	5.3E-04	mg/kg-day	2.0E-01	mg/kg-day	2.6E-03
				Cadmium	5.2E-01	mg/kg	5.5E-08	mg/kg-day	1.5E+01	(mg/kg-day)-1	8.3E-07	4.9E-07	mg/kg-day	1.0E-03	mg/kg-day	4.9E-04
				Chromium	2.5E+02	mg/kg	2.7E-05	mg/kg-day	--	--	--	2.4E-04	mg/kg-day	1.5E+00	mg/kg-day	1.6E-04
				Cobalt	1.8E+01	mg/kg	1.9E-06	mg/kg-day	--	--	--	1.7E-05	mg/kg-day	3.0E-04	mg/kg-day	5.7E-02
				Copper	1.5E+02	mg/kg	1.6E-05	mg/kg-day	--	--	--	1.4E-04	mg/kg-day	4.0E-02	mg/kg-day	3.5E-03
				Iron	4.3E+04	mg/kg	4.6E-03	mg/kg-day	--	--	--	4.1E-02	mg/kg-day	7.0E-01	mg/kg-day	5.9E-02
				Lead	9.8E+01	mg/kg	1.0E-05	mg/kg-day	--	--	--	9.3E-05	mg/kg-day	--	--	--
				Manganese	4.5E+02	mg/kg	4.8E-05	mg/kg-day	--	--	--	4.3E-04	mg/kg-day	1.4E-01	mg/kg-day	3.1E-03
				Mercury	8.2E-01	mg/kg	8.8E-08	mg/kg-day	--	--	--	7.8E-07	mg/kg-day	1.0E-04	mg/kg-day	7.8E-03
				Molybdenum	1.2E+00	mg/kg	1.3E-07	mg/kg-day	--	--	--	1.2E-06	mg/kg-day	5.0E-03	mg/kg-day	2.3E-04
				Nickel	1.2E+02	mg/kg	1.3E-05	mg/kg-day	--	--	--	1.2E-04	mg/kg-day	2.0E-02	mg/kg-day	5.9E-03
				Selenium	3.6E-01	mg/kg	3.8E-08	mg/kg-day	--	--	--	3.4E-07	mg/kg-day	5.0E-03	mg/kg-day	6.8E-05
				Silver	1.0E+00	mg/kg	1.1E-07	mg/kg-day	--	--	--	9.9E-07	mg/kg-day	5.0E-03	mg/kg-day	2.0E-04
				Vanadium	1.4E+02	mg/kg	1.5E-05	mg/kg-day	--	--	--	1.4E-04	mg/kg-day	5.0E-03	mg/kg-day	2.7E-02
				Zinc	2.1E+02	mg/kg	2.3E-05	mg/kg-day	--	--	--	2.0E-04	mg/kg-day	3.0E-01	mg/kg-day	6.7E-04
				2,4'-DDD	1.2E-04	mg/kg	1.3E-11	mg/kg-day	2.4E-01	(mg/kg-day)-1	3.1E-12	1.1E-10	mg/kg-day	5.0E-04	mg/kg-day	2.3E-07
				4,4'-DDD	1.8E-02	mg/kg	1.9E-09	mg/kg-day	2.4E-01	(mg/kg-day)-1	4.6E-10	1.7E-08	mg/kg-day	5.0E-04	mg/kg-day	3.4E-05
				4,4'-DDE	7.4E-03	mg/kg	7.9E-10	mg/kg-day	3.4E-01	(mg/kg-day)-1	2.7E-10	7.0E-09	mg/kg-day	5.0E-04	mg/kg-day	1.4E-05
				4,4'-DDT	3.6E-03	mg/kg	3.8E-10	mg/kg-day	3.4E-01	(mg/kg-day)-1	1.3E-10	3.4E-09	mg/kg-day	5.0E-04	mg/kg-day	6.8E-06
				alpha-Chlordane	2.1E-03	mg/kg	2.3E-10	mg/kg-day	3.5E-01	(mg/kg-day)-1	7.9E-11	2.0E-09	mg/kg-day	5.0E-04	mg/kg-day	4.0E-06
				Dieldrin	7.2E-03	mg/kg	7.7E-10	mg/kg-day	1.6E+01	(mg/kg-day)-1	1.2E-08	6.8E-09	mg/kg-day	5.0E-05	mg/kg-day	1.4E-04
				gamma-Chlordane	3.3E-03	mg/kg	3.6E-10	mg/kg-day	3.5E-01	(mg/kg-day)-1	1.2E-10	3.2E-09	mg/kg-day	5.0E-04	mg/kg-day	6.3E-06
				Heptachlor	2.1E-03	mg/kg	2.3E-10	mg/kg-day	4.5E+00	(mg/kg-day)-1	1.0E-09	2.0E-09	mg/kg-day	5.0E-04	mg/kg-day	4.0E-06
				2-Methylnaphthalene	2.2E-02	mg/kg	2.3E-09	mg/kg-day	--	--	--	2.0E-08	mg/kg-day	4.0E-03	mg/kg-day	5.1E-06
				Acenaphthene	9.1E-03	mg/kg	9.7E-10	mg/kg-day	--	--	--	8.6E-09	mg/kg-day	6.0E-02	mg/kg-day	1.4E-07
				Acenaphthylene	2.0E-02	mg/kg	2.1E-09	mg/kg-day	--	--	--	1.9E-08	mg/kg-day	6.0E-02	mg/kg-day	3.2E-07
				Anthracene	1.0E-01	mg/kg	1.1E-08	mg/kg-day	--	--	--	9.6E-08	mg/kg-day	3.0E-01	mg/kg-day	3.2E-07
				Fluorene	3.0E-02	mg/kg	3.2E-09	mg/kg-day	--	--	--	2.9E-08	mg/kg-day	4.0E-02	mg/kg-day	7.2E-07
				Naphthalene	3.5E-02	mg/kg	3.7E-09	mg/kg-day	--	--	--	3.3E-08	mg/kg-day	2.0E-02	mg/kg-day	1.6E-06
				Phenanthrene	2.8E-01	mg/kg	3.0E-08	mg/kg-day	--	--	--	2.6E-07	mg/kg-day	3.0E-01	mg/kg-day	8.8E-07
				Benzo(a)anthracene M	2.4E-01	mg/kg	1.1E-07	mg/kg-day	1.2E+00	(mg/kg-day)-1	1.4E-07	2.2E-07	mg/kg-day	--	--	--
				Benzo(a)pyrene M	3.1E-01	mg/kg	1.5E-07	mg/kg-day	7.3E+00	(mg/kg-day)-1	1.1E-06	3.0E-07	mg/kg-day	--	--	--
				Benzo(b)fluoranthene M	2.4E-01	mg/kg	1.1E-07	mg/kg-day	1.2E+00	(mg/kg-day)-1	1.4E-07	2.2E-07	mg/kg-day	--	--	--
				Benzo(g,h,i)perylene	2.7E-01	mg/kg	2.9E-08	mg/kg-day	--	--	--	2.6E-07	mg/kg-day	3.0E-02	mg/kg-day	8.5E-06
				Benzo(k)fluoranthene M	2.4E-01	mg/kg	1.2E-07	mg/kg-day	1.2E+00	(mg/kg-day)-1	1.4E-07	2.3E-07	mg/kg-day	--	--	--
				Chrysene M	3.2E-01	mg/kg	1.5E-07	mg/kg-day	1.2E-01	(mg/kg-day)-1	1.8E-08	3.0E-07	mg/kg-day	--	--	--
				Dibenz(a,h)anthracene M	4.4E-02	mg/kg	2.1E-08	mg/kg-day	7.3E+00	(mg/kg-day)-1	1.6E-07	4.2E-08	mg/kg-day	--	--	--
				Fluoranthene	3.9E-01	mg/kg	4.2E-08	mg/kg-day	--	--	--	3.7E-07	mg/kg-day	4.0E-02	mg/kg-day	9.4E-06
				Indeno(1,2,3-cd)pyrene	2.5E-01	mg/kg	1.2E-07	mg/kg-day	1.2E+00	(mg/kg-day)-1	1.4E-07	2.3E-07	mg/kg-day	--	--	--
				Pyrene	4.6E-01	mg/kg	4.9E-08	mg/kg-day	--	--	--	4.4E-07	mg/kg-day	3.0E-02	mg/kg-day	1.5E-05
				Monobutyltin	1.2E-03	mg/kg	1.2E-10	mg/kg-day	--	--	--	1.1E-09	mg/kg-day	3.0E-04	mg/kg-day	3.7E-06
				Dibutyltin	2.2E-02	mg/kg	2.3E-09	mg/kg-day	--	--	--	2.0E-08	mg/kg-day	3.0E-04	mg/kg-day	6.8E-05
				Tributyltin	4.9E-02	mg/kg	5.2E-09	mg/kg-day	--	--	--	4.6E-08	mg/kg-day	3.0E-04	mg/kg-day	1.5E-04
				Total PCB Congeners	1.7E+00	mg/kg	1.8E-07	mg/kg-day	2.0E+00	(mg/kg-day)-1	3.6E-07	1.6E-06	mg/kg-day	2.0E-05	mg/kg-day	8.1E-02
				Total TEQ – PCB DLC	3.0E-05	mg/kg	3.2E-12	mg/kg-day	1.3E+05	(mg/kg-day)-1	4.1E-07	2.8E-11	mg/kg-day	7.0E-10	mg/kg-day	4.0E-02
			Exp. Route Total								1.0E-05					3.9E-01

TABLE A-14A

Calculation of RME Chemical Cancer Risks and Noncancer Hazards - Adult and Child Recreational User, South Basin Area X

Appendix A - Updated Human Health Risk Assessment for Chemical Exposures

Scenario Timeframe:	Future
Receptor Population:	Recreational User
Receptor Age:	Adult and Child

							Cancer Risk Calculations					Noncancer Hazard Quotient				
					EPC		Intake/Exposure Concentration		CSF / Unit Risk			Intake/Exposure Concentration		RfD / RfC		
Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	Value	Units	Value	Units	Value	Units	Cancer Risk	Value	Units	Value	Units	Hazard Quotient
Sediment	Sediment	Sediment	Dermal	Aluminum	6.8E+04	mg/kg	2.3E-04	mg/kg-day	--	--	--	1.9E-03	mg/kg-day	1.0E+00	mg/kg-day	1.9E-03
				Antimony	4.3E+00	mg/kg	1.5E-08	mg/kg-day	--	--	--	1.2E-07	mg/kg-day	6.0E-05	mg/kg-day	2.0E-03
				Arsenic	1.1E+01	mg/kg	1.2E-07	mg/kg-day	9.5E+00	(mg/kg-day)-1	1.1E-06	9.4E-07	mg/kg-day	3.0E-04	mg/kg-day	3.1E-03
				Barium	5.6E+02	mg/kg	1.9E-06	mg/kg-day	--	--	--	1.5E-05	mg/kg-day	1.4E-02	mg/kg-day	1.1E-03
				Cadmium	5.2E-01	mg/kg	1.8E-10	mg/kg-day	6.0E+02	(mg/kg-day)-1	1.1E-07	1.4E-09	mg/kg-day	2.5E-05	mg/kg-day	5.7E-05
				Chromium	2.5E+02	mg/kg	8.7E-07	mg/kg-day	--	--	--	6.9E-06	mg/kg-day	2.0E-02	mg/kg-day	3.6E-04
				Cobalt	1.8E+01	mg/kg	6.2E-08	mg/kg-day	--	--	--	5.0E-07	mg/kg-day	3.0E-04	mg/kg-day	1.7E-03
				Copper	1.5E+02	mg/kg	5.1E-07	mg/kg-day	--	--	--	4.1E-06	mg/kg-day	4.0E-02	mg/kg-day	1.0E-04
				Iron	4.3E+04	mg/kg	1.5E-04	mg/kg-day	--	--	--	1.2E-03	mg/kg-day	7.0E-01	mg/kg-day	1.7E-03
				Lead	9.8E+01	mg/kg	3.4E-07	mg/kg-day	--	--	--	2.7E-06	mg/kg-day	--	--	--
				Manganese	4.5E+02	mg/kg	1.6E-06	mg/kg-day	--	--	--	1.2E-05	mg/kg-day	1.4E-01	mg/kg-day	8.9E-05
				Mercury	8.2E-01	mg/kg	2.8E-09	mg/kg-day	--	--	--	2.3E-08	mg/kg-day	1.0E-04	mg/kg-day	2.3E-04
				Molybdenum	1.2E+00	mg/kg	4.2E-09	mg/kg-day	--	--	--	3.4E-08	mg/kg-day	5.0E-03	mg/kg-day	6.8E-06
				Nickel	1.2E+02	mg/kg	4.3E-07	mg/kg-day	--	--	--	3.4E-06	mg/kg-day	8.0E-04	mg/kg-day	4.3E-03
				Selenium	3.6E-01	mg/kg	1.2E-09	mg/kg-day	--	--	--	9.9E-09	mg/kg-day	5.0E-03	mg/kg-day	2.0E-06
				Silver	1.0E+00	mg/kg	3.6E-09	mg/kg-day	--	--	--	2.9E-08	mg/kg-day	2.0E-04	mg/kg-day	1.4E-04
				Vanadium	1.4E+02	mg/kg	4.9E-07	mg/kg-day	--	--	--	3.9E-06	mg/kg-day	1.3E-04	mg/kg-day	3.0E-02
				Zinc	2.1E+02	mg/kg	7.3E-07	mg/kg-day	--	--	--	5.9E-06	mg/kg-day	3.0E-01	mg/kg-day	2.0E-05
				2,4'-DDD	1.2E-04	mg/kg	2.1E-12	mg/kg-day	2.4E-01	(mg/kg-day)-1	4.9E-13	1.7E-11	mg/kg-day	5.0E-04	mg/kg-day	3.3E-08
				4,4'-DDD	1.8E-02	mg/kg	3.1E-10	mg/kg-day	2.4E-01	(mg/kg-day)-1	7.5E-11	2.5E-09	mg/kg-day	5.0E-04	mg/kg-day	5.0E-06
				4,4'-DDE	7.4E-03	mg/kg	1.3E-10	mg/kg-day	3.4E-01	(mg/kg-day)-1	4.3E-11	1.0E-09	mg/kg-day	5.0E-04	mg/kg-day	2.0E-06
				4,4'-DDT	3.6E-03	mg/kg	6.2E-11	mg/kg-day	3.4E-01	(mg/kg-day)-1	2.1E-11	4.9E-10	mg/kg-day	5.0E-04	mg/kg-day	9.9E-07
				alpha-Chlordane	2.1E-03	mg/kg	3.6E-11	mg/kg-day	3.5E-01	(mg/kg-day)-1	1.3E-11	2.9E-10	mg/kg-day	5.0E-04	mg/kg-day	5.8E-07
				Dieldrin	7.2E-03	mg/kg	2.5E-10	mg/kg-day	1.6E+01	(mg/kg-day)-1	3.9E-09	2.0E-09	mg/kg-day	5.0E-05	mg/kg-day	4.0E-05
				gamma-Chlordane	3.3E-03	mg/kg	5.7E-11	mg/kg-day	3.5E-01	(mg/kg-day)-1	2.0E-11	4.6E-10	mg/kg-day	5.0E-04	mg/kg-day	9.2E-07
				Heptachlor	2.1E-03	mg/kg	7.3E-11	mg/kg-day	4.5E+00	(mg/kg-day)-1	3.3E-10	5.9E-10	mg/kg-day	5.0E-04	mg/kg-day	1.2E-06
				2-Methylnaphthalene	2.2E-02	mg/kg	1.1E-09	mg/kg-day	--	--	--	8.9E-09	mg/kg-day	4.0E-03	mg/kg-day	2.2E-06
				Acenaphthene	9.1E-03	mg/kg	4.7E-10	mg/kg-day	--	--	--	3.8E-09	mg/kg-day	6.0E-02	mg/kg-day	6.3E-08
				Acenaphthylene	2.0E-02	mg/kg	1.0E-09	mg/kg-day	--	--	--	8.2E-09	mg/kg-day	6.0E-02	mg/kg-day	1.4E-07
				Anthracene	1.0E-01	mg/kg	5.2E-09	mg/kg-day	--	--	--	4.2E-08	mg/kg-day	3.0E-01	mg/kg-day	1.4E-07
				Fluorene	3.0E-02	mg/kg	1.6E-09	mg/kg-day	--	--	--	1.3E-08	mg/kg-day	4.0E-02	mg/kg-day	3.1E-07
				Naphthalene	3.5E-02	mg/kg	1.8E-09	mg/kg-day	--	--	--	1.4E-08	mg/kg-day	2.0E-02	mg/kg-day	7.1E-07
				Phenanthrene	2.8E-01	mg/kg	1.4E-08	mg/kg-day	--	--	--	1.1E-07	mg/kg-day	3.0E-01	mg/kg-day	3.8E-07
				Benzo(a)anthracene M	2.4E-01	mg/kg	5.2E-08	mg/kg-day	1.2E+00	(mg/kg-day)-1	6.3E-08	9.8E-08	mg/kg-day	--	--	--
				Benzo(a)pyrene M	3.1E-01	mg/kg	6.9E-08	mg/kg-day	7.3E+00	(mg/kg-day)-1	5.1E-07	1.3E-07	mg/kg-day	--	--	--
				Benzo(b)fluoranthene M	2.4E-01	mg/kg	5.2E-08	mg/kg-day	1.2E+00	(mg/kg-day)-1	6.3E-08	9.8E-08	mg/kg-day	--	--	--
				Benzo(g,h,i)perylene	2.7E-01	mg/kg	1.4E-08	mg/kg-day	--	--	--	1.1E-07	mg/kg-day	3.0E-02	mg/kg-day	3.7E-06
				Benzo(k)fluoranthene M	2.4E-01	mg/kg	5.4E-08	mg/kg-day	1.2E+00	(mg/kg-day)-1	6.5E-08	1.0E-07	mg/kg-day	--	--	--
				Chrysene M	3.2E-01	mg/kg	7.0E-08	mg/kg-day	1.2E-01	(mg/kg-day)-1	8.4E-09	1.3E-07	mg/kg-day	--	--	--
				Dibenz(a,h)anthracene M	4.4E-02	mg/kg	9.8E-09	mg/kg-day	7.3E+00	(mg/kg-day)-1	7.1E-08	1.8E-08	mg/kg-day	--	--	--
				Fluoranthene	3.9E-01	mg/kg	2.0E-08	mg/kg-day	--	--	--	1.6E-07	mg/kg-day	4.0E-02	mg/kg-day	4.1E-06
				Indeno(1,2,3-cd)pyrene M	2.5E-01	mg/kg	5.5E-08	mg/kg-day	1.2E+00	(mg/kg-day)-1	6.6E-08	1.0E-07	mg/kg-day	--	--	--
				Pyrene	4.6E-01	mg/kg	2.4E-08	mg/kg-day	--	--	--	1.9E-07	mg/kg-day	3.0E-02	mg/kg-day	6.4E-06
				Monobutyltin	1.2E-03	mg/kg	4.0E-11	mg/kg-day	--	--	--	3.2E-10	mg/kg-day	3.0E-04	mg/kg-day	1.1E-06
				Dibutyltin	2.2E-02	mg/kg	7.4E-10	mg/kg-day	--	--	--	5.9E-09	mg/kg-day	3.0E-04	mg/kg-day	2.0E-05
				Tributyltin	4.9E-02	mg/kg	1.7E-09	mg/kg-day	--	--	--	1.3E-08	mg/kg-day	3.0E-04	mg/kg-day	4.5E-05
				Total PCB Congeners	1.7E+00	mg/kg	8.7E-08	mg/kg-day	2.0E+00	(mg/kg-day)-1	1.7E-07	7.0E-07	mg/kg-day	2.0E-05	mg/kg-day	3.5E-02
				Total TEQ – PCB DLC	3.0E-05	mg/kg	3.1E-13	mg/kg-day	1.3E+05	(mg/kg-day)-1	4.0E-08	2.5E-12	mg/kg-day	7.0E-10	mg/kg-day	3.5E-03
			Exp. Route Total								2.3E-06					8.6E-02
		Exposure Point Total									1.3E-05					4.7E-01
	Exposure Medium Total										1.3E-05					4.7E-01
Medium Total											1.3E-05					4.7E-01

TABLE A-14A

Calculation of RME Chemical Cancer Risks and Noncancer Hazards - Adult and Child Recreational User, South Basin Area X

Appendix A - Updated Human Health Risk Assessment for Chemical Exposures

Scenario Timeframe:	Future
Receptor Population:	Recreational User
Receptor Age:	Adult and Child

							Cancer Risk Calculations					Noncancer Hazard Quotient				
					EPC		Intake/Exposure Concentration		CSF / Unit Risk		Cancer	Intake/Exposure Concentration		RfD / RfC		Hazard
Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	Value	Units	Value	Units	Value	Units	Risk	Value	Units	Value	Units	Quotient
Macoma[a]	Macoma	Macoma	Ingestion	Aluminum	2.9E+02	mg/kg	2.2E-03	mg/kg-day	--	--	--	7.7E-03	mg/kg-day	1.0E+00	mg/kg-day	7.7E-03
				Antimony	8.4E-02	mg/kg	6.4E-07	mg/kg-day	--	--	--	2.2E-06	mg/kg-day	4.0E-04	mg/kg-day	5.6E-03
				Arsenic	3.4E+00	mg/kg	2.6E-05	mg/kg-day	9.5E+00	(mg/kg-day)-1	2.5E-04	9.1E-05	mg/kg-day	3.0E-04	mg/kg-day	3.0E-01
				Barium	3.0E+00	mg/kg	2.3E-05	mg/kg-day	--	--	--	8.1E-05	mg/kg-day	2.0E-01	mg/kg-day	4.0E-04
				Cadmium	5.0E-02	mg/kg	3.8E-07	mg/kg-day	1.5E+01	(mg/kg-day)-1	5.7E-06	1.3E-06	mg/kg-day	1.0E-03	mg/kg-day	1.3E-03
				Chromium	2.0E+00	mg/kg	1.5E-05	mg/kg-day	--	--	--	5.3E-05	mg/kg-day	1.5E+00	mg/kg-day	3.5E-05
				Cobalt	3.5E-01	mg/kg	2.7E-06	mg/kg-day	--	--	--	9.4E-06	mg/kg-day	3.0E-04	mg/kg-day	3.1E-02
				Copper	3.4E+00	mg/kg	2.6E-05	mg/kg-day	--	--	--	9.2E-05	mg/kg-day	4.0E-02	mg/kg-day	2.3E-03
				Iron	3.8E+02	mg/kg	2.9E-03	mg/kg-day	--	--	--	1.0E-02	mg/kg-day	7.0E-01	mg/kg-day	1.5E-02
				Lead	1.3E+00	mg/kg	1.0E-05	mg/kg-day	--	--	--	3.5E-05	mg/kg-day	--	--	--
				Manganese	4.4E+00	mg/kg	3.3E-05	mg/kg-day	--	--	--	1.2E-04	mg/kg-day	1.4E-01	mg/kg-day	8.3E-04
				Mercury	2.5E-02	mg/kg	1.9E-07	mg/kg-day	--	--	--	6.5E-07	mg/kg-day	1.0E-04	mg/kg-day	6.5E-03
				Molybdenum	4.6E-01	mg/kg	3.5E-06	mg/kg-day	--	--	--	1.2E-05	mg/kg-day	5.0E-03	mg/kg-day	2.4E-03
				Nickel	1.3E+00	mg/kg	1.0E-05	mg/kg-day	--	--	--	3.6E-05	mg/kg-day	2.0E-02	mg/kg-day	1.8E-03
				Selenium	7.5E-01	mg/kg	5.7E-06	mg/kg-day	--	--	--	2.0E-05	mg/kg-day	5.0E-03	mg/kg-day	4.0E-03
				Silver	2.5E-02	mg/kg	1.9E-07	mg/kg-day	--	--	--	6.6E-07	mg/kg-day	5.0E-03	mg/kg-day	1.3E-04
				Vanadium	1.2E+00	mg/kg	9.2E-06	mg/kg-day	--	--	--	3.2E-05	mg/kg-day	5.0E-03	mg/kg-day	6.4E-03
				Zinc	1.8E+01	mg/kg	1.4E-04	mg/kg-day	--	--	--	4.9E-04	mg/kg-day	3.0E-01	mg/kg-day	1.6E-03
				4,4'-DDD	1.9E-03	mg/kg	1.4E-08	mg/kg-day	2.4E-01	(mg/kg-day)-1	3.4E-09	5.0E-08	mg/kg-day	5.0E-04	mg/kg-day	9.9E-05
				4,4'-DDE	6.1E-03	mg/kg	4.6E-08	mg/kg-day	3.4E-01	(mg/kg-day)-1	1.6E-08	1.6E-07	mg/kg-day	5.0E-04	mg/kg-day	3.2E-04
				4,4'-DDT	1.3E-04	mg/kg	1.0E-09	mg/kg-day	3.4E-01	(mg/kg-day)-1	3.4E-10	3.5E-09	mg/kg-day	5.0E-04	mg/kg-day	7.0E-06
				alpha-Chlordane	1.1E-03	mg/kg	8.2E-09	mg/kg-day	3.5E-01	(mg/kg-day)-1	2.9E-09	2.9E-08	mg/kg-day	5.0E-04	mg/kg-day	5.8E-05
				Dieldrin	1.8E-03	mg/kg	1.4E-08	mg/kg-day	1.6E+01	(mg/kg-day)-1	2.2E-07	4.8E-08	mg/kg-day	5.0E-05	mg/kg-day	9.7E-04
				gamma-Chlordane	1.5E-03	mg/kg	1.2E-08	mg/kg-day	3.5E-01	(mg/kg-day)-1	4.0E-09	4.0E-08	mg/kg-day	5.0E-04	mg/kg-day	8.1E-05
				2-Methylnaphthalene	3.3E-04	mg/kg	2.5E-09	mg/kg-day	--	--	--	8.8E-09	mg/kg-day	4.0E-03	mg/kg-day	2.2E-06
				Acenaphthene	3.3E-04	mg/kg	2.5E-09	mg/kg-day	--	--	--	8.7E-09	mg/kg-day	6.0E-02	mg/kg-day	1.5E-07
				Acenaphthylene	4.9E-04	mg/kg	3.7E-09	mg/kg-day	--	--	--	1.3E-08	mg/kg-day	6.0E-02	mg/kg-day	2.2E-07
				Anthracene	1.9E-03	mg/kg	1.5E-08	mg/kg-day	--	--	--	5.1E-08	mg/kg-day	3.0E-01	mg/kg-day	1.7E-07
				Fluorene	3.7E-04	mg/kg	2.8E-09	mg/kg-day	--	--	--	9.8E-09	mg/kg-day	4.0E-02	mg/kg-day	2.5E-07
				Naphthalene	2.0E-03	mg/kg	1.5E-08	mg/kg-day	--	--	--	5.3E-08	mg/kg-day	2.0E-02	mg/kg-day	2.6E-06
				Phenanthrene	3.9E-03	mg/kg	3.0E-08	mg/kg-day	--	--	--	1.0E-07	mg/kg-day	3.0E-01	mg/kg-day	3.5E-07
				Benzo(a)anthracene	5.3E-03	mg/kg	4.0E-08	mg/kg-day	1.2E+00	(mg/kg-day)-1	4.8E-08	1.4E-07	mg/kg-day	--	--	--
				Benzo(a)pyrene	7.8E-03	mg/kg	6.0E-08	mg/kg-day	7.3E+00	(mg/kg-day)-1	4.3E-07	2.1E-07	mg/kg-day	--	--	--
				Benzo(b)fluoranthene	8.9E-03	mg/kg	6.8E-08	mg/kg-day	1.2E+00	(mg/kg-day)-1	8.1E-08	2.4E-07	mg/kg-day	--	--	--
				Benzo(g,h,i)perylene	5.4E-03	mg/kg	4.1E-08	mg/kg-day	--	--	--	1.4E-07	mg/kg-day	3.0E-02	mg/kg-day	4.8E-06
				Benzo(k)fluoranthene	1.2E-02	mg/kg	8.8E-08	mg/kg-day	1.2E+00	(mg/kg-day)-1	1.1E-07	3.1E-07	mg/kg-day	--	--	--
				Chrysene	8.8E-03	mg/kg	6.7E-08	mg/kg-day	1.2E-01	(mg/kg-day)-1	8.0E-09	2.3E-07	mg/kg-day	--	--	--
				Dibenz(a,h)anthracene	5.4E-04	mg/kg	4.1E-09	mg/kg-day	7.3E+00	(mg/kg-day)-1	3.0E-08	1.4E-08	mg/kg-day	--	--	--
				Fluoranthene	2.4E-02	mg/kg	1.8E-07	mg/kg-day	--	--	--	6.3E-07	mg/kg-day	4.0E-02	mg/kg-day	1.6E-05
				Indeno(1,2,3-cd)pyrene	3.7E-03	mg/kg	2.8E-08	mg/kg-day	1.2E+00	(mg/kg-day)-1	3.3E-08	9.7E-08	mg/kg-day	--	--	--
				Pyrene	3.0E-02	mg/kg	2.3E-07	mg/kg-day	--	--	--	8.0E-07	mg/kg-day	3.0E-02	mg/kg-day	2.7E-05
				Dibutyltin	2.5E-03	mg/kg	1.9E-08	mg/kg-day	--	--	--	6.5E-08	mg/kg-day	3.0E-04	mg/kg-day	2.2E-04
				Tributyltin	1.2E-02	mg/kg	9.3E-08	mg/kg-day	--	--	--	3.2E-07	mg/kg-day	3.0E-04	mg/kg-day	1.1E-03
				Total PCB Congeners	3.3E-01	mg/kg	2.5E-06	mg/kg-day	2.0E+00	(mg/kg-day)-1	5.0E-06	8.8E-06	mg/kg-day	2.0E-05	mg/kg-day	4.4E-01
				Total TEQ – PCB DLC	7.7E-06	mg/kg	5.8E-11	mg/kg-day	1.3E+05	(mg/kg-day)-1	7.6E-06	2.0E-10	mg/kg-day	7.0E-10	mg/kg-day	2.9E-01
				Total TEQ – TCDD DLC	8.8E-07	mg/kg	6.7E-12	mg/kg-day	1.3E+05	(mg/kg-day)-1	8.7E-07	2.3E-11	mg/kg-day	7.0E-10	mg/kg-day	3.3E-02
			Exp. Route Total								2.7E-04					1.2E+00
		Exposure Point Total									2.7E-04					1.2E+00
	Exposure Medium Total										2.7E-04					1.2E+00
Medium Total											2.7E-04					1.2E+00
										Total of Receptor Risks across All Media	2.8E-04				Total of Receptor Hazards across All Media	1.6E+00

TABLE A-14A
Calculation of RME Chemical Cancer Risks and Noncancer Hazards - Adult and Child Recreational User, South Basin Area X
Appendix A - Updated Human Health Risk Assessment for Chemical Exposures

Scenario Timeframe:	Future
Receptor Population:	Recreational User
Receptor Age:	Adult and Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Noncancer Hazard Quotient				
							Intake/Exposure Concentration		CSF / Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD / RfC		Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	

Notes:
[a] Macoma ingestion risks are evaluated for the adult receptor only.
Acronyms/Abbreviations:

-- =	not available or not applicable	(mg/kg-day)-1 =	1/(milligram[s] per kilogram per day)
CSF =	cancer slope factor	mg/kg =	milligram(s) per kilogram
DDD =	dichlorodiphenyldichloroethane	mg/kg-day =	milligram(s) per kilogram per day
DDE =	dichlorodiphenyldichloroethylene	PCB =	polychlorinated biphenyl
DDT =	dichlorodiphenyltrichloroethane	RfC =	reference concentration
EPC =	exposure point concentration	RfD =	reference dose
Exp. =	exposure	RME =	reasonable maximum exposure
M =	lifetime exposure from birth, mutagenic endpoint	TCDD =	tetrachlorodibenzo-p-dioxin

TABLE A-14B
Summary of Receptor Risks and Hazards - Adult and Child Recreational User, South Basin Area X
Appendix A - Updated Human Health Risk Assessment for Chemical Exposures

Scenario Timeframe:	Future
Receptor Population:	Recreational User
Receptor Age:	Adult and Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient			
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total
Sediment	Sediment	Sediment	Aluminum	--	--	--	--	6.5E-02	--	1.9E-03	6.7E-02
			Antimony	--	--	--	--	1.0E-02	--	2.0E-03	1.2E-02
			Arsenic	6.9E-06	--	1.1E-06	8.1E-06	2.2E-02	--	3.1E-03	2.5E-02
			Barium	--	--	--	--	2.6E-03	--	1.1E-03	3.7E-03
			Cadmium	8.3E-07	--	1.1E-07	9.3E-07	4.9E-04	--	5.7E-05	5.5E-04
			Chromium	--	--	--	--	1.6E-04	--	3.6E-04	5.2E-04
			Cobalt	--	--	--	--	5.7E-02	--	1.7E-03	5.9E-02
			Copper	--	--	--	--	3.5E-03	--	1.0E-04	3.6E-03
			Iron	--	--	--	--	5.9E-02	--	1.7E-03	6.1E-02
			Lead	--	--	--	--	--	--	--	--
			Manganese	--	--	--	--	3.1E-03	--	8.9E-05	3.2E-03
			Mercury	--	--	--	--	7.8E-03	--	2.3E-04	8.0E-03
			Molybdenum	--	--	--	--	2.3E-04	--	6.8E-06	2.4E-04
			Nickel	--	--	--	--	5.9E-03	--	4.3E-03	1.0E-02
			Selenium	--	--	--	--	6.8E-05	--	2.0E-06	7.0E-05
			Silver	--	--	--	--	2.0E-04	--	1.4E-04	3.4E-04
			Vanadium	--	--	--	--	2.7E-02	--	3.0E-02	5.7E-02
			Zinc	--	--	--	--	6.7E-04	--	2.0E-05	6.9E-04
			2,4'-DDD	3.1E-12	--	4.9E-13	3.6E-12	2.3E-07	--	3.3E-08	2.6E-07
			4,4'-DDD	4.6E-10	--	7.5E-11	5.4E-10	3.4E-05	--	5.0E-06	3.9E-05
			4,4'-DDE	2.7E-10	--	4.3E-11	3.1E-10	1.4E-05	--	2.0E-06	1.6E-05
			4,4'-DDT	1.3E-10	--	2.1E-11	1.5E-10	6.8E-06	--	9.9E-07	7.8E-06
			alpha-Chlordane	7.9E-11	--	1.3E-11	9.2E-11	4.0E-06	--	5.8E-07	4.6E-06
			Dieldrin	1.2E-08	--	3.9E-09	1.6E-08	1.4E-04	--	4.0E-05	1.8E-04
			gamma-Chlordane	1.2E-10	--	2.0E-11	1.4E-10	6.3E-06	--	9.2E-07	7.2E-06
			Heptachlor	1.0E-09	--	3.3E-10	1.4E-09	4.0E-06	--	1.2E-06	5.2E-06
			2-Methylnaphthalene	--	--	--	--	5.1E-06	--	2.2E-06	7.3E-06
			Acenaphthene	--	--	--	--	1.4E-07	--	6.3E-08	2.1E-07
			Acenaphthylene	--	--	--	--	3.2E-07	--	1.4E-07	4.5E-07
			Anthracene	--	--	--	--	3.2E-07	--	1.4E-07	4.6E-07
			Fluorene	--	--	--	--	7.2E-07	--	3.1E-07	1.0E-06
			Naphthalene	--	--	--	--	1.6E-06	--	7.1E-07	2.4E-06
			Phenanthrene	--	--	--	--	8.8E-07	--	3.8E-07	1.3E-06
			Benzo(a)anthracene	1.4E-07	--	6.3E-08	2.0E-07	--	--	--	--
			Benzo(a)pyrene	1.1E-06	--	5.1E-07	1.6E-06	--	--	--	--
			Benzo(b)fluoranthene	1.4E-07	--	6.3E-08	2.0E-07	--	--	--	--
			Benzo(g,h,i)perylene	--	--	--	--	8.5E-06	--	3.7E-06	1.2E-05
			Benzo(k)fluoranthene	1.4E-07	--	6.5E-08	2.1E-07	--	--	--	--
			Chrysene	1.8E-08	--	8.4E-09	2.7E-08	--	--	--	--
			Dibenz(a,h)anthracene	1.6E-07	--	7.1E-08	2.3E-07	--	--	--	--
			Fluoranthene	--	--	--	--	9.4E-06	--	4.1E-06	1.3E-05
			Indeno(1,2,3-cd)pyrene	1.4E-07	--	6.6E-08	2.1E-07	--	--	--	--
			Pyrene	--	--	--	--	1.5E-05	--	6.4E-06	2.1E-05
			Monobutyltin	--	--	--	--	3.7E-06	--	1.1E-06	4.7E-06
			Dibutyltin	--	--	--	--	6.8E-05	--	2.0E-05	8.8E-05
			Tributyltin	--	--	--	--	1.5E-04	--	4.5E-05	2.0E-04
			Total PCB Congeners	3.6E-07	--	1.7E-07	5.4E-07	8.1E-02	--	3.5E-02	1.2E-01
			Total TEQ – PCB DLC	4.1E-07	--	4.0E-08	4.5E-07	4.0E-02	--	3.5E-03	4.4E-02
			Chemical Total	1.0E-05	--	2.3E-06	1.3E-05	3.9E-01	--	8.6E-02	4.7E-01
		Exposure Point Total					1.3E-05				4.7E-01
	Exposure Medium Total						1.3E-05				4.7E-01
Medium Total							1.3E-05				4.7E-01

TABLE A-14B
Summary of Receptor Risks and Hazards - Adult and Child Recreational User, South Basin Area X
Appendix A - Updated Human Health Risk Assessment for Chemical Exposures

Scenario Timeframe:	Future
Receptor Population:	Recreational User
Receptor Age:	Adult and Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk Ingestion	Cancer Risk Inhalation	Cancer Risk Dermal	Cancer Risk Exposure Routes Total	Noncancer Hazard Quotient Ingestion	Noncancer Hazard Quotient Inhalation	Noncancer Hazard Quotient Dermal	Noncancer Hazard Quotient Exposure Routes Total
Macoma	Macoma	Macoma	Aluminum	--	--	--	--	7.7E-03	--	--	7.7E-03
		(ingestion)	Antimony	--	--	--	--	5.6E-03	--	--	5.6E-03
			Arsenic	2.5E-04	--	--	2.5E-04	3.0E-01	--	--	3.0E-01
			Barium	--	--	--	--	4.0E-04	--	--	4.0E-04
			Cadmium	5.7E-06	--	--	5.7E-06	1.3E-03	--	--	1.3E-03
			Chromium	--	--	--	--	3.5E-05	--	--	3.5E-05
			Cobalt	--	--	--	--	3.1E-02	--	--	3.1E-02
			Copper	--	--	--	--	2.3E-03	--	--	2.3E-03
			Iron	--	--	--	--	1.5E-02	--	--	1.5E-02
			Lead	--	--	--	--	--	--	--	--
			Manganese	--	--	--	--	8.3E-04	--	--	8.3E-04
			Mercury	--	--	--	--	6.5E-03	--	--	6.5E-03
			Molybdenum	--	--	--	--	2.4E-03	--	--	2.4E-03
			Nickel	--	--	--	--	1.8E-03	--	--	1.8E-03
			Selenium	--	--	--	--	4.0E-03	--	--	4.0E-03
			Silver	--	--	--	--	1.3E-04	--	--	1.3E-04
			Vanadium	--	--	--	--	6.4E-03	--	--	6.4E-03
			Zinc	--	--	--	--	1.6E-03	--	--	1.6E-03
			4,4'-DDD	3.4E-09	--	--	3.4E-09	9.9E-05	--	--	9.9E-05
			4,4'-DDE	1.6E-08	--	--	1.6E-08	3.2E-04	--	--	3.2E-04
			4,4'-DDT	3.4E-10	--	--	3.4E-10	7.0E-06	--	--	7.0E-06
			alpha-Chlordane	2.9E-09	--	--	2.9E-09	5.8E-05	--	--	5.8E-05
			Dieldrin	2.2E-07	--	--	2.2E-07	9.7E-04	--	--	9.7E-04
			gamma-Chlordane	4.0E-09	--	--	4.0E-09	8.1E-05	--	--	8.1E-05
			2-Methylnaphthalene	--	--	--	--	2.2E-06	--	--	2.2E-06
			Acenaphthene	--	--	--	--	1.5E-07	--	--	1.5E-07
			Acenaphthylene	--	--	--	--	2.2E-07	--	--	2.2E-07
			Anthracene	--	--	--	--	1.7E-07	--	--	1.7E-07
			Fluorene	--	--	--	--	2.5E-07	--	--	2.5E-07
			Naphthalene	--	--	--	--	2.6E-06	--	--	2.6E-06
			Phenanthrene	--	--	--	--	3.5E-07	--	--	3.5E-07
			Benzo(a)anthracene	4.8E-08	--	--	4.8E-08	--	--	--	--
			Benzo(a)pyrene	4.3E-07	--	--	4.3E-07	--	--	--	--
			Benzo(b)fluoranthene	8.1E-08	--	--	8.1E-08	--	--	--	--
			Benzo(g,h,i)perylene	--	--	--	--	4.8E-06	--	--	4.8E-06
			Benzo(k)fluoranthene	1.1E-07	--	--	1.1E-07	--	--	--	--
			Chrysene	8.0E-09	--	--	8.0E-09	--	--	--	--
			Dibenz(a,h)anthracene	3.0E-08	--	--	3.0E-08	--	--	--	--
			Fluoranthene	--	--	--	--	1.6E-05	--	--	1.6E-05
			Indeno(1,2,3-cd)pyrene	3.3E-08	--	--	3.3E-08	--	--	--	--
			Pyrene	--	--	--	--	2.7E-05	--	--	2.7E-05
			Dibutyltin	--	--	--	--	2.2E-04	--	--	2.2E-04
			Tributyltin	--	--	--	--	1.1E-03	--	--	1.1E-03
			Total PCB Congeners	5.0E-06	--	--	5.0E-06	4.4E-01	--	--	4.4E-01
			Total TEQ – PCB DLC	7.6E-06	--	--	7.6E-06	2.9E-01	--	--	2.9E-01
			Total TEQ – TCDD DLC	8.7E-07	--	--	8.7E-07	3.3E-02	--	--	3.3E-02
			Chemical Total	2.7E-04	--	--	2.7E-04	1.2E+00	--	--	1.2E+00
		Exposure Point Total					2.7E-04				1.2E+00
	Exposure Medium Total						2.7E-04				1.2E+00
Medium Total							2.7E-04				1.2E+00
Receptor Total						Total Risk across All Media	2.8E-04			Total Hazard across All Media	1.6E+00

Acronyms/Abbreviations:
-- = not available or not applicable
DDD = dichlorodiphenyldichloroethane
DDE = dichlorodiphenyldichloroethylene
DDT = dichlorodiphenyltrichloroethane
PCB = polychlorinated biphenyl
TCDD = tetrachlorodibenzo-p-dioxin

TABLE A-14C
Summary of Risk Drivers - Adult and Child Recreational User, South Basin Area X
Appendix A - Updated Human Health Risk Assessment for Chemical Exposures

Scenario Timeframe:	Future
Receptor Population:	Recreational User
Receptor Age:	Adult and Chilc

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient			
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total
Sediment	Sediment	Sediment (Oral/Dermal)	BAP (EQ)*	1.5E-06	--	7.7E-07	2.3E-06	--	--	--	--
			Arsenic	6.9E-06	--	1.1E-06	8.1E-06	2.2E-02	--	3.1E-03	2.5E-02
			Total PCB Congeners	3.6E-07	--	1.7E-07	5.4E-07	8.1E-02	--	3.5E-02	1.2E-01
			Chemical Total	8.5E-06	--	1.9E-06	1.0E-05	2.2E-02	--	3.1E-03	2.5E-02
		Exposure Point Total					1.0E-05				2.5E-02
	Exposure Medium Total						1.0E-05				2.5E-02
Medium Total							1.0E-05				2.5E-02
Macoma	Macoma	Macoma (Oral)	Arsenic	2.5E-04	--	--	2.5E-04	3.0E-01	--	--	3.0E-01
			Cadmium	5.7E-06	--	--	5.7E-06	1.3E-03	--	--	1.3E-03
			Total PCB Congeners	5.0E-06	--	--	5.0E-06	4.4E-01	--	--	4.4E-01
			Total TEQ – PCB DLC	7.6E-06	--	--	7.6E-06	2.9E-01	--	--	2.9E-01
			Total TEQ – TCDD DLC	8.7E-07	--	--	8.7E-07	3.3E-02	--	--	3.3E-02
			Chemical Total	2.7E-04	--	--	2.7E-04	1.1E+00	--	--	1.1E+00
		Exposure Point Total					2.7E-04				1.1E+00
	Exposure Medium Total						2.7E-04				1.1E+00
Medium Total							2.7E-04				1.1E+00
Receptor Total						Total Risk across All Media	2.8E-04			Total Hazard across All Media	1.1E+00

Notes:

* Risk for benzo(a)pyrene equivalent (BAP [EQ]) is calculated by summing the risks for each of the individual potentially carcinogenic PAHs: benzo(a)anthracene, benzo(b)fluoranthene, benzo(a)pyrene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene.

Acronyms/Abbreviations:

-- = not available or not applicable
BAP (EQ) = benzo(a)pyrene equivalent
PAH = polycyclic aromatic hydrocarbon
PCB = polychlorinated biphenyl

TABLE A-15A
Calculation of RME Chemical Cancer Risks and Noncancer Hazards - Construction Worker, South Basin Area X
Appendix A - Updated Human Health Risk Assessment for Chemical Exposures

Scenario Timeframe:	Future
Receptor Population:	Construction Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Noncancer Hazard Quotient				
							Intake/Exposure Concentration		CSF / Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD / RfC		Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
Sediment	Sediment	Sediment	Ingestion	Aluminum	6.8E+04	mg/kg	2.8E-03	mg/kg-day	--	--	--	1.9E-01	mg/kg-day	1.0E+00	mg/kg-day	1.9E-01
				Antimony	4.3E+00	mg/kg	1.7E-07	mg/kg-day	--	--	--	1.2E-05	mg/kg-day	4.0E-04	mg/kg-day	3.0E-02
				Arsenic	1.1E+01	mg/kg	2.8E-07	mg/kg-day	9.5E+00	(mg/kg-day)-1	2.6E-06	1.9E-05	mg/kg-day	3.0E-04	mg/kg-day	6.4E-02
				Barium	5.6E+02	mg/kg	2.2E-05	mg/kg-day	--	--	--	1.6E-03	mg/kg-day	2.0E-01	mg/kg-day	7.9E-03
				Cadmium	5.2E-01	mg/kg	2.1E-08	mg/kg-day	1.5E+01	(mg/kg-day)-1	3.1E-07	1.5E-06	mg/kg-day	1.0E-03	mg/kg-day	1.5E-03
				Chromium	2.5E+02	mg/kg	1.0E-05	mg/kg-day	--	--	--	7.1E-04	mg/kg-day	1.5E+00	mg/kg-day	4.7E-04
				Cobalt	1.8E+01	mg/kg	7.3E-07	mg/kg-day	--	--	--	5.1E-05	mg/kg-day	3.0E-04	mg/kg-day	1.7E-01
				Copper	1.5E+02	mg/kg	6.0E-06	mg/kg-day	--	--	--	4.2E-04	mg/kg-day	4.0E-02	mg/kg-day	1.1E-02
				Iron	4.3E+04	mg/kg	1.8E-03	mg/kg-day	--	--	--	1.2E-01	mg/kg-day	7.0E-01	mg/kg-day	1.8E-01
				Lead	9.8E+01	mg/kg	4.0E-06	mg/kg-day	--	--	--	2.8E-04	mg/kg-day	--	--	--
				Manganese	4.5E+02	mg/kg	1.8E-05	mg/kg-day	--	--	--	1.3E-03	mg/kg-day	1.4E-01	mg/kg-day	9.1E-03
				Mercury	8.2E-01	mg/kg	3.3E-08	mg/kg-day	--	--	--	2.3E-06	mg/kg-day	1.0E-04	mg/kg-day	2.3E-02
				Molybdenum	1.2E+00	mg/kg	5.0E-08	mg/kg-day	--	--	--	3.5E-06	mg/kg-day	5.0E-03	mg/kg-day	6.9E-04
				Nickel	1.2E+02	mg/kg	5.0E-06	mg/kg-day	--	--	--	3.5E-04	mg/kg-day	2.0E-02	mg/kg-day	1.8E-02
				Selenium	3.6E-01	mg/kg	1.4E-08	mg/kg-day	--	--	--	1.0E-06	mg/kg-day	5.0E-03	mg/kg-day	2.0E-04
				Silver	1.0E+00	mg/kg	4.2E-08	mg/kg-day	--	--	--	2.9E-06	mg/kg-day	5.0E-03	mg/kg-day	5.9E-04
				Vanadium	1.4E+02	mg/kg	5.7E-06	mg/kg-day	--	--	--	4.0E-04	mg/kg-day	5.0E-03	mg/kg-day	8.0E-02
				Zinc	2.1E+02	mg/kg	8.6E-06	mg/kg-day	--	--	--	6.0E-04	mg/kg-day	3.0E-01	mg/kg-day	2.0E-03
				2,4'-DDD	1.2E-04	mg/kg	4.8E-12	mg/kg-day	2.4E-01	(mg/kg-day)-1	1.2E-12	3.4E-10	mg/kg-day	5.0E-04	mg/kg-day	6.8E-07
				4,4'-DDD	1.8E-02	mg/kg	7.3E-10	mg/kg-day	2.4E-01	(mg/kg-day)-1	1.8E-10	5.1E-08	mg/kg-day	5.0E-04	mg/kg-day	1.0E-04
				4,4'-DDE	7.4E-03	mg/kg	3.0E-10	mg/kg-day	3.4E-01	(mg/kg-day)-1	1.0E-10	2.1E-08	mg/kg-day	5.0E-04	mg/kg-day	4.2E-05
				4,4'-DDT	3.6E-03	mg/kg	1.4E-10	mg/kg-day	3.4E-01	(mg/kg-day)-1	4.9E-11	1.0E-08	mg/kg-day	5.0E-04	mg/kg-day	2.0E-05
				alpha-Chlordane	2.1E-03	mg/kg	8.6E-11	mg/kg-day	3.5E-01	(mg/kg-day)-1	3.0E-11	6.0E-09	mg/kg-day	5.0E-04	mg/kg-day	1.2E-05
				Dieldrin	7.2E-03	mg/kg	2.9E-10	mg/kg-day	1.6E+01	(mg/kg-day)-1	4.6E-09	2.0E-08	mg/kg-day	5.0E-05	mg/kg-day	4.1E-04
				gamma-Chlordane	3.3E-03	mg/kg	1.3E-10	mg/kg-day	3.5E-01	(mg/kg-day)-1	4.7E-11	9.4E-09	mg/kg-day	5.0E-04	mg/kg-day	1.9E-05
				Heptachlor	2.1E-03	mg/kg	8.6E-11	mg/kg-day	4.5E+00	(mg/kg-day)-1	3.9E-10	6.0E-09	mg/kg-day	5.0E-04	mg/kg-day	1.2E-05
				2-Methylnaphthalene	2.2E-02	mg/kg	8.7E-10	mg/kg-day	--	--	--	6.1E-08	mg/kg-day	4.0E-03	mg/kg-day	1.5E-05
				Acenaphthene	9.1E-03	mg/kg	3.7E-10	mg/kg-day	--	--	--	2.6E-08	mg/kg-day	6.0E-02	mg/kg-day	4.3E-07
				Acenaphthylene	2.0E-02	mg/kg	8.0E-10	mg/kg-day	--	--	--	5.6E-08	mg/kg-day	6.0E-02	mg/kg-day	9.4E-07
				Anthracene	1.0E-01	mg/kg	4.1E-09	mg/kg-day	--	--	--	2.9E-07	mg/kg-day	3.0E-01	mg/kg-day	9.5E-07
				Fluorene	3.0E-02	mg/kg	1.2E-09	mg/kg-day	--	--	--	8.6E-08	mg/kg-day	4.0E-02	mg/kg-day	2.1E-06
				Naphthalene	3.5E-02	mg/kg	1.4E-09	mg/kg-day	--	--	--	9.7E-08	mg/kg-day	2.0E-02	mg/kg-day	4.9E-06
				Phenanthrene	2.8E-01	mg/kg	1.1E-08	mg/kg-day	--	--	--	7.9E-07	mg/kg-day	3.0E-01	mg/kg-day	2.6E-06
				Benzo(a)anthracene	2.4E-01	mg/kg	9.5E-09	mg/kg-day	1.2E+00	(mg/kg-day)-1	1.1E-08	6.7E-07	mg/kg-day	--	--	--
				Benzo(a)pyrene	3.1E-01	mg/kg	1.3E-08	mg/kg-day	7.3E+00	(mg/kg-day)-1	9.3E-08	8.9E-07	mg/kg-day	--	--	--
				Benzo(b)fluoranthene	2.4E-01	mg/kg	9.5E-09	mg/kg-day	1.2E+00	(mg/kg-day)-1	1.1E-08	6.7E-07	mg/kg-day	--	--	--
				Benzo(g,h,i)perylene	2.7E-01	mg/kg	1.1E-08	mg/kg-day	--	--	--	7.6E-07	mg/kg-day	3.0E-02	mg/kg-day	2.5E-05
				Benzo(k)fluoranthene	2.4E-01	mg/kg	9.8E-09	mg/kg-day	1.2E+00	(mg/kg-day)-1	1.2E-08	6.9E-07	mg/kg-day	--	--	--
				Chrysene	3.2E-01	mg/kg	1.3E-08	mg/kg-day	1.2E-01	(mg/kg-day)-1	1.5E-09	8.9E-07	mg/kg-day	--	--	--
				Dibenz(a,h)anthracene	4.4E-02	mg/kg	1.8E-09	mg/kg-day	7.3E+00	(mg/kg-day)-1	1.3E-08	1.2E-07	mg/kg-day	--	--	--
				Fluoranthene	3.9E-01	mg/kg	1.6E-08	mg/kg-day	--	--	--	1.1E-06	mg/kg-day	4.0E-02	mg/kg-day	2.8E-05
				Indeno(1,2,3-cd)pyrene	2.5E-01	mg/kg	1.0E-08	mg/kg-day	1.2E+00	(mg/kg-day)-1	1.2E-08	7.0E-07	mg/kg-day	--	--	--
				Pyrene	4.6E-01	mg/kg	1.9E-08	mg/kg-day	--	--	--	1.3E-06	mg/kg-day	3.0E-02	mg/kg-day	4.4E-05
				Monobutyltin	1.2E-03	mg/kg	4.7E-11	mg/kg-day	--	--	--	3.3E-09	mg/kg-day	3.0E-04	mg/kg-day	1.1E-05
				Dibutyltin	2.2E-02	mg/kg	8.7E-10	mg/kg-day	--	--	--	6.1E-08	mg/kg-day	3.0E-04	mg/kg-day	2.0E-04
				Tributyltin	4.9E-02	mg/kg	2.0E-09	mg/kg-day	--	--	--	1.4E-07	mg/kg-day	3.0E-04	mg/kg-day	4.6E-04
				Total PCB Congeners	1.7E+00	mg/kg	6.8E-08	mg/kg-day	2.0E+00	(mg/kg-day)-1	1.4E-07	4.8E-06	mg/kg-day	2.0E-05	mg/kg-day	2.4E-01
				Total TEQ – PCB DLC	3.0E-05	mg/kg	1.2E-12	mg/kg-day	1.3E+05	(mg/kg-day)-1	1.6E-07	8.4E-11	mg/kg-day	7.0E-10	mg/kg-day	1.2E-01
			Exp. Route Total								3.4E-06					1.1E+00

TABLE A-15A

Calculation of RME Chemical Cancer Risks and Noncancer Hazards - Construction Worker, South Basin Area X

Appendix A - Updated Human Health Risk Assessment for Chemical Exposures

Scenario Timeframe:	Future
Receptor Population:	Construction Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Noncancer Hazard Quotient				
							Intake/Exposure Concentration		CSF / Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD / RfC		Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
Sediment	Sediment	Sediment	Dermal	Aluminum	6.8E+04	mg/kg	4.0E-04	mg/kg-day	--	--	--	2.8E-02	mg/kg-day	1.0E+00	mg/kg-day	2.8E-02
				Antimony	4.3E+00	mg/kg	2.5E-08	mg/kg-day	--	--	--	1.8E-06	mg/kg-day	6.0E-05	mg/kg-day	2.9E-02
				Arsenic	1.1E+01	mg/kg	2.0E-07	mg/kg-day	9.5E+00	(mg/kg-day)-1	1.9E-06	1.4E-05	mg/kg-day	3.0E-04	mg/kg-day	4.7E-02
				Barium	5.6E+02	mg/kg	3.3E-06	mg/kg-day	--	--	--	2.3E-04	mg/kg-day	1.4E-02	mg/kg-day	1.6E-02
				Cadmium	5.2E-01	mg/kg	3.0E-10	mg/kg-day	6.0E+02	(mg/kg-day)-1	1.8E-07	2.1E-08	mg/kg-day	2.5E-05	mg/kg-day	8.5E-04
				Chromium	2.5E+02	mg/kg	1.5E-06	mg/kg-day	--	--	--	1.0E-04	mg/kg-day	2.0E-02	mg/kg-day	5.3E-03
				Cobalt	1.8E+01	mg/kg	1.1E-07	mg/kg-day	--	--	--	7.4E-06	mg/kg-day	3.0E-04	mg/kg-day	2.5E-02
				Copper	1.5E+02	mg/kg	8.8E-07	mg/kg-day	--	--	--	6.1E-05	mg/kg-day	4.0E-02	mg/kg-day	1.5E-03
				Iron	4.3E+04	mg/kg	2.6E-04	mg/kg-day	--	--	--	1.8E-02	mg/kg-day	7.0E-01	mg/kg-day	2.6E-02
				Lead	9.8E+01	mg/kg	5.8E-07	mg/kg-day	--	--	--	4.0E-05	mg/kg-day	--	--	--
				Manganese	4.5E+02	mg/kg	2.7E-06	mg/kg-day	--	--	--	1.9E-04	mg/kg-day	1.4E-01	mg/kg-day	1.3E-03
				Mercury	8.2E-01	mg/kg	4.8E-09	mg/kg-day	--	--	--	3.4E-07	mg/kg-day	1.0E-04	mg/kg-day	3.4E-03
				Molybdenum	1.2E+00	mg/kg	7.2E-09	mg/kg-day	--	--	--	5.1E-07	mg/kg-day	5.0E-03	mg/kg-day	1.0E-04
				Nickel	1.2E+02	mg/kg	7.3E-07	mg/kg-day	--	--	--	5.1E-05	mg/kg-day	8.0E-04	mg/kg-day	6.4E-02
				Selenium	3.6E-01	mg/kg	2.1E-09	mg/kg-day	--	--	--	1.5E-07	mg/kg-day	5.0E-03	mg/kg-day	3.0E-05
				Silver	1.0E+00	mg/kg	6.2E-09	mg/kg-day	--	--	--	4.3E-07	mg/kg-day	2.0E-04	mg/kg-day	2.2E-03
				Vanadium	1.4E+02	mg/kg	8.4E-07	mg/kg-day	--	--	--	5.9E-05	mg/kg-day	1.3E-04	mg/kg-day	4.5E-01
				Zinc	2.1E+02	mg/kg	1.3E-06	mg/kg-day	--	--	--	8.8E-05	mg/kg-day	3.0E-01	mg/kg-day	2.9E-04
				2,4'-DDD	1.2E-04	mg/kg	3.5E-12	mg/kg-day	2.4E-01	(mg/kg-day)-1	8.5E-13	2.5E-10	mg/kg-day	5.0E-04	mg/kg-day	5.0E-07
				4,4'-DDD	1.8E-02	mg/kg	5.3E-10	mg/kg-day	2.4E-01	(mg/kg-day)-1	1.3E-10	3.7E-08	mg/kg-day	5.0E-04	mg/kg-day	7.5E-05
				4,4'-DDE	7.4E-03	mg/kg	2.2E-10	mg/kg-day	3.4E-01	(mg/kg-day)-1	7.4E-11	1.5E-08	mg/kg-day	5.0E-04	mg/kg-day	3.1E-05
				4,4'-DDT	3.6E-03	mg/kg	1.1E-10	mg/kg-day	3.4E-01	(mg/kg-day)-1	3.6E-11	7.4E-09	mg/kg-day	5.0E-04	mg/kg-day	1.5E-05
				alpha-Chlordane	2.1E-03	mg/kg	6.3E-11	mg/kg-day	3.5E-01	(mg/kg-day)-1	2.2E-11	4.4E-09	mg/kg-day	5.0E-04	mg/kg-day	8.8E-06
				Dieldrin	7.2E-03	mg/kg	4.2E-10	mg/kg-day	1.6E+01	(mg/kg-day)-1	6.8E-09	3.0E-08	mg/kg-day	5.0E-05	mg/kg-day	5.9E-04
				gamma-Chlordane	3.3E-03	mg/kg	9.8E-11	mg/kg-day	3.5E-01	(mg/kg-day)-1	3.4E-11	6.9E-09	mg/kg-day	5.0E-04	mg/kg-day	1.4E-05
				Heptachlor	2.1E-03	mg/kg	1.3E-10	mg/kg-day	4.5E+00	(mg/kg-day)-1	5.7E-10	8.8E-09	mg/kg-day	5.0E-04	mg/kg-day	1.8E-05
				2-Methylnaphthalene	2.2E-02	mg/kg	1.9E-09	mg/kg-day	--	--	--	1.3E-07	mg/kg-day	4.0E-03	mg/kg-day	3.3E-05
				Acenaphthene	9.1E-03	mg/kg	8.1E-10	mg/kg-day	--	--	--	5.6E-08	mg/kg-day	6.0E-02	mg/kg-day	9.4E-07
				Acenaphthylene	2.0E-02	mg/kg	1.8E-09	mg/kg-day	--	--	--	1.2E-07	mg/kg-day	6.0E-02	mg/kg-day	2.1E-06
				Anthracene	1.0E-01	mg/kg	8.9E-09	mg/kg-day	--	--	--	6.3E-07	mg/kg-day	3.0E-01	mg/kg-day	2.1E-06
				Fluorene	3.0E-02	mg/kg	2.7E-09	mg/kg-day	--	--	--	1.9E-07	mg/kg-day	4.0E-02	mg/kg-day	4.7E-06
				Naphthalene	3.5E-02	mg/kg	3.1E-09	mg/kg-day	--	--	--	2.1E-07	mg/kg-day	2.0E-02	mg/kg-day	1.1E-05
				Phenanthrene	2.8E-01	mg/kg	2.5E-08	mg/kg-day	--	--	--	1.7E-06	mg/kg-day	3.0E-01	mg/kg-day	5.7E-06
				Benzo(a)anthracene	2.4E-01	mg/kg	2.1E-08	mg/kg-day	1.2E+00	(mg/kg-day)-1	2.5E-08	1.5E-06	mg/kg-day	--	--	--
				Benzo(a)pyrene	3.1E-01	mg/kg	2.8E-08	mg/kg-day	7.3E+00	(mg/kg-day)-1	2.0E-07	1.9E-06	mg/kg-day	--	--	--
				Benzo(b)fluoranthene	2.4E-01	mg/kg	2.1E-08	mg/kg-day	1.2E+00	(mg/kg-day)-1	2.5E-08	1.5E-06	mg/kg-day	--	--	--
				Benzo(g,h,i)perylene	2.7E-01	mg/kg	2.4E-08	mg/kg-day	--	--	--	1.7E-06	mg/kg-day	3.0E-02	mg/kg-day	5.6E-05
				Benzo(k)fluoranthene	2.4E-01	mg/kg	2.2E-08	mg/kg-day	1.2E+00	(mg/kg-day)-1	2.6E-08	1.5E-06	mg/kg-day	--	--	--
				Chrysene	3.2E-01	mg/kg	2.8E-08	mg/kg-day	1.2E-01	(mg/kg-day)-1	3.3E-09	2.0E-06	mg/kg-day	--	--	--
				Dibenz(a,h)anthracene	4.4E-02	mg/kg	3.9E-09	mg/kg-day	7.3E+00	(mg/kg-day)-1	2.9E-08	2.7E-07	mg/kg-day	--	--	--
				Fluoranthene	3.9E-01	mg/kg	3.5E-08	mg/kg-day	--	--	--	2.4E-06	mg/kg-day	4.0E-02	mg/kg-day	6.1E-05
				Indeno(1,2,3-cd)pyrene	2.5E-01	mg/kg	2.2E-08	mg/kg-day	1.2E+00	(mg/kg-day)-1	2.6E-08	1.5E-06	mg/kg-day	--	--	--
				Pyrene	4.6E-01	mg/kg	4.1E-08	mg/kg-day	--	--	--	2.9E-06	mg/kg-day	3.0E-02	mg/kg-day	9.6E-05
				Monobutyltin	1.2E-03	mg/kg	6.8E-11	mg/kg-day	--	--	--	4.8E-09	mg/kg-day	3.0E-04	mg/kg-day	1.6E-05
				Dibutyltin	2.2E-02	mg/kg	1.3E-09	mg/kg-day	--	--	--	8.9E-08	mg/kg-day	3.0E-04	mg/kg-day	3.0E-04
				Tributyltin	4.9E-02	mg/kg	2.9E-09	mg/kg-day	--	--	--	2.0E-07	mg/kg-day	3.0E-04	mg/kg-day	6.7E-04
				Total PCB Congeners	1.7E+00	mg/kg	1.5E-07	mg/kg-day	2.0E+00	(mg/kg-day)-1	3.0E-07	1.1E-05	mg/kg-day	2.0E-05	mg/kg-day	5.3E-01
				Total TEQ – PCB DLC	3.0E-05	mg/kg	5.3E-13	mg/kg-day	1.3E+05	(mg/kg-day)-1	6.9E-08	3.7E-11	mg/kg-day	7.0E-10	mg/kg-day	5.3E-02
			Exp. Route Total								2.8E-06					1.3E+00
		Exposure Point Total									6.2E-06					2.4E+00
	Exposure Medium Total										6.2E-06					2.4E+00
Medium Total											6.2E-06					2.4E+00
										Total of Receptor Risks across All Media	6.2E-06				Total of Receptor Hazards across All Media	2.4E+00

TABLE A-15A
Calculation of RME Chemical Cancer Risks and Noncancer Hazards - Construction Worker, South Basin Area X
Appendix A - Updated Human Health Risk Assessment for Chemical Exposures

Scenario Timeframe:	Future
Receptor Population:	Construction Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Noncancer Hazard Quotient				
							Intake/Exposure Concentration		CSF / Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD / RfC		Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	

Acronyms/Abbreviations:

-- =	not available or not applicable	(mg/kg-day)-	1/(milligram[s] per kilogram per day)
CSF =	cancer slope factor	mg/kg =	milligram(s) per kilogram
DDD =	dichlorodiphenyldichloroethane	mg/kg-day =	milligram(s) per kilogram per day
DDE =	dichlorodiphenyldichloroethylene	PCB =	polychlorinated biphenyl
DDT =	dichlorodiphenyltrichloroethane	RfC =	reference concentration
EPC =	exposure point concentration	RfD =	reference dose
Exp. =	exposure	RME =	reasonable maximum exposure
M =	lifetime exposure from birth, mutagenic endpoint	TCDD =	tetrachlorodibenzo-p-dioxin

TABLE A-15B
Summary of Receptor Risks and Hazards - Construction Worker, South Basin Area X
Appendix A - Updated Human Health Risk Assessment for Chemical Exposures

Scenario Timeframe:	Future
Receptor Population:	Construction Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk: Ingestion	Cancer Risk: Inhalation	Cancer Risk: Dermal	Cancer Risk: Exposure Routes Total	Noncancer Hazard Quotient: Ingestion	Noncancer Hazard Quotient: Inhalation	Noncancer Hazard Quotient: Dermal	Noncancer Hazard Quotient: Exposure Routes Total
Sediment	Sediment	Sediment	Aluminum	--	--	--	--	1.9E-01	--	2.8E-02	2.2E-01
			Antimony	--	--	--	--	3.0E-02	--	2.9E-02	6.0E-02
			Arsenic	2.6E-06	--	1.9E-06	4.5E-06	6.4E-02	--	4.7E-02	1.1E-01
			Barium	--	--	--	--	7.9E-03	--	1.6E-02	2.4E-02
			Cadmium	3.1E-07	--	1.8E-07	4.9E-07	1.5E-03	--	8.5E-04	2.3E-03
			Chromium	--	--	--	--	4.7E-04	--	5.3E-03	5.8E-03
			Cobalt	--	--	--	--	1.7E-01	--	2.5E-02	1.9E-01
			Copper	--	--	--	--	1.1E-02	--	1.5E-03	1.2E-02
			Iron	--	--	--	--	1.8E-01	--	2.6E-02	2.0E-01
			Lead	--	--	--	--	--	--	--	--
			Manganese	--	--	--	--	9.1E-03	--	1.3E-03	1.0E-02
			Mercury	--	--	--	--	2.3E-02	--	3.4E-03	2.7E-02
			Molybdenum	--	--	--	--	6.9E-04	--	1.0E-04	8.0E-04
			Nickel	--	--	--	--	1.8E-02	--	6.4E-02	8.1E-02
			Selenium	--	--	--	--	2.0E-04	--	3.0E-05	2.3E-04
			Silver	--	--	--	--	5.9E-04	--	2.2E-03	2.7E-03
			Vanadium	--	--	--	--	8.0E-02	--	4.5E-01	5.3E-01
			Zinc	--	--	--	--	2.0E-03	--	2.9E-04	2.3E-03
			2,4'-DDD	1.2E-12	--	8.5E-13	2.0E-12	6.8E-07	--	5.0E-07	1.2E-06
			4,4'-DDD	1.8E-10	--	1.3E-10	3.0E-10	1.0E-04	--	7.5E-05	1.8E-04
			4,4'-DDE	1.0E-10	--	7.4E-11	1.8E-10	4.2E-05	--	3.1E-05	7.2E-05
			4,4'-DDT	4.9E-11	--	3.6E-11	8.5E-11	2.0E-05	--	1.5E-05	3.5E-05
			alpha-Chlordane	3.0E-11	--	2.2E-11	5.2E-11	1.2E-05	--	8.8E-06	2.1E-05
			Dieldrin	4.6E-09	--	6.8E-09	1.1E-08	4.1E-04	--	5.9E-04	1.0E-03
			gamma-Chlordane	4.7E-11	--	3.4E-11	8.1E-11	1.9E-05	--	1.4E-05	3.3E-05
			Heptachlor	3.9E-10	--	5.7E-10	9.5E-10	1.2E-05	--	1.8E-05	3.0E-05
			2-Methylnaphthalene	--	--	--	--	1.5E-05	--	3.3E-05	4.8E-05
			Acenaphthene	--	--	--	--	4.3E-07	--	9.4E-07	1.4E-06
			Acenaphthylene	--	--	--	--	9.4E-07	--	2.1E-06	3.0E-06
			Anthracene	--	--	--	--	9.5E-07	--	2.1E-06	3.0E-06
			Fluorene	--	--	--	--	2.1E-06	--	4.7E-06	6.8E-06
			Naphthalene	--	--	--	--	4.9E-06	--	1.1E-05	1.6E-05
			Phenanthrene	--	--	--	--	2.6E-06	--	5.7E-06	8.4E-06
			Benzo(a)anthracene	1.1E-08	--	2.5E-08	3.7E-08	--	--	--	--
			Benzo(a)pyrene	9.3E-08	--	2.0E-07	3.0E-07	--	--	--	--
			Benzo(b)fluoranthene	1.1E-08	--	2.5E-08	3.7E-08	--	--	--	--
			Benzo(g,h,i)perylene	--	--	--	--	2.5E-05	--	5.6E-05	8.1E-05
			Benzo(k)fluoranthene	1.2E-08	--	2.6E-08	3.8E-08	--	--	--	--
			Chrysene	1.5E-09	--	3.3E-09	4.9E-09	--	--	--	--
			Dibenz(a,h)anthracene	1.3E-08	--	2.9E-08	4.1E-08	--	--	--	--
			Fluoranthene	--	--	--	--	2.8E-05	--	6.1E-05	8.9E-05
			Indeno(1,2,3-cd)pyrene	1.2E-08	--	2.6E-08	3.8E-08	--	--	--	--
			Pyrene	--	--	--	--	4.4E-05	--	9.6E-05	1.4E-04
			Monobutyltin	--	--	--	--	1.1E-05	--	1.6E-05	2.7E-05
			Dibutyltin	--	--	--	--	2.0E-04	--	3.0E-04	5.0E-04
			Tributyltin	--	--	--	--	4.6E-04	--	6.7E-04	1.1E-03
			Total PCB Congeners	1.4E-07	--	3.0E-07	4.4E-07	2.4E-01	--	5.3E-01	7.7E-01
			Total TEQ – PCB DLC	1.6E-07	--	6.9E-08	2.2E-07	1.2E-01	--	5.3E-02	1.7E-01
			Chemical Total	3.4E-06	--	2.8E-06	6.2E-06	1.1E+00	--	1.3E+00	2.4E+00
		Exposure Point Total					6.2E-06				2.4E+00
	Exposure Medium Total						6.2E-06				2.4E+00
Medium Total							6.2E-06				2.4E+00
Receptor Total						Total Risk across All Media	6.2E-06			Total Hazard across All Media	2.4E+00

TABLE A-15B
Summary of Receptor Risks and Hazards - Construction Worker, South Basin Area X
Appendix A - Updated Human Health Risk Assessment for Chemical Exposures

Scenario Timeframe:	Future
Receptor Population:	Construction Worker
Receptor Age:	Adult

				Cancer Risk				Noncancer Hazard Quotient			
Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Ingestion	Inhalation	Dermal	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total

Acronyms/Abbreviations:

-- =	not available or not applicable
DDD =	dichlorodiphenyldichloroethane
DDE =	dichlorodiphenyldichloroethylene
DDT =	dichlorodiphenyltrichloroethane
PCB =	polychlorinated biphenyl
TCDD =	tetrachlorodibenzo-p-dioxin

TABLE A-15C
Summary of Risk Drivers - Construction Worker, South Basin Area X
Appendix A - Updated Human Health Risk Assessment for Chemical Exposures

Scenario Timeframe:	Future
Receptor Population:	Construction Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk: Ingestion	Cancer Risk: Inhalation	Cancer Risk: Dermal	Cancer Risk: Exposure Routes Total	Noncancer Hazard Quotient: Ingestion	Noncancer Hazard Quotient: Inhalation	Noncancer Hazard Quotient: Dermal	Noncancer Hazard Quotient: Exposure Routes Total
Sediment	Sediment	Sediment	Arsenic	2.6E-06	--	1.9E-06	4.5E-06	6.4E-02	--	4.7E-02	1.1E-01
			Chemical Total	--	--	--	4.5E-06	--	--	--	1.1E-01
		Exposure Point Total					4.5E-06				1.1E-01
	Exposure Medium Total						4.5E-06				1.1E-01
Medium Total							4.5E-06				1.1E-01
Receptor Total						Total Risk across All Media	4.5E-06			Total Hazard across All Media	1.1E-01

Acronyms/Abbreviations:

-- = not available or not applicable

TABLE A-16A

Calculation of RME Chemical Cancer Risks and Noncancer Hazards - Adult and Child Recreational User, Reference Stations

Appendix A - Updated Human Health Risk Assessment for Chemical Exposures

Scenario Timeframe:	Future
Receptor Population:	Recreational User
Receptor Age:	Adult and Child

								Cancer Risk Calculations					Noncancer Hazard Quotient				
						EPC		Intake/Exposure Concentration		CSF / Unit Risk			Intake/Exposure Concentration		RfD / RfC		
Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern		Value	Units	Value	Units	Value	Units	Cancer Risk	Value	Units	Value	Units	Hazard Quotient
Sediment	Sediment	Sediment	Ingestion	Aluminum		7.6E+04	mg/kg	8.1E-03	mg/kg-day	--	--	--	7.2E-02	mg/kg-day	1.0E+00	mg/kg-day	7.2E-02
				Antimony		9.2E-01	mg/kg	9.8E-08	mg/kg-day	--	--	--	8.7E-07	mg/kg-day	4.0E-04	mg/kg-day	2.2E-03
				Arsenic		1.2E+01	mg/kg	7.8E-07	mg/kg-day	9.5E+00	(mg/kg-day)-1	7.4E-06	6.9E-06	mg/kg-day	3.0E-04	mg/kg-day	2.3E-02
				Barium		4.8E+02	mg/kg	5.2E-05	mg/kg-day	--	--	--	4.6E-04	mg/kg-day	2.0E-01	mg/kg-day	2.3E-03
				Cadmium		6.4E-01	mg/kg	6.9E-08	mg/kg-day	1.5E+01	(mg/kg-day)-1	1.0E-06	6.1E-07	mg/kg-day	1.0E-03	mg/kg-day	6.1E-04
				Chromium		1.8E+02	mg/kg	1.9E-05	mg/kg-day	--	--	--	1.7E-04	mg/kg-day	1.5E+00	mg/kg-day	1.1E-04
				Cobalt		2.1E+01	mg/kg	2.3E-06	mg/kg-day	--	--	--	2.0E-05	mg/kg-day	3.0E-04	mg/kg-day	6.8E-02
				Copper		4.7E+01	mg/kg	5.0E-06	mg/kg-day	--	--	--	4.5E-05	mg/kg-day	4.0E-02	mg/kg-day	1.1E-03
				Iron		4.9E+04	mg/kg	5.3E-03	mg/kg-day	--	--	--	4.7E-02	mg/kg-day	7.0E-01	mg/kg-day	6.7E-02
				Lead		2.9E+01	mg/kg	3.1E-06	mg/kg-day	--	--	--	2.7E-05	mg/kg-day	--	--	--
				Manganese		6.2E+02	mg/kg	6.6E-05	mg/kg-day	--	--	--	5.8E-04	mg/kg-day	1.4E-01	mg/kg-day	4.2E-03
				Mercury		3.6E-01	mg/kg	3.9E-08	mg/kg-day	--	--	--	3.5E-07	mg/kg-day	1.0E-04	mg/kg-day	3.5E-03
				Molybdenum		8.5E-01	mg/kg	9.1E-08	mg/kg-day	--	--	--	8.1E-07	mg/kg-day	5.0E-03	mg/kg-day	1.6E-04
				Nickel		1.0E+02	mg/kg	1.1E-05	mg/kg-day	--	--	--	9.5E-05	mg/kg-day	2.0E-02	mg/kg-day	4.8E-03
				Selenium		4.6E-01	mg/kg	4.9E-08	mg/kg-day	--	--	--	4.3E-07	mg/kg-day	5.0E-03	mg/kg-day	8.7E-05
				Silver		4.5E-01	mg/kg	4.8E-08	mg/kg-day	--	--	--	4.2E-07	mg/kg-day	5.0E-03	mg/kg-day	8.5E-05
				Vanadium		1.6E+02	mg/kg	1.7E-05	mg/kg-day	--	--	--	1.5E-04	mg/kg-day	5.0E-03	mg/kg-day	3.0E-02
				Zinc		1.3E+02	mg/kg	1.4E-05	mg/kg-day	--	--	--	1.2E-04	mg/kg-day	3.0E-01	mg/kg-day	4.0E-04
				4,4'-DDD		2.4E-03	mg/kg	2.6E-10	mg/kg-day	2.4E-01	(mg/kg-day)-1	6.2E-11	2.3E-09	mg/kg-day	5.0E-04	mg/kg-day	4.6E-06
				4,4'-DDE		9.1E-04	mg/kg	9.8E-11	mg/kg-day	3.4E-01	(mg/kg-day)-1	3.3E-11	8.7E-10	mg/kg-day	5.0E-04	mg/kg-day	1.7E-06
				4,4'-DDT		1.7E-03	mg/kg	1.8E-10	mg/kg-day	3.4E-01	(mg/kg-day)-1	6.0E-11	1.6E-09	mg/kg-day	5.0E-04	mg/kg-day	3.1E-06
				alpha-Chlordane		1.2E-04	mg/kg	1.3E-11	mg/kg-day	3.5E-01	(mg/kg-day)-1	4.5E-12	1.1E-10	mg/kg-day	5.0E-04	mg/kg-day	2.3E-07
				2-Methylnaphthalene		6.4E-03	mg/kg	6.9E-10	mg/kg-day	--	--	--	6.1E-09	mg/kg-day	4.0E-03	mg/kg-day	1.5E-06
				Acenaphthene		1.2E-02	mg/kg	1.3E-09	mg/kg-day	--	--	--	1.2E-08	mg/kg-day	6.0E-02	mg/kg-day	2.0E-07
				Acenaphthylene		9.3E-03	mg/kg	9.9E-10	mg/kg-day	--	--	--	8.8E-09	mg/kg-day	6.0E-02	mg/kg-day	1.5E-07
				Anthracene		3.1E-02	mg/kg	3.3E-09	mg/kg-day	--	--	--	3.0E-08	mg/kg-day	3.0E-01	mg/kg-day	9.9E-08
				Fluorene		8.4E-03	mg/kg	8.9E-10	mg/kg-day	--	--	--	7.9E-09	mg/kg-day	4.0E-02	mg/kg-day	2.0E-07
				Naphthalene		1.4E-02	mg/kg	1.5E-09	mg/kg-day	--	--	--	1.4E-08	mg/kg-day	2.0E-02	mg/kg-day	6.8E-07
				Phenanthrene		1.1E-01	mg/kg	1.1E-08	mg/kg-day	--	--	--	1.0E-07	mg/kg-day	3.0E-01	mg/kg-day	3.3E-07
				Benzo(a)anthracene	M	9.5E-02	mg/kg	4.6E-08	mg/kg-day	1.2E+00	(mg/kg-day)-1	5.5E-08	9.0E-08	mg/kg-day	--	--	--
				Benzo(a)pyrene	M	1.9E-01	mg/kg	9.0E-08	mg/kg-day	7.3E+00	(mg/kg-day)-1	6.6E-07	1.8E-07	mg/kg-day	--	--	--
				Benzo(b)fluoranthene	M	1.2E-01	mg/kg	5.7E-08	mg/kg-day	1.2E+00	(mg/kg-day)-1	6.8E-08	1.1E-07	mg/kg-day	--	--	--
				Benzo(g,h,i)perylene		1.8E-01	mg/kg	1.9E-08	mg/kg-day	--	--	--	1.7E-07	mg/kg-day	3.0E-02	mg/kg-day	5.6E-06
				Benzo(k)fluoranthene	M	1.1E-01	mg/kg	5.5E-08	mg/kg-day	1.2E+00	(mg/kg-day)-1	6.6E-08	1.1E-07	mg/kg-day	--	--	--
				Chrysene	M	1.1E-01	mg/kg	5.4E-08	mg/kg-day	1.2E-01	(mg/kg-day)-1	6.5E-09	1.1E-07	mg/kg-day	--	--	--
				Dibenz(a,h)anthracene	M	1.9E-02	mg/kg	9.1E-09	mg/kg-day	7.3E+00	(mg/kg-day)-1	6.6E-08	1.8E-08	mg/kg-day	--	--	--
				Fluoranthene		2.3E-01	mg/kg	2.5E-08	mg/kg-day	--	--	--	2.2E-07	mg/kg-day	4.0E-02	mg/kg-day	5.5E-06
				Indeno(1,2,3-cd)pyrene	M	1.6E-01	mg/kg	7.7E-08	mg/kg-day	1.2E+00	(mg/kg-day)-1	9.3E-08	1.5E-07	mg/kg-day	--	--	--
				Pyrene		2.9E-01	mg/kg	3.1E-08	mg/kg-day	--	--	--	2.8E-07	mg/kg-day	3.0E-02	mg/kg-day	9.3E-06
				Dibutyltin		1.3E-03	mg/kg	1.4E-10	mg/kg-day	--	--	--	1.3E-09	mg/kg-day	3.0E-04	mg/kg-day	4.2E-06
				Tributyltin		4.0E-03	mg/kg	4.3E-10	mg/kg-day	--	--	--	3.8E-09	mg/kg-day	3.0E-04	mg/kg-day	1.3E-05
				Total PCB Congeners		3.0E-02	mg/kg	3.2E-09	mg/kg-day	2.0E+00	(mg/kg-day)-1	6.5E-09	2.9E-08	mg/kg-day	2.0E-05	mg/kg-day	1.4E-03
				Total TEQ – PCB DLC		8.7E-06	mg/kg	9.3E-13	mg/kg-day	1.3E+05	(mg/kg-day)-1	1.2E-07	8.2E-12	mg/kg-day	7.0E-10	mg/kg-day	1.2E-02
			Exp. Route Total									9.5E-06					2.9E-01

TABLE A-16A

Calculation of RME Chemical Cancer Risks and Noncancer Hazards - Adult and Child Recreational User, Reference Stations

Appendix A - Updated Human Health Risk Assessment for Chemical Exposures

Scenario Timeframe:	Future
Receptor Population:	Recreational User
Receptor Age:	Adult and Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC Value	EPC Units	Cancer Risk Calculations: Intake/Exposure Concentration Value	Intake/Exposure Concentration Units	CSF / Unit Risk Value	CSF / Unit Risk Units	Cancer Risk	Noncancer Hazard Quotient: Intake/Exposure Concentration Value	Intake/Exposure Concentration Units	RfD / RfC Value	RfD / RfC Units	Hazard Quotient
Sediment	Sediment	Sediment	Dermal	Aluminum	7.6E+04	mg/kg	2.6E-04	mg/kg-day	--	--	--	2.1E-03	mg/kg-day	1.0E+00	mg/kg-day	2.1E-03
				Antimony	9.2E-01	mg/kg	3.1E-09	mg/kg-day	--	--	--	2.5E-08	mg/kg-day	6.0E-05	mg/kg-day	4.2E-04
				Arsenic	1.2E+01	mg/kg	1.2E-07	mg/kg-day	9.5E+00	(mg/kg-day)-1	1.2E-06	1.0E-06	mg/kg-day	3.0E-04	mg/kg-day	3.3E-03
				Barium	4.8E+02	mg/kg	1.7E-06	mg/kg-day	--	--	--	1.3E-05	mg/kg-day	1.4E-02	mg/kg-day	9.5E-04
				Cadmium	6.4E-01	mg/kg	2.2E-10	mg/kg-day	6.0E+02	(mg/kg-day)-1	1.3E-07	1.8E-09	mg/kg-day	2.5E-05	mg/kg-day	7.1E-05
				Chromium	1.8E+02	mg/kg	6.0E-07	mg/kg-day	--	--	--	4.8E-06	mg/kg-day	2.0E-02	mg/kg-day	2.5E-04
				Cobalt	2.1E+01	mg/kg	7.4E-08	mg/kg-day	--	--	--	5.9E-07	mg/kg-day	3.0E-04	mg/kg-day	2.0E-03
				Copper	4.7E+01	mg/kg	1.6E-07	mg/kg-day	--	--	--	1.3E-06	mg/kg-day	4.0E-02	mg/kg-day	3.2E-05
				Iron	4.9E+04	mg/kg	1.7E-04	mg/kg-day	--	--	--	1.4E-03	mg/kg-day	7.0E-01	mg/kg-day	1.9E-03
				Lead	2.9E+01	mg/kg	9.8E-08	mg/kg-day	--	--	--	7.9E-07	mg/kg-day	--	--	--
				Manganese	6.2E+02	mg/kg	2.1E-06	mg/kg-day	--	--	--	1.7E-05	mg/kg-day	1.4E-01	mg/kg-day	1.2E-04
				Mercury	3.6E-01	mg/kg	1.3E-09	mg/kg-day	--	--	--	1.0E-08	mg/kg-day	1.0E-04	mg/kg-day	1.0E-04
				Molybdenum	8.5E-01	mg/kg	2.9E-09	mg/kg-day	--	--	--	2.3E-08	mg/kg-day	5.0E-03	mg/kg-day	4.7E-06
				Nickel	1.0E+02	mg/kg	3.4E-07	mg/kg-day	--	--	--	2.8E-06	mg/kg-day	8.0E-04	mg/kg-day	3.5E-03
				Selenium	4.6E-01	mg/kg	1.6E-09	mg/kg-day	--	--	--	1.3E-08	mg/kg-day	5.0E-03	mg/kg-day	2.5E-06
				Silver	4.5E-01	mg/kg	1.5E-09	mg/kg-day	--	--	--	1.2E-08	mg/kg-day	2.0E-04	mg/kg-day	6.2E-05
				Vanadium	1.6E+02	mg/kg	5.5E-07	mg/kg-day	--	--	--	4.4E-06	mg/kg-day	1.3E-04	mg/kg-day	3.4E-02
				Zinc	1.3E+02	mg/kg	4.4E-07	mg/kg-day	--	--	--	3.5E-06	mg/kg-day	3.0E-01	mg/kg-day	1.2E-05
				4,4'-DDD	2.4E-03	mg/kg	4.1E-11	mg/kg-day	2.4E-01	(mg/kg-day)-1	9.9E-12	3.3E-10	mg/kg-day	5.0E-04	mg/kg-day	6.6E-07
				4,4'-DDE	9.1E-04	mg/kg	1.6E-11	mg/kg-day	3.4E-01	(mg/kg-day)-1	5.3E-12	1.3E-10	mg/kg-day	5.0E-04	mg/kg-day	2.5E-07
				4,4'-DDT	1.7E-03	mg/kg	2.8E-11	mg/kg-day	3.4E-01	(mg/kg-day)-1	9.6E-12	2.3E-10	mg/kg-day	5.0E-04	mg/kg-day	4.5E-07
				alpha-Chlordane	1.2E-04	mg/kg	2.1E-12	mg/kg-day	3.5E-01	(mg/kg-day)-1	7.2E-13	1.7E-11	mg/kg-day	5.0E-04	mg/kg-day	3.3E-08
				2-Methylnaphthalene	6.4E-03	mg/kg	3.3E-10	mg/kg-day	--	--	--	2.7E-09	mg/kg-day	4.0E-03	mg/kg-day	6.6E-07
				Acenaphthene	1.2E-02	mg/kg	6.4E-10	mg/kg-day	--	--	--	5.1E-09	mg/kg-day	6.0E-02	mg/kg-day	8.5E-08
				Acenaphthylene	9.3E-03	mg/kg	4.8E-10	mg/kg-day	--	--	--	3.8E-09	mg/kg-day	6.0E-02	mg/kg-day	6.4E-08
				Anthracene	3.1E-02	mg/kg	1.6E-09	mg/kg-day	--	--	--	1.3E-08	mg/kg-day	3.0E-01	mg/kg-day	4.3E-08
				Fluorene	8.4E-03	mg/kg	4.3E-10	mg/kg-day	--	--	--	3.5E-09	mg/kg-day	4.0E-02	mg/kg-day	8.6E-08
				Naphthalene	1.4E-02	mg/kg	7.4E-10	mg/kg-day	--	--	--	5.9E-09	mg/kg-day	2.0E-02	mg/kg-day	3.0E-07
				Phenanthrene	1.1E-01	mg/kg	5.4E-09	mg/kg-day	--	--	--	4.3E-08	mg/kg-day	3.0E-01	mg/kg-day	1.4E-07
				Benzo(a)anthracene M	9.5E-02	mg/kg	2.1E-08	mg/kg-day	1.2E+00	(mg/kg-day)-1	2.5E-08	3.9E-08	mg/kg-day	--	--	--
				Benzo(a)pyrene M	1.9E-01	mg/kg	4.1E-08	mg/kg-day	7.3E+00	(mg/kg-day)-1	3.0E-07	7.7E-08	mg/kg-day	--	--	--
				Benzo(b)fluoranthene M	1.2E-01	mg/kg	2.6E-08	mg/kg-day	1.2E+00	(mg/kg-day)-1	3.1E-08	4.8E-08	mg/kg-day	--	--	--
				Benzo(g,h,i)perylene	1.8E-01	mg/kg	9.2E-09	mg/kg-day	--	--	--	7.4E-08	mg/kg-day	3.0E-02	mg/kg-day	2.5E-06
				Benzo(k)fluoranthene M	1.1E-01	mg/kg	2.5E-08	mg/kg-day	1.2E+00	(mg/kg-day)-1	3.0E-08	4.7E-08	mg/kg-day	--	--	--
				Chrysene M	1.1E-01	mg/kg	2.5E-08	mg/kg-day	1.2E-01	(mg/kg-day)-1	3.0E-09	4.6E-08	mg/kg-day	--	--	--
				Dibenz(a,h)anthracene M	1.9E-02	mg/kg	4.1E-09	mg/kg-day	7.3E+00	(mg/kg-day)-1	3.0E-08	7.7E-09	mg/kg-day	--	--	--
				Fluoranthene	2.3E-01	mg/kg	1.2E-08	mg/kg-day	--	--	--	9.6E-08	mg/kg-day	4.0E-02	mg/kg-day	2.4E-06
				Indeno(1,2,3-cd)pyrene M	1.6E-01	mg/kg	3.5E-08	mg/kg-day	1.2E+00	(mg/kg-day)-1	4.2E-08	6.6E-08	mg/kg-day	--	--	--
				Pyrene	2.9E-01	mg/kg	1.5E-08	mg/kg-day	--	--	--	1.2E-07	mg/kg-day	3.0E-02	mg/kg-day	4.0E-06
				Dibutyltin	1.3E-03	mg/kg	4.5E-11	mg/kg-day	--	--	--	3.6E-10	mg/kg-day	3.0E-04	mg/kg-day	1.2E-06
				Tributyltin	4.0E-03	mg/kg	1.4E-10	mg/kg-day	--	--	--	1.1E-09	mg/kg-day	3.0E-04	mg/kg-day	3.7E-06
				Total PCB Congeners	3.0E-02	mg/kg	1.6E-09	mg/kg-day	2.0E+00	(mg/kg-day)-1	3.1E-09	1.3E-08	mg/kg-day	2.0E-05	mg/kg-day	6.3E-04
				Total TEQ – PCB DLC	8.7E-06	mg/kg	8.9E-14	mg/kg-day	1.3E+05	(mg/kg-day)-1	1.2E-08	7.2E-13	mg/kg-day	7.0E-10	mg/kg-day	1.0E-03
			Exp. Route Total								1.8E-06					5.0E-02
		Exposure Point Total									1.1E-05					3.4E-01
	Exposure Medium Total										1.1E-05					3.4E-01
Medium Total											1.1E-05					3.4E-01

TABLE A-16A
Calculation of RME Chemical Cancer Risks and Noncancer Hazards - Adult and Child Recreational User, Reference Stations
Appendix A - Updated Human Health Risk Assessment for Chemical Exposures

Scenario Timeframe:	Future
Receptor Population:	Recreational User
Receptor Age:	Adult and Child

					EPC		Cancer Risk Calculations					Noncancer Hazard Quotient				
							Intake/Exposure Concentration		CSF / Unit Risk			Intake/Exposure Concentration		RfD / RfC		
Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	Value	Units	Value	Units	Value	Units	Cancer Risk	Value	Units	Value	Units	Hazard Quotient
Macoma[a]	Macoma	Macoma	Ingestion	Aluminum	2.8E+02	mg/kg	2.1E-03	mg/kg-day	--	--	--	7.4E-03	mg/kg-day	1.0E+00	mg/kg-day	7.4E-03
				Antimony	2.7E-02	mg/kg	2.0E-07	mg/kg-day	--	--	--	7.1E-07	mg/kg-day	4.0E-04	mg/kg-day	1.8E-03
				Arsenic	3.8E+00	mg/kg	2.9E-05	mg/kg-day	9.5E+00	(mg/kg-day)-1	2.7E-04	1.0E-04	mg/kg-day	3.0E-04	mg/kg-day	3.4E-01
				Barium	2.9E+00	mg/kg	2.2E-05	mg/kg-day	--	--	--	7.8E-05	mg/kg-day	2.0E-01	mg/kg-day	3.9E-04
				Cadmium	1.5E-01	mg/kg	1.1E-06	mg/kg-day	1.5E+01	(mg/kg-day)-1	1.7E-05	3.9E-06	mg/kg-day	1.0E-03	mg/kg-day	3.9E-03
				Chromium	2.8E+00	mg/kg	2.1E-05	mg/kg-day	--	--	--	7.5E-05	mg/kg-day	1.5E+00	mg/kg-day	5.0E-05
				Cobalt	5.1E-01	mg/kg	3.9E-06	mg/kg-day	--	--	--	1.4E-05	mg/kg-day	3.0E-04	mg/kg-day	4.5E-02
				Copper	2.5E+00	mg/kg	1.9E-05	mg/kg-day	--	--	--	6.6E-05	mg/kg-day	4.0E-02	mg/kg-day	1.7E-03
				Iron	3.9E+02	mg/kg	3.0E-03	mg/kg-day	--	--	--	1.0E-02	mg/kg-day	7.0E-01	mg/kg-day	1.5E-02
				Lead	4.9E-01	mg/kg	3.7E-06	mg/kg-day	--	--	--	1.3E-05	mg/kg-day	--	--	--
				Manganese	7.9E+00	mg/kg	6.0E-05	mg/kg-day	--	--	--	2.1E-04	mg/kg-day	1.4E-01	mg/kg-day	1.5E-03
				Mercury	2.5E-02	mg/kg	1.9E-07	mg/kg-day	--	--	--	6.8E-07	mg/kg-day	1.0E-04	mg/kg-day	6.8E-03
				Molybdenum	4.9E-01	mg/kg	3.7E-06	mg/kg-day	--	--	--	1.3E-05	mg/kg-day	5.0E-03	mg/kg-day	2.6E-03
				Nickel	1.4E+00	mg/kg	1.0E-05	mg/kg-day	--	--	--	3.6E-05	mg/kg-day	2.0E-02	mg/kg-day	1.8E-03
				Selenium	7.9E-01	mg/kg	6.0E-06	mg/kg-day	--	--	--	2.1E-05	mg/kg-day	5.0E-03	mg/kg-day	4.2E-03
				Silver	2.8E-02	mg/kg	2.1E-07	mg/kg-day	--	--	--	7.3E-07	mg/kg-day	5.0E-03	mg/kg-day	1.5E-04
				Vanadium	1.5E+00	mg/kg	1.2E-05	mg/kg-day	--	--	--	4.0E-05	mg/kg-day	5.0E-03	mg/kg-day	8.1E-03
				Zinc	1.8E+01	mg/kg	1.4E-04	mg/kg-day	--	--	--	4.9E-04	mg/kg-day	3.0E-01	mg/kg-day	1.6E-03
				4,4'-DDD	5.1E-04	mg/kg	3.8E-09	mg/kg-day	2.4E-01	(mg/kg-day)-1	9.2E-10	1.3E-08	mg/kg-day	5.0E-04	mg/kg-day	2.7E-05
				4,4'-DDE	8.7E-04	mg/kg	6.6E-09	mg/kg-day	3.4E-01	(mg/kg-day)-1	2.3E-09	2.3E-08	mg/kg-day	5.0E-04	mg/kg-day	4.6E-05
				4,4'-DDT	3.7E-04	mg/kg	2.8E-09	mg/kg-day	3.4E-01	(mg/kg-day)-1	9.6E-10	9.9E-09	mg/kg-day	5.0E-04	mg/kg-day	2.0E-05
				alpha-Chlordane	1.2E-04	mg/kg	8.9E-10	mg/kg-day	3.5E-01	(mg/kg-day)-1	3.1E-10	3.1E-09	mg/kg-day	5.0E-04	mg/kg-day	6.3E-06
				Dieldrin	1.6E-04	mg/kg	1.2E-09	mg/kg-day	1.6E+01	(mg/kg-day)-1	2.0E-08	4.3E-09	mg/kg-day	5.0E-05	mg/kg-day	8.5E-05
				gamma-Chlordane	9.7E-05	mg/kg	7.4E-10	mg/kg-day	3.5E-01	(mg/kg-day)-1	2.6E-10	2.6E-09	mg/kg-day	5.0E-04	mg/kg-day	5.2E-06
				Acenaphthene	1.8E-04	mg/kg	1.4E-09	mg/kg-day	--	--	--	4.9E-09	mg/kg-day	6.0E-02	mg/kg-day	8.2E-08
				Acenaphthylene	3.1E-04	mg/kg	2.4E-09	mg/kg-day	--	--	--	8.3E-09	mg/kg-day	6.0E-02	mg/kg-day	1.4E-07
				Anthracene	1.2E-03	mg/kg	9.3E-09	mg/kg-day	--	--	--	3.2E-08	mg/kg-day	3.0E-01	mg/kg-day	1.1E-07
				Fluorene	2.7E-04	mg/kg	2.0E-09	mg/kg-day	--	--	--	7.1E-09	mg/kg-day	4.0E-02	mg/kg-day	1.8E-07
				Phenanthrene	2.5E-03	mg/kg	1.9E-08	mg/kg-day	--	--	--	6.7E-08	mg/kg-day	3.0E-01	mg/kg-day	2.2E-07
				Benzo(a)anthracene	2.5E-03	mg/kg	1.9E-08	mg/kg-day	1.2E+00	(mg/kg-day)-1	2.3E-08	6.6E-08	mg/kg-day	--	--	--
				Benzo(a)pyrene	3.8E-03	mg/kg	2.9E-08	mg/kg-day	7.3E+00	(mg/kg-day)-1	2.1E-07	1.0E-07	mg/kg-day	--	--	--
				Benzo(b)fluoranthene	3.5E-03	mg/kg	2.7E-08	mg/kg-day	1.2E+00	(mg/kg-day)-1	3.2E-08	9.3E-08	mg/kg-day	--	--	--
				Benzo(g,h,i)perylene	3.0E-03	mg/kg	2.3E-08	mg/kg-day	--	--	--	8.1E-08	mg/kg-day	3.0E-02	mg/kg-day	2.7E-06
				Benzo(k)fluoranthene	4.0E-03	mg/kg	3.0E-08	mg/kg-day	1.2E+00	(mg/kg-day)-1	3.6E-08	1.1E-07	mg/kg-day	--	--	--
				Chrysene	4.4E-03	mg/kg	3.3E-08	mg/kg-day	1.2E-01	(mg/kg-day)-1	4.0E-09	1.2E-07	mg/kg-day	--	--	--
				Dibenz(a,h)anthracene	1.4E-04	mg/kg	1.1E-09	mg/kg-day	7.3E+00	(mg/kg-day)-1	7.8E-09	3.8E-09	mg/kg-day	--	--	--
				Fluoranthene	1.0E-02	mg/kg	7.7E-08	mg/kg-day	--	--	--	2.7E-07	mg/kg-day	4.0E-02	mg/kg-day	6.7E-06
				Indeno(1,2,3-cd)pyrene	1.8E-03	mg/kg	1.4E-08	mg/kg-day	1.2E+00	(mg/kg-day)-1	1.7E-08	4.9E-08	mg/kg-day	--	--	--
				Pyrene	1.2E-02	mg/kg	9.2E-08	mg/kg-day	--	--	--	3.2E-07	mg/kg-day	3.0E-02	mg/kg-day	1.1E-05
				Dibutyltin	1.6E-03	mg/kg	1.2E-08	mg/kg-day	--	--	--	4.3E-08	mg/kg-day	3.0E-04	mg/kg-day	1.4E-04
				Tributyltin	4.8E-03	mg/kg	3.6E-08	mg/kg-day	--	--	--	1.3E-07	mg/kg-day	3.0E-04	mg/kg-day	4.2E-04
				Total PCB Congeners	1.2E-02	mg/kg	9.1E-08	mg/kg-day	2.0E+00	(mg/kg-day)-1	1.8E-07	3.2E-07	mg/kg-day	2.0E-05	mg/kg-day	1.6E-02
				Total TEQ – PCB DLC	7.2E-06	mg/kg	5.5E-11	mg/kg-day	1.3E+05	(mg/kg-day)-1	7.1E-06	1.9E-10	mg/kg-day	7.0E-10	mg/kg-day	2.7E-01
				Total TEQ – TCDD DLC	3.9E-07	mg/kg	2.9E-12	mg/kg-day	1.3E+05	(mg/kg-day)-1	3.8E-07	1.0E-11	mg/kg-day	7.0E-10	mg/kg-day	1.5E-02
			Exp. Route Total								3.0E-04					7.4E-01
		Exposure Point Total									3.0E-04					7.4E-01
	Exposure Medium Total										3.0E-04					7.4E-01
Medium Total											3.0E-04					7.4E-01
										Total of Receptor Risks across All Media	3.1E-04				Total of Receptor Hazards across All Media	1.1E+00

TABLE A-16A
Calculation of RME Chemical Cancer Risks and Noncancer Hazards - Adult and Child Recreational User, Reference Stations
Appendix A - Updated Human Health Risk Assessment for Chemical Exposures

Scenario Timeframe:	Future
Receptor Population:	Recreational User
Receptor Age:	Adult and Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Noncancer Hazard Quotient				
					EPC		Intake/Exposure Concentration		CSF / Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD / RfC		Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	

Notes:
[a] Macoma ingestion risks are evaluated for the adult receptor only.
Acronyms/Abbreviations:

-- =	not available or not applicable	(mg/kg-day)-1 =	1/(milligram[s] per kilogram per day)
CSF =	cancer slope factor	mg/kg =	milligram(s) per kilogram
DDD =	dichlorodiphenyldichloroethane	mg/kg-day =	milligram(s) per kilogram per day
DDE =	dichlorodiphenyldichloroethylene	PCB =	polychlorinated biphenyl
DDT =	dichlorodiphenyltrichloroethane	RfC =	reference concentration
EPC =	exposure point concentration	RfD =	reference dose
Exp. =	exposure	RME =	reasonable maximum exposure
M =	lifetime exposure from birth, mutagenic endpoint	TCDD =	tetrachlorodibenzo-p-dioxin

TABLE A-16B

Summary of Receptor Risks and Hazards - Adult and Child Recreational User, Reference Stations

Appendix A - Updated Human Health Risk Assessment for Chemical Exposures

Scenario Timeframe:	Future
Receptor Population:	Recreational User
Receptor Age:	Adult and Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient			
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total
Sediment	Sediment	Sediment	Aluminum	--	--	--	--	7.2E-02	--	2.1E-03	7.4E-02
			Antimony	--	--	--	--	2.2E-03	--	4.2E-04	2.6E-03
			Arsenic	7.4E-06	--	1.2E-06	8.6E-06	2.3E-02	--	3.3E-03	2.6E-02
			Barium	--	--	--	--	2.3E-03	--	9.5E-04	3.2E-03
			Cadmium	1.0E-06	--	1.3E-07	1.2E-06	6.1E-04	--	7.1E-05	6.8E-04
			Chromium	--	--	--	--	1.1E-04	--	2.5E-04	3.6E-04
			Cobalt	--	--	--	--	6.8E-02	--	2.0E-03	7.0E-02
			Copper	--	--	--	--	1.1E-03	--	3.2E-05	1.1E-03
			Iron	--	--	--	--	6.7E-02	--	1.9E-03	6.9E-02
			Lead	--	--	--	--	--	--	--	--
			Manganese	--	--	--	--	4.2E-03	--	1.2E-04	4.3E-03
			Mercury	--	--	--	--	3.5E-03	--	1.0E-04	3.6E-03
			Molybdenum	--	--	--	--	1.6E-04	--	4.7E-06	1.7E-04
			Nickel	--	--	--	--	4.8E-03	--	3.5E-03	8.2E-03
			Selenium	--	--	--	--	8.7E-05	--	2.5E-06	8.9E-05
			Silver	--	--	--	--	8.5E-05	--	6.2E-05	1.5E-04
			Vanadium	--	--	--	--	3.0E-02	--	3.4E-02	6.4E-02
			Zinc	--	--	--	--	4.0E-04	--	1.2E-05	4.1E-04
			4,4'-DDD	6.2E-11	--	9.9E-12	7.2E-11	4.6E-06	--	6.6E-07	5.2E-06
			4,4'-DDE	3.3E-11	--	5.3E-12	3.9E-11	1.7E-06	--	2.5E-07	2.0E-06
			4,4'-DDT	6.0E-11	--	9.6E-12	7.0E-11	3.1E-06	--	4.5E-07	3.6E-06
			alpha-Chlordane	4.5E-12	--	7.2E-13	5.2E-12	2.3E-07	--	3.3E-08	2.6E-07
			2-Methylnaphthalene	--	--	--	--	1.5E-06	--	6.6E-07	2.2E-06
			Acenaphthene	--	--	--	--	2.0E-07	--	8.5E-08	2.8E-07
			Acenaphthylene	--	--	--	--	1.5E-07	--	6.4E-08	2.1E-07
			Anthracene	--	--	--	--	9.9E-08	--	4.3E-08	1.4E-07
			Fluorene	--	--	--	--	2.0E-07	--	8.6E-08	2.8E-07
			Naphthalene	--	--	--	--	6.8E-07	--	3.0E-07	9.7E-07
			Phenanthrene	--	--	--	--	3.3E-07	--	1.4E-07	4.8E-07
			Benzo(a)anthracene	5.5E-08	--	2.5E-08	8.0E-08	--	--	--	--
			Benzo(a)pyrene	6.6E-07	--	3.0E-07	9.6E-07	--	--	--	--
			Benzo(b)fluoranthene	6.8E-08	--	3.1E-08	9.9E-08	--	--	--	--
			Benzo(g,h,i)perylene	--	--	--	--	5.6E-06	--	2.5E-06	8.1E-06
			Benzo(k)fluoranthene	6.6E-08	--	3.0E-08	9.6E-08	--	--	--	--
			Chrysene	6.5E-09	--	3.0E-09	9.5E-09	--	--	--	--
			Dibenz(a,h)anthracene	6.6E-08	--	3.0E-08	9.6E-08	--	--	--	--
			Fluoranthene	--	--	--	--	5.5E-06	--	2.4E-06	7.9E-06
			Indeno(1,2,3-cd)pyrene	9.3E-08	--	4.2E-08	1.3E-07	--	--	--	--
			Pyrene	--	--	--	--	9.3E-06	--	4.0E-06	1.3E-05
			Dibutyltin	--	--	--	--	4.2E-06	--	1.2E-06	5.4E-06
			Tributyltin	--	--	--	--	1.3E-05	--	3.7E-06	1.6E-05
			Total PCB Congeners	6.5E-09	--	3.1E-09	9.6E-09	1.4E-03	--	6.3E-04	2.1E-03
			Total TEQ – PCB DLC	1.2E-07	--	1.2E-08	1.3E-07	1.2E-02	--	1.0E-03	1.3E-02
			Chemical Total	9.5E-06	--	1.8E-06	1.1E-05	2.9E-01	--	5.0E-02	3.4E-01
		Exposure Point Total					1.1E-05				3.4E-01
	Exposure Medium Total						1.1E-05				3.4E-01
Medium Total							1.1E-05				3.4E-01

TABLE A-16B

Summary of Receptor Risks and Hazards - Adult and Child Recreational User, Reference Stations

Appendix A - Updated Human Health Risk Assessment for Chemical Exposures

Scenario Timeframe:	Future
Receptor Population:	Recreational User
Receptor Age:	Adult and Child

				Cancer Risk				Noncancer Hazard Quotient			
Medium	**Exposure Medium**	**Exposure Point**	**Chemical of Potential Concern**	**Ingestion**	**Inhalation**	**Dermal**	**Exposure Routes Total**	**Ingestion**	**Inhalation**	**Dermal**	**Exposure Routes Total**
Macoma	Macoma	Macoma (ingestion)	Aluminum	--	--	--	--	7.4E-03	--	--	7.4E-03
			Antimony	--	--	--	--	1.8E-03	--	--	1.8E-03
			Arsenic	2.7E-04	--	--	2.7E-04	3.4E-01	--	--	3.4E-01
			Barium	--	--	--	--	3.9E-04	--	--	3.9E-04
			Cadmium	1.7E-05	--	--	1.7E-05	3.9E-03	--	--	3.9E-03
			Chromium	--	--	--	--	5.0E-05	--	--	5.0E-05
			Cobalt	--	--	--	--	4.5E-02	--	--	4.5E-02
			Copper	--	--	--	--	1.7E-03	--	--	1.7E-03
			Iron	--	--	--	--	1.5E-02	--	--	1.5E-02
			Lead	--	--	--	--	--	--	--	--
			Manganese	--	--	--	--	1.5E-03	--	--	1.5E-03
			Mercury	--	--	--	--	6.8E-03	--	--	6.8E-03
			Molybdenum	--	--	--	--	2.6E-03	--	--	2.6E-03
			Nickel	--	--	--	--	1.8E-03	--	--	1.8E-03
			Selenium	--	--	--	--	4.2E-03	--	--	4.2E-03
			Silver	--	--	--	--	1.5E-04	--	--	1.5E-04
			Vanadium	--	--	--	--	8.1E-03	--	--	8.1E-03
			Zinc	--	--	--	--	1.6E-03	--	--	1.6E-03
			4,4'-DDD	9.2E-10	--	--	9.2E-10	2.7E-05	--	--	2.7E-05
			4,4'-DDE	2.3E-09	--	--	2.3E-09	4.6E-05	--	--	4.6E-05
			4,4'-DDT	9.6E-10	--	--	9.6E-10	2.0E-05	--	--	2.0E-05
			alpha-Chlordane	3.1E-10	--	--	3.1E-10	6.3E-06	--	--	6.3E-06
			Dieldrin	2.0E-08	--	--	2.0E-08	8.5E-05	--	--	8.5E-05
			gamma-Chlordane	2.6E-10	--	--	2.6E-10	5.2E-06	--	--	5.2E-06
			Acenaphthene	--	--	--	--	8.2E-08	--	--	8.2E-08
			Acenaphthylene	--	--	--	--	1.4E-07	--	--	1.4E-07
			Anthracene	--	--	--	--	1.1E-07	--	--	1.1E-07
			Fluorene	--	--	--	--	1.8E-07	--	--	1.8E-07
			Phenanthrene	--	--	--	--	2.2E-07	--	--	2.2E-07
			Benzo(a)anthracene	2.3E-08	--	--	2.3E-08	--	--	--	--
			Benzo(a)pyrene	2.1E-07	--	--	2.1E-07	--	--	--	--
			Benzo(b)fluoranthene	3.2E-08	--	--	3.2E-08	--	--	--	--
			Benzo(g,h,i)perylene	--	--	--	--	2.7E-06	--	--	2.7E-06
			Benzo(k)fluoranthene	3.6E-08	--	--	3.6E-08	--	--	--	--
			Chrysene	4.0E-09	--	--	4.0E-09	--	--	--	--
			Dibenz(a,h)anthracene	7.8E-09	--	--	7.8E-09	--	--	--	--
			Fluoranthene	--	--	--	--	6.7E-06	--	--	6.7E-06
			Indeno(1,2,3-cd)pyrene	1.7E-08	--	--	1.7E-08	--	--	--	--
			Pyrene	--	--	--	--	1.1E-05	--	--	1.1E-05
			Dibutyltin	--	--	--	--	1.4E-04	--	--	1.4E-04
			Tributyltin	--	--	--	--	4.2E-04	--	--	4.2E-04
			Total PCB Congeners	1.8E-07	--	--	1.8E-07	1.6E-02	--	--	1.6E-02
			Total TEQ – PCB DLC	7.1E-06	--	--	7.1E-06	2.7E-01	--	--	2.7E-01
			Total TEQ – TCDD DLC	3.8E-07	--	--	3.8E-07	1.5E-02	--	--	1.5E-02
			Chemical Total	3.0E-04	--	--	3.0E-04	7.4E-01	--	--	7.4E-01
		Exposure Point Total					3.0E-04				7.4E-01
	Exposure Medium Total						3.0E-04				7.4E-01
Medium Total							3.0E-04				7.4E-01
Receptor Total						Total Risk across All Media	3.1E-04			Total Hazard across All Media	1.1E+00

TABLE A-16B
Summary of Receptor Risks and Hazards - Adult and Child Recreational User, Reference Stations
Appendix A - Updated Human Health Risk Assessment for Chemical Exposures

Scenario Timeframe:	Future
Receptor Population:	Recreational User
Receptor Age:	Adult and Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk				Noncancer Hazard Quotient			
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total

Acronyms/Abbreviations:

-- =	not available or not applicable
DDD =	dichlorodiphenyldichloroethane
DDE =	dichlorodiphenyldichloroethylene
DDT =	dichlorodiphenyltrichloroethane
PCB =	polychlorinated biphenyl
TCDD =	tetrachlorodibenzo-p-dioxin

TABLE A-16C
Summary of Risk Drivers - Adult and Child Recreational User, Reference Stations
Appendix A - Updated Human Health Risk Assessment for Chemical Exposures

Scenario Timeframe:	Future
Receptor Population:	Recreational User
Receptor Age:	Adult and Chilc

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk Ingestion	Cancer Risk Inhalation	Cancer Risk Dermal	Cancer Risk Exposure Routes Total	Noncancer Hazard Quotient Ingestion	Noncancer Hazard Quotient Inhalation	Noncancer Hazard Quotient Dermal	Noncancer Hazard Quotient Exposure Routes Total
Sediment	Sediment	Sediment (Oral/Dermal)	BAP (EQ)*	9.5E-07	--	4.3E-07	1.4E-06	--	--	--	--
			Arsenic	7.4E-06	--	1.2E-06	8.6E-06	2.3E-02	--	3.3E-03	2.6E-02
			Cadmium	1.0E-06	--	1.3E-07	1.2E-06	6.1E-04	--	7.1E-05	6.8E-04
			Chemical Total	8.3E-06	--	1.6E-06	9.9E-06	2.3E-02	--	3.3E-03	2.6E-02
		Exposure Point Total					9.9E-06				2.6E-02
	Exposure Medium Total						9.9E-06				2.6E-02
Medium Total							9.9E-06				2.6E-02
Macoma	Macoma	Macoma (Oral)	Arsenic	2.7E-04	--	--	2.7E-04	3.4E-01	--	--	3.4E-01
			Cadmium	1.7E-05	--	--	1.7E-05	3.9E-03	--	--	3.9E-03
			Total TEQ – PCB DLC	7.1E-06	--	--	7.1E-06	2.7E-01	--	--	2.7E-01
			Chemical Total	3.0E-04	--	--	3.0E-04	6.1E-01	--	--	6.1E-01
		Exposure Point Total					3.0E-04				6.1E-01
	Exposure Medium Total						3.0E-04				6.1E-01
Medium Total							3.0E-04				6.1E-01
Receptor Total						Total Risk across All Media	3.1E-04			Total Hazard across All Media	6.4E-01

Notes:

* Risk for benzo(a)pyrene equivalent (BAP [EQ]) is calculated by summing the risks for each of the individual potentially carcinogenic PAHs: benzo(a)anthracene, benzo(b)fluoranthene, benzo(a)pyrene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene.

Acronyms/Abbreviations:

-- =	not available or not applicable	PAH =	polycyclic aromatic hydrocarbon
BAP (EQ) =	benzo(a)pyrene equivalent	PCB =	polychlorinated biphenyl

TABLE A-17A

Calculation of RME Chemical Cancer Risks and Noncancer Hazards - Construction Worker, Reference Stations

Appendix A - Updated Human Health Risk Assessment for Chemical Exposures

Scenario Timeframe:	Future
Receptor Population:	Construction Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations: Intake/Exposure Concentration		Cancer Risk Calculations: CSF / Unit Risk		Cancer Risk	Noncancer Hazard Quotient: Intake/Exposure Concentration		Noncancer Hazard Quotient: RfD / RfC		Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
Sediment	Sediment	Sediment	Ingestion	Aluminum	7.6E+04	mg/kg	3.1E-03	mg/kg-day	--	--	--	2.1E-01	mg/kg-day	1.0E+00	mg/kg-day	2.1E-01
				Antimony	9.2E-01	mg/kg	3.7E-08	mg/kg-day	--	--	--	2.6E-06	mg/kg-day	4.0E-04	mg/kg-day	6.5E-03
				Arsenic	1.2E+01	mg/kg	2.9E-07	mg/kg-day	9.5E+00	(mg/kg-day)-1	2.8E-06	2.1E-05	mg/kg-day	3.0E-04	mg/kg-day	6.8E-02
				Barium	4.8E+02	mg/kg	1.9E-05	mg/kg-day	--	--	--	1.4E-03	mg/kg-day	2.0E-01	mg/kg-day	6.8E-03
				Cadmium	6.4E-01	mg/kg	2.6E-08	mg/kg-day	1.5E+01	(mg/kg-day)-1	3.9E-07	1.8E-06	mg/kg-day	1.0E-03	mg/kg-day	1.8E-03
				Chromium	1.8E+02	mg/kg	7.1E-06	mg/kg-day	--	--	--	5.0E-04	mg/kg-day	1.5E+00	mg/kg-day	3.3E-04
				Cobalt	2.1E+01	mg/kg	8.7E-07	mg/kg-day	--	--	--	6.1E-05	mg/kg-day	3.0E-04	mg/kg-day	2.0E-01
				Copper	4.7E+01	mg/kg	1.9E-06	mg/kg-day	--	--	--	1.3E-04	mg/kg-day	4.0E-02	mg/kg-day	3.3E-03
				Iron	4.9E+04	mg/kg	2.0E-03	mg/kg-day	--	--	--	1.4E-01	mg/kg-day	7.0E-01	mg/kg-day	2.0E-01
				Lead	2.9E+01	mg/kg	1.2E-06	mg/kg-day	--	--	--	8.1E-05	mg/kg-day	--	--	--
				Manganese	6.2E+02	mg/kg	2.5E-05	mg/kg-day	--	--	--	1.7E-03	mg/kg-day	1.4E-01	mg/kg-day	1.2E-02
				Mercury	3.6E-01	mg/kg	1.5E-08	mg/kg-day	--	--	--	1.0E-06	mg/kg-day	1.0E-04	mg/kg-day	1.0E-02
				Molybdenum	8.5E-01	mg/kg	3.4E-08	mg/kg-day	--	--	--	2.4E-06	mg/kg-day	5.0E-03	mg/kg-day	4.8E-04
				Nickel	1.0E+02	mg/kg	4.0E-06	mg/kg-day	--	--	--	2.8E-04	mg/kg-day	2.0E-02	mg/kg-day	1.4E-02
				Selenium	4.6E-01	mg/kg	1.8E-08	mg/kg-day	--	--	--	1.3E-06	mg/kg-day	5.0E-03	mg/kg-day	2.6E-04
				Silver	4.5E-01	mg/kg	1.8E-08	mg/kg-day	--	--	--	1.3E-06	mg/kg-day	5.0E-03	mg/kg-day	2.5E-04
				Vanadium	1.6E+02	mg/kg	6.4E-06	mg/kg-day	--	--	--	4.5E-04	mg/kg-day	5.0E-03	mg/kg-day	9.0E-02
				Zinc	1.3E+02	mg/kg	5.1E-06	mg/kg-day	--	--	--	3.6E-04	mg/kg-day	3.0E-01	mg/kg-day	1.2E-03
				4,4'-DDD	2.4E-03	mg/kg	9.7E-11	mg/kg-day	2.4E-01	(mg/kg-day)-1	2.3E-11	6.8E-09	mg/kg-day	5.0E-04	mg/kg-day	1.4E-05
				4,4'-DDE	9.1E-04	mg/kg	3.7E-11	mg/kg-day	3.4E-01	(mg/kg-day)-1	1.3E-11	2.6E-09	mg/kg-day	5.0E-04	mg/kg-day	5.2E-06
				4,4'-DDT	1.7E-03	mg/kg	6.7E-11	mg/kg-day	3.4E-01	(mg/kg-day)-1	2.3E-11	4.7E-09	mg/kg-day	5.0E-04	mg/kg-day	9.3E-06
				alpha-Chlordane	1.2E-04	mg/kg	4.8E-12	mg/kg-day	3.5E-01	(mg/kg-day)-1	1.7E-12	3.4E-10	mg/kg-day	5.0E-04	mg/kg-day	6.8E-07
				2-Methylnaphthalene	6.4E-03	mg/kg	2.6E-10	mg/kg-day	--	--	--	1.8E-08	mg/kg-day	4.0E-03	mg/kg-day	4.5E-06
				Acenaphthene	1.2E-02	mg/kg	5.0E-10	mg/kg-day	--	--	--	3.5E-08	mg/kg-day	6.0E-02	mg/kg-day	5.8E-07
				Acenaphthylene	9.3E-03	mg/kg	3.8E-10	mg/kg-day	--	--	--	2.6E-08	mg/kg-day	6.0E-02	mg/kg-day	4.4E-07
				Anthracene	3.1E-02	mg/kg	1.3E-09	mg/kg-day	--	--	--	8.8E-08	mg/kg-day	3.0E-01	mg/kg-day	2.9E-07
				Fluorene	8.4E-03	mg/kg	3.4E-10	mg/kg-day	--	--	--	2.4E-08	mg/kg-day	4.0E-02	mg/kg-day	5.9E-07
				Naphthalene	1.4E-02	mg/kg	5.8E-10	mg/kg-day	--	--	--	4.0E-08	mg/kg-day	2.0E-02	mg/kg-day	2.0E-06
				Phenanthrene	1.1E-01	mg/kg	4.2E-09	mg/kg-day	--	--	--	3.0E-07	mg/kg-day	3.0E-01	mg/kg-day	9.9E-07
				Benzo(a)anthracene	9.5E-02	mg/kg	3.8E-09	mg/kg-day	1.2E+00	(mg/kg-day)-1	4.6E-09	2.7E-07	mg/kg-day	--	--	--
				Benzo(a)pyrene	1.9E-01	mg/kg	7.5E-09	mg/kg-day	7.3E+00	(mg/kg-day)-1	5.5E-08	5.3E-07	mg/kg-day	--	--	--
				Benzo(b)fluoranthene	1.2E-01	mg/kg	4.7E-09	mg/kg-day	1.2E+00	(mg/kg-day)-1	5.7E-09	3.3E-07	mg/kg-day	--	--	--
				Benzo(g,h,i)perylene	1.8E-01	mg/kg	7.2E-09	mg/kg-day	--	--	--	5.0E-07	mg/kg-day	3.0E-02	mg/kg-day	1.7E-05
				Benzo(k)fluoranthene	1.1E-01	mg/kg	4.6E-09	mg/kg-day	1.2E+00	(mg/kg-day)-1	5.5E-09	3.2E-07	mg/kg-day	--	--	--
				Chrysene	1.1E-01	mg/kg	4.5E-09	mg/kg-day	1.2E-01	(mg/kg-day)-1	5.4E-10	3.2E-07	mg/kg-day	--	--	--
				Dibenz(a,h)anthracene	1.9E-02	mg/kg	7.5E-10	mg/kg-day	7.3E+00	(mg/kg-day)-1	5.5E-09	5.3E-08	mg/kg-day	--	--	--
				Fluoranthene	2.3E-01	mg/kg	9.4E-09	mg/kg-day	--	--	--	6.6E-07	mg/kg-day	4.0E-02	mg/kg-day	1.6E-05
				Indeno(1,2,3-cd)pyrene	1.6E-01	mg/kg	6.4E-09	mg/kg-day	1.2E+00	(mg/kg-day)-1	7.7E-09	4.5E-07	mg/kg-day	--	--	--
				Pyrene	2.9E-01	mg/kg	1.2E-08	mg/kg-day	--	--	--	8.3E-07	mg/kg-day	3.0E-02	mg/kg-day	2.8E-05
				Dibutyltin	1.3E-03	mg/kg	5.3E-11	mg/kg-day	--	--	--	3.7E-09	mg/kg-day	3.0E-04	mg/kg-day	1.2E-05
				Tributyltin	4.0E-03	mg/kg	1.6E-10	mg/kg-day	--	--	--	1.1E-08	mg/kg-day	3.0E-04	mg/kg-day	3.8E-05
				Total PCB Congeners	3.0E-02	mg/kg	1.2E-09	mg/kg-day	2.0E+00	(mg/kg-day)-1	2.5E-09	8.6E-08	mg/kg-day	2.0E-05	mg/kg-day	4.3E-03
				Total TEQ – PCB DLC	8.7E-06	mg/kg	3.5E-13	mg/kg-day	1.3E+05	(mg/kg-day)-1	4.5E-08	2.4E-11	mg/kg-day	7.0E-10	mg/kg-day	3.5E-02
			Exp. Route Total								3.3E-06					8.7E-01

TABLE A-17A
Calculation of RME Chemical Cancer Risks and Noncancer Hazards - Construction Worker, Reference Stations
Appendix A - Updated Human Health Risk Assessment for Chemical Exposures

Scenario Timeframe:	Future
Receptor Population:	Construction Worker
Receptor Age:	Adult

					EPC		Cancer Risk Calculations					Noncancer Hazard Quotient				
							Intake/Exposure Concentration		CSF / Unit Risk			Intake/Exposure Concentration		RfD / RfC		
Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	Value	Units	Value	Units	Value	Units	Cancer Risk	Value	Units	Value	Units	Hazard Quotient
Sediment	Sediment	Sediment	Dermal	Aluminum	7.6E+04	mg/kg	4.5E-04	mg/kg-day	--	--	--	3.1E-02	mg/kg-day	1.0E+00	mg/kg-day	3.1E-02
				Antimony	9.2E-01	mg/kg	5.4E-09	mg/kg-day	--	--	--	3.8E-07	mg/kg-day	6.0E-05	mg/kg-day	6.3E-03
				Arsenic	1.2E+01	mg/kg	2.1E-07	mg/kg-day	9.5E+00	(mg/kg-day)-1	2.0E-06	1.5E-05	mg/kg-day	3.0E-04	mg/kg-day	5.0E-02
				Barium	4.8E+02	mg/kg	2.9E-06	mg/kg-day	--	--	--	2.0E-04	mg/kg-day	1.4E-02	mg/kg-day	1.4E-02
				Cadmium	6.4E-01	mg/kg	3.8E-10	mg/kg-day	6.0E+02	(mg/kg-day)-1	2.3E-07	2.7E-08	mg/kg-day	2.5E-05	mg/kg-day	1.1E-03
				Chromium	1.8E+02	mg/kg	1.0E-06	mg/kg-day	--	--	--	7.3E-05	mg/kg-day	2.0E-02	mg/kg-day	3.7E-03
				Cobalt	2.1E+01	mg/kg	1.3E-07	mg/kg-day	--	--	--	8.9E-06	mg/kg-day	3.0E-04	mg/kg-day	3.0E-02
				Copper	4.7E+01	mg/kg	2.8E-07	mg/kg-day	--	--	--	1.9E-05	mg/kg-day	4.0E-02	mg/kg-day	4.9E-04
				Iron	4.9E+04	mg/kg	2.9E-04	mg/kg-day	--	--	--	2.0E-02	mg/kg-day	7.0E-01	mg/kg-day	2.9E-02
				Lead	2.9E+01	mg/kg	1.7E-07	mg/kg-day	--	--	--	1.2E-05	mg/kg-day	--	--	--
				Manganese	6.2E+02	mg/kg	3.6E-06	mg/kg-day	--	--	--	2.5E-04	mg/kg-day	1.4E-01	mg/kg-day	1.8E-03
				Mercury	3.6E-01	mg/kg	2.1E-09	mg/kg-day	--	--	--	1.5E-07	mg/kg-day	1.0E-04	mg/kg-day	1.5E-03
				Molybdenum	8.5E-01	mg/kg	5.0E-09	mg/kg-day	--	--	--	3.5E-07	mg/kg-day	5.0E-03	mg/kg-day	7.0E-05
				Nickel	1.0E+02	mg/kg	5.9E-07	mg/kg-day	--	--	--	4.1E-05	mg/kg-day	8.0E-04	mg/kg-day	5.2E-02
				Selenium	4.6E-01	mg/kg	2.7E-09	mg/kg-day	--	--	--	1.9E-07	mg/kg-day	5.0E-03	mg/kg-day	3.8E-05
				Silver	4.5E-01	mg/kg	2.6E-09	mg/kg-day	--	--	--	1.8E-07	mg/kg-day	2.0E-04	mg/kg-day	9.2E-04
				Vanadium	1.6E+02	mg/kg	9.4E-07	mg/kg-day	--	--	--	6.6E-05	mg/kg-day	1.3E-04	mg/kg-day	5.1E-01
				Zinc	1.3E+02	mg/kg	7.5E-07	mg/kg-day	--	--	--	5.3E-05	mg/kg-day	3.0E-01	mg/kg-day	1.8E-04
				4,4'-DDD	2.4E-03	mg/kg	7.1E-11	mg/kg-day	2.4E-01	(mg/kg-day)-1	1.7E-11	5.0E-09	mg/kg-day	5.0E-04	mg/kg-day	1.0E-05
				4,4'-DDE	9.1E-04	mg/kg	2.7E-11	mg/kg-day	3.4E-01	(mg/kg-day)-1	9.2E-12	1.9E-09	mg/kg-day	5.0E-04	mg/kg-day	3.8E-06
				4,4'-DDT	1.7E-03	mg/kg	4.9E-11	mg/kg-day	3.4E-01	(mg/kg-day)-1	1.7E-11	3.4E-09	mg/kg-day	5.0E-04	mg/kg-day	6.8E-06
				alpha-Chlordane	1.2E-04	mg/kg	3.5E-12	mg/kg-day	3.5E-01	(mg/kg-day)-1	1.2E-12	2.5E-10	mg/kg-day	5.0E-04	mg/kg-day	5.0E-07
				2-Methylnaphthalene	6.4E-03	mg/kg	5.7E-10	mg/kg-day	--	--	--	4.0E-08	mg/kg-day	4.0E-03	mg/kg-day	1.0E-05
				Acenaphthene	1.2E-02	mg/kg	1.1E-09	mg/kg-day	--	--	--	7.7E-08	mg/kg-day	6.0E-02	mg/kg-day	1.3E-06
				Acenaphthylene	9.3E-03	mg/kg	8.2E-10	mg/kg-day	--	--	--	5.8E-08	mg/kg-day	6.0E-02	mg/kg-day	9.6E-07
				Anthracene	3.1E-02	mg/kg	2.8E-09	mg/kg-day	--	--	--	1.9E-07	mg/kg-day	3.0E-01	mg/kg-day	6.5E-07
				Fluorene	8.4E-03	mg/kg	7.4E-10	mg/kg-day	--	--	--	5.2E-08	mg/kg-day	4.0E-02	mg/kg-day	1.3E-06
				Naphthalene	1.4E-02	mg/kg	1.3E-09	mg/kg-day	--	--	--	8.9E-08	mg/kg-day	2.0E-02	mg/kg-day	4.4E-06
				Phenanthrene	1.1E-01	mg/kg	9.3E-09	mg/kg-day	--	--	--	6.5E-07	mg/kg-day	3.0E-01	mg/kg-day	2.2E-06
				Benzo(a)anthracene	9.5E-02	mg/kg	8.4E-09	mg/kg-day	1.2E+00	(mg/kg-day)-1	1.0E-08	5.9E-07	mg/kg-day	--	--	--
				Benzo(a)pyrene	1.9E-01	mg/kg	1.6E-08	mg/kg-day	7.3E+00	(mg/kg-day)-1	1.2E-07	1.2E-06	mg/kg-day	--	--	--
				Benzo(b)fluoranthene	1.2E-01	mg/kg	1.0E-08	mg/kg-day	1.2E+00	(mg/kg-day)-1	1.2E-08	7.3E-07	mg/kg-day	--	--	--
				Benzo(g,h,i)perylene	1.8E-01	mg/kg	1.6E-08	mg/kg-day	--	--	--	1.1E-06	mg/kg-day	3.0E-02	mg/kg-day	3.7E-05
				Benzo(k)fluoranthene	1.1E-01	mg/kg	1.0E-08	mg/kg-day	1.2E+00	(mg/kg-day)-1	1.2E-08	7.0E-07	mg/kg-day	--	--	--
				Chrysene	1.1E-01	mg/kg	9.9E-09	mg/kg-day	1.2E-01	(mg/kg-day)-1	1.2E-09	6.9E-07	mg/kg-day	--	--	--
				Dibenz(a,h)anthracene	1.9E-02	mg/kg	1.7E-09	mg/kg-day	7.3E+00	(mg/kg-day)-1	1.2E-08	1.2E-07	mg/kg-day	--	--	--
				Fluoranthene	2.3E-01	mg/kg	2.1E-08	mg/kg-day	--	--	--	1.4E-06	mg/kg-day	4.0E-02	mg/kg-day	3.6E-05
				Indeno(1,2,3-cd)pyrene	1.6E-01	mg/kg	1.4E-08	mg/kg-day	1.2E+00	(mg/kg-day)-1	1.7E-08	9.9E-07	mg/kg-day	--	--	--
				Pyrene	2.9E-01	mg/kg	2.6E-08	mg/kg-day	--	--	--	1.8E-06	mg/kg-day	3.0E-02	mg/kg-day	6.1E-05
				Dibutyltin	1.3E-03	mg/kg	7.8E-11	mg/kg-day	--	--	--	5.5E-09	mg/kg-day	3.0E-04	mg/kg-day	1.8E-05
				Tributyltin	4.0E-03	mg/kg	2.4E-10	mg/kg-day	--	--	--	1.7E-08	mg/kg-day	3.0E-04	mg/kg-day	5.6E-05
				Total PCB Congeners	3.0E-02	mg/kg	2.7E-09	mg/kg-day	2.0E+00	(mg/kg-day)-1	5.4E-09	1.9E-07	mg/kg-day	2.0E-05	mg/kg-day	9.4E-03
				Total TEQ – PCB DLC	8.7E-06	mg/kg	1.5E-13	mg/kg-day	1.3E+05	(mg/kg-day)-1	2.0E-08	1.1E-11	mg/kg-day	7.0E-10	mg/kg-day	1.5E-02
			Exp. Route Total								2.5E-06					7.5E-01
		Exposure Point Total									5.8E-06					1.6E+00
	Exposure Medium Total										5.8E-06					1.6E+00
Medium Total											5.8E-06					1.6E+00
										Total of Receptor Risks across All Media	5.8E-06				Total of Receptor Hazards across All Media	1.6E+00

Acronyms/Abbreviations:

-- =	not available or not applicable
CSF =	cancer slope factor
DDD =	dichlorodiphenyldichloroethane
DDE =	dichlorodiphenyldichloroethylene
DDT =	dichlorodiphenyltrichloroethane
EPC =	exposure point concentration
Exp. =	exposure
M =	lifetime exposure from birth, mutagenic endpoint
(mg/kg-day)-	1/(milligram[s] per kilogram per day)
mg/kg =	milligram(s) per kilogram
mg/kg-day =	milligram(s) per kilogram per day
PCB =	polychlorinated biphenyl
RfC =	reference concentration
RfD =	reference dose
RME =	reasonable maximum exposure
TCDD =	tetrachlorodibenzo-p-dioxin

TABLE A-17B
Summary of Receptor Risks and Hazards - Construction Worker, Reference Stations
Appendix A - Updated Human Health Risk Assessment for Chemical Exposures

Scenario Timeframe:	Future
Receptor Population:	Construction Worker
Receptor Age:	Adult

				Cancer Risk				Noncancer Hazard Quotient			
Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Ingestion	Inhalation	Dermal	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total
Sediment	Sediment	Sediment	Aluminum	--	--	--	--	2.1E-01	--	3.1E-02	2.5E-01
			Antimony	--	--	--	--	6.5E-03	--	6.3E-03	1.3E-02
			Arsenic	2.8E-06	--	2.0E-06	4.8E-06	6.8E-02	--	5.0E-02	1.2E-01
			Barium	--	--	--	--	6.8E-03	--	1.4E-02	2.1E-02
			Cadmium	3.9E-07	--	2.3E-07	6.2E-07	1.8E-03	--	1.1E-03	2.9E-03
			Chromium	--	--	--	--	3.3E-04	--	3.7E-03	4.1E-03
			Cobalt	--	--	--	--	2.0E-01	--	3.0E-02	2.3E-01
			Copper	--	--	--	--	3.3E-03	--	4.9E-04	3.8E-03
			Iron	--	--	--	--	2.0E-01	--	2.9E-02	2.3E-01
			Lead	--	--	--	--	--	--	--	--
			Manganese	--	--	--	--	1.2E-02	--	1.8E-03	1.4E-02
			Mercury	--	--	--	--	1.0E-02	--	1.5E-03	1.2E-02
			Molybdenum	--	--	--	--	4.8E-04	--	7.0E-05	5.5E-04
			Nickel	--	--	--	--	1.4E-02	--	5.2E-02	6.6E-02
			Selenium	--	--	--	--	2.6E-04	--	3.8E-05	3.0E-04
			Silver	--	--	--	--	2.5E-04	--	9.2E-04	1.2E-03
			Vanadium	--	--	--	--	9.0E-02	--	5.1E-01	6.0E-01
			Zinc	--	--	--	--	1.2E-03	--	1.8E-04	1.4E-03
			4,4'-DDD	2.3E-11	--	1.7E-11	4.0E-11	1.4E-05	--	1.0E-05	2.4E-05
			4,4'-DDE	1.3E-11	--	9.2E-12	2.2E-11	5.2E-06	--	3.8E-06	8.9E-06
			4,4'-DDT	2.3E-11	--	1.7E-11	3.9E-11	9.3E-06	--	6.8E-06	1.6E-05
			alpha-Chlordane	1.7E-12	--	1.2E-12	2.9E-12	6.8E-07	--	5.0E-07	1.2E-06
			2-Methylnaphthalene	--	--	--	--	4.5E-06	--	1.0E-05	1.5E-05
			Acenaphthene	--	--	--	--	5.8E-07	--	1.3E-06	1.9E-06
			Acenaphthylene	--	--	--	--	4.4E-07	--	9.6E-07	1.4E-06
			Anthracene	--	--	--	--	2.9E-07	--	6.5E-07	9.4E-07
			Fluorene	--	--	--	--	5.9E-07	--	1.3E-06	1.9E-06
			Naphthalene	--	--	--	--	2.0E-06	--	4.4E-06	6.5E-06
			Phenanthrene	--	--	--	--	9.9E-07	--	2.2E-06	3.2E-06
			Benzo(a)anthracene	4.6E-09	--	1.0E-08	1.5E-08	--	--	--	--
			Benzo(a)pyrene	5.5E-08	--	1.2E-07	1.8E-07	--	--	--	--
			Benzo(b)fluoranthene	5.7E-09	--	1.2E-08	1.8E-08	--	--	--	--
			Benzo(g,h,i)perylene	--	--	--	--	1.7E-05	--	3.7E-05	5.4E-05
			Benzo(k)fluoranthene	5.5E-09	--	1.2E-08	1.7E-08	--	--	--	--
			Chrysene	5.4E-10	--	1.2E-09	1.7E-09	--	--	--	--
			Dibenz(a,h)anthracene	5.5E-09	--	1.2E-08	1.8E-08	--	--	--	--
			Fluoranthene	--	--	--	--	1.6E-05	--	3.6E-05	5.3E-05
			Indeno(1,2,3-cd)pyrene	7.7E-09	--	1.7E-08	2.5E-08	--	--	--	--
			Pyrene	--	--	--	--	2.8E-05	--	6.1E-05	8.8E-05
			Dibutyltin	--	--	--	--	1.2E-05	--	1.8E-05	3.1E-05
			Tributyltin	--	--	--	--	3.8E-05	--	5.6E-05	9.4E-05
			Total PCB Congeners	2.5E-09	--	5.4E-09	7.8E-09	4.3E-03	--	9.4E-03	1.4E-02
			Total TEQ – PCB DLC	4.5E-08	--	2.0E-08	6.5E-08	3.5E-02	--	1.5E-02	5.0E-02
			Chemical Total	3.3E-06	--	2.5E-06	5.8E-06	8.7E-01	--	7.5E-01	1.6E+00
		Exposure Point Total					5.8E-06				1.6E+00
	Exposure Medium Total						5.8E-06				1.6E+00
Medium Total							5.8E-06				1.6E+00
Receptor Total						Total Risk across All Media	5.8E-06			Total Hazard across All Media	1.6E+00

Acronyms/Abbreviations:

-- =	not available or not applicable	DDT =	dichlorodiphenyltrichloroethane
DDD =	dichlorodiphenyldichloroethane	PCB =	polychlorinated biphenyl
DDE =	dichlorodiphenyldichloroethylene	TCDD =	tetrachlorodibenzo-p-dioxin

TABLE A-17C
Summary of Risk Drivers - Construction Worker, Reference Stations
Appendix A - Updated Human Health Risk Assessment for Chemical Exposures

Scenario Timeframe:	Future
Receptor Population:	Construction Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Cancer Risk Ingestion	Cancer Risk Inhalation	Cancer Risk Dermal	Cancer Risk Exposure Routes Total	Noncancer Hazard Quotient Ingestion	Noncancer Hazard Quotient Inhalation	Noncancer Hazard Quotient Dermal	Noncancer Hazard Quotient Exposure Routes Total
Sediment	Sediment	Sediment	Arsenic	2.8E-06	--	2.0E-06	4.8E-06	6.8E-02	--	5.0E-02	1.2E-01
			Chemical Total	--	--	--	4.8E-06	--	--	--	1.2E-01
		Exposure Point Total					4.8E-06				1.2E-01
	Exposure Medium Total						4.8E-06				1.2E-01
Medium Total							4.8E-06				1.2E-01
Receptor Total						Total Risk across All Media	4.8E-06			Total Hazard across All Media	1.2E-01

Acronyms/Abbreviations:
-- = not available or not applicable

TABLE A-18
Summary of Cancer Risks and Noncancer Hazards
Appendix A - Updated Human Health Risk Assessment for Chemical Exposures

Area	Exposure Pathway	CANCER RISK		NONCANCER HAZARD	
		Future Recreational User [a]	Future Construction Worker	Future Recreational User [a]	Future Construction Worker
Eastern Wetland Area	**Sediment Exposure Pathways**				
	Sediment Ingestion	7E-06	2E-06	2E-01	7E-01
	Dermal Contact with Sediment	1E-06	2E-06	4E-02	7E-01
	Sediment TOTAL	**9E-06**	**4E-06**	**3E-01**	**1E+00**
	Macoma Exposure Pathway				
	Macoma Ingestion	3E-04	--	1E+00	--
	Macoma TOTAL	**3E-04**	**--**	**1E+00**	**--**
	Multipathway Total	**4E-04**	**4E-06**	**2E+00**	**1E+00**
India Basin I	**Sediment Exposure Pathways**				
	Sediment Ingestion	9E-06	3E-06	3E-01	8E-01
	Dermal Contact with Sediment	2E-06	2E-06	5E-02	7E-01
	Sediment TOTAL	**1E-05**	**5E-06**	**3E-01**	**2E+00**
	Macoma Exposure Pathway				
	Macoma Ingestion	3E-04	--	9E-01	--
	Macoma TOTAL	**3E-04**	**--**	**9E-01**	**--**
	Multipathway Total	**3E-04**	**5E-06**	**1E+00**	**2E+00**
Oil Reclamation Area	**Sediment Exposure Pathways**				
	Sediment Ingestion	1E-05	3E-06	3E-01	9E-01
	Dermal Contact with Sediment	2E-06	3E-06	6E-02	9E-01
	Sediment TOTAL	**1E-05**	**6E-06**	**4E-01**	**2E+00**
	Macoma Exposure Pathway				
	Macoma Ingestion	3E-04	--	9E-01	--
	Macoma TOTAL	**3E-04**	**--**	**9E-01**	**--**
	Multipathway Total	**3E-04**	**6E-06**	**1E+00**	**2E+00**
Point Avisadero Area	**Sediment Exposure Pathways**				
	Sediment Ingestion	1E-05	3E-06	4E-01	1E+00
	Dermal Contact with Sediment	3E-06	3E-06	8E-02	1E+00
	Sediment TOTAL	**1E-05**	**6E-06**	**5E-01**	**2E+00**
	Macoma Exposure Pathway				
	Macoma Ingestion	3E-04	--	9E-01	--
	Macoma TOTAL	**3E-04**	**--**	**9E-01**	**--**
	Multipathway Total	**3E-04**	**6E-06**	**1E+00**	**2E+00**
South Basin Area X	**Sediment Exposure Pathways**				
	Sediment Ingestion	1E-05	3E-06	4E-01	1E+00
	Dermal Contact with Sediment	2E-06	3E-06	9E-02	1E+00
	Sediment TOTAL	**1E-05**	**6E-06**	**5E-01**	**2E+00**
	Macoma Exposure Pathway				
	Macoma Ingestion	3E-04	--	1E+00	--
	Macoma TOTAL	**3E-04**	**--**	**1E+00**	**--**
	Multipathway Total	**3E-04**	**6E-06**	**2E+00**	**2E+00**

TABLE A-18
Summary of Cancer Risks and Noncancer Hazards
Appendix A - Updated Human Health Risk Assessment for Chemical Exposures

Area	Exposure Pathway	CANCER RISK		NONCANCER HAZARD	
		Future Recreational User [a]	Future Construction Worker	Future Recreational User [a]	Future Construction Worker
Reference Stations	**Sediment Exposure Pathways**				
	Sediment Ingestion	1E-05	3E-06	3E-01	9E-01
	Dermal Contact with Sediment	2E-06	2E-06	5E-02	8E-01
	Sediment TOTAL	**1E-05**	**6E-06**	**3E-01**	**2E+00**
	Macoma Exposure Pathway				
	Macoma Ingestion	3E-04	--	7E-01	--
	Macoma TOTAL	**3E-04**	**--**	**7E-01**	**--**
	Multipathway Total	**3E-04**	**6E-06**	**1E+00**	**2E+00**

Notes:

In accordance with USEPA (1989), cumulative risk and hazard estimates are presented to one significant figure.

-- Not applicable; exposure pathway is not complete for this receptor.

a For the recreational user, the cancer risk for sediment exposure is based on adult and child exposures while the noncancer hazard is based on child exposure only. The cancer risk and noncancer hazard for recreational ingestion of macoma is based on adult exposure only.

Reference:

United States Environmental Protection Agency (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. December.

TABLE A-19

Comparison of Updated HHRA Results with 2005 HHRA Results

Appendix A - Updated Human Health Risk Assessment for Chemical Exposures

A1. Shellfish Consumption, Recreational User - Summary of Cumulative RME Cancer Risks

Area	*2005 HHRA Results*				*Updated HHRA Results*			
	Cumulative Risk at HPS	Cumulative Risk from Reference	Exceedance Above Safe Risk Level (10^{-6})?	Exceedance Above Reference Levels?	Cumulative Risk at HPS	Cumulative Risk from Reference	Exceedance Above Safe Risk Level (10-6)?	Exceedance Above Reference Levels?
	RME Exposure Factors	RME Exposure Factors	RME Risk	RME Risk	RME Exposure Factors	RME Exposure Factors	RME Risk	RME Risk
Eastern Wetland Area	2.2E-02	3.3E-02	Yes	No	3.5E-04	3.1E-04	Yes	Yes
India Basin Area I	1.7E-03	3.3E-02	Yes	No	2.7E-04	3.1E-04	Yes	No
Oil Reclamation Area	3.9E-02	3.3E-02	Yes	Yes	3.1E-04	3.1E-04	Yes	Yes
Point Avisadero Area	1.8E-03	3.3E-02	Yes	No	2.7E-04	3.1E-04	Yes	No
South Basin Area X	4.3E-02	3.3E-02	Yes	Yes	2.7E-04	3.1E-04	Yes	No

Note:

Results based on adult exposure only.

A2. Shellfish Consumption, Recreational User - RME Cancer Risk Drivers by Area

Area	*2005 HHRA Results*								*Updated HHRA Results*									
	Individual Risk at HPS				Individual Risk at Reference				Individual Risk at HPS					Individual Risk at Reference				
	Arsenic	Chromium	Total Congeners	Dioxin	Arsenic	Chromium	Total Congeners	Dioxin	Arsenic	Cadmium	Total PCB Congeners	Total TEQ – PCB DLC	Total TEQ – TCDD DLC	Arsenic	Cadmium	Total PCB Congeners	Total TEQ – PCB DLC	Total TEQ – TCDD DLC
Eastern Wetland Area	1.9E-03	1.5E-04	6.9E-05	1.9E-02	1.7E-03	1.6E-04	1.2E-05	3.1E-02	3.1E-04	2.0E-05	7.3E-07	1.8E-05	--	2.7E-04	1.7E-05	1.8E-07	7.1E-06	3.8E-07
India Basin Area I	1.5E-03	9.0E-05	2.5E-05	–	1.7E-03	1.6E-04	1.2E-05	3.1E-02	2.5E-04	5.4E-06	--	1.3E-05	--	2.7E-04	1.7E-05	1.8E-07	7.1E-06	3.8E-07
Oil Reclamation Area	1.6E-03	1.3E-04	5.8E-04	3.6E-02	1.7E-03	1.6E-04	1.2E-05	3.1E-02	2.8E-04	2.3E-05	2.6E-06	5.5E-06	--	2.7E-04	1.7E-05	1.8E-07	7.1E-06	3.8E-07
Point Avisadero Area	1.6E-03	1.8E-04	3.8E-05	–	1.7E-03	1.6E-04	1.2E-05	3.1E-02	2.6E-04	5.7E-06	--	8.1E-06	--	2.7E-04	1.7E-05	1.8E-07	7.1E-06	3.8E-07
South Basin Area X	1.5E-03	1.1E-04	4.7E-04	4.1E-02	1.7E-03	1.6E-04	1.2E-05	3.1E-02	2.5E-04	5.7E-06	5.0E-06	7.6E-06	8.7E-07	2.7E-04	1.7E-05	1.8E-07	7.1E-06	3.8E-07

Note:

-- Chemical was not identified as a risk driver for this area (cancer risk did not exceed 1E-06).

Results based on adult exposure only.

A3. Shellfish Consumption, Adult Recreational User - Percent Contribution by Area and Ratios of Chemical-Specific RME Cancer Risks

Area	*2005 HHRA Results*								*Updated HHRA Results*									
	% Contribution to Cumulative HPS RME Risk				Ratio of Individual Risk from HPS Site to Reference				% Contribution to Cumulative HPS RME Risk					Ratio of Individual Risk from HPS Site to Reference				
	Arsenic	Chromium	Total Congeners	Dioxin	Arsenic	Chromium	Total Congeners	Dioxin	Arsenic	Cadmium	Total PCB Congeners	Total TEQ – PCB DLC	Total TEQ – TCDD DLC	Arsenic	Cadmium	Total PCB Congeners	Total TEQ – PCB DLC	Total TEQ – TCDD DLC
Eastern Wetland Area	9%	0.70%	0.30%	90%	1.1	1	6	0.6	89%	6%	--	5%	--	1.1	1.2	4.0	2.6	--
India Basin Area I	90%	5%	1.50%	–	0.9	0.6	2.2	–	93%	2%	--	5%	--	0.9	0.3	--	1.9	--
Oil Reclamation Area	4%	0.30%	1.50%	94%	1	0.8	50.1	1.2	90%	7%	1%	2%	--	1.0	1.4	14.4	0.8	--
Point Avisadero Area	86%	10%	2.10%	–	0.9	1.2	3.3	–	95%	2%	--	3%	--	0.9	0.3	--	1.1	--
South Basin Area X	3%	0.30%	1.10%	95%	0.9	0.7	41.1	1.3	92%	2%	2%	3%	0.3%	0.9	0.3	27.7	1.1	2.3

Note:

-- Chemical was not identified as a risk driver for this area (cancer risk did not exceed 1E-06).

Results based on adult exposure only.

B1. Direct Contact with Sediment, Recreational User - Summary of Cumulative RME Cancer Risks

Area	*2005 HHRA Results (a)*				*Updated HHRA Results (a)*			
	Cumulative Risk at HPS	Cumulative Risk from Reference	Exceedance Above Safe Risk Level (10^{-6})?	Exceedance Above Reference Levels?	Cumulative Risk at HPS	Cumulative Risk from Reference	Exceedance Above Safe Risk Level (10^{-6})?	Exceedance Above Reference Levels?
	RME Exposure Factors	RME Exposure Factors	RME Risk	RME Risk	RME Exposure Factors	RME Exposure Factors	RME Risk	RME Risk
Eastern Wetland Area	3.4E-06	2.6E-06	Yes	Yes	8.6E-06	1.1E-05	Yes	No
India Basin Area I	3.4E-06	2.6E-06	Yes	Yes	1.0E-05	1.1E-05	Yes	No
Oil Reclamation Area	4.9E-06	2.6E-06	Yes	Yes	1.2E-05	1.1E-05	Yes	Yes
Point Avisadero Area	3.8E-06	2.6E-06	Yes	Yes	1.4E-05	1.1E-05	Yes	Yes
South Basin Area X	3.7E-06	2.6E-06	Yes	Yes	1.3E-05	1.1E-05	Yes	Yes

Note:

a Previous results based on adult exposure only; updated results based on combined adult and child exposure (cumulative lifetime risk).

TABLE A-19
Comparison of Updated HHRA Results with 2005 HHRA Results
Appendix A - Updated Human Health Risk Assessment for Chemical Exposures

B2. Direct Contact with Sediment, Recreational User - RME Cancer Risk Drivers by Area

Area	*2005 HHRA Results (a)*								*Updated HHRA Results (a)*				
	Individual Risk at HPS				Individual Risk at Reference				Individual Risk at HPS		Individual Risk at Reference		
	Arsenic	Chromium	Benzo(a)pyrene	Total Congeners	Arsenic	Chromium	Benzo(a)pyrene	Total Congeners	BAP (EQ)*	Arsenic	BAP (EQ)*	Arsenic	Cadmium
Eastern Wetland Area	7.1E-07	2.5E-06	1.0E-07	6.1E-09	8.9E-07	1.5E-06	1.5E-07	4.9E-09	1.1E-06	6.8E-06	1.4E-06	8.6E-06	1.2E-06
India Basin Area I	8.0E-07	2.3E-06	1.9E-07	1.6E-08	8.9E-07	1.5E-06	1.5E-07	4.9E-09	1.9E-06	7.8E-06	1.4E-06	8.6E-06	1.2E-06
Oil Reclamation Area	9.3E-07	3.7E-06	1.6E-07	6.0E-08	8.9E-07	1.5E-06	1.5E-07	4.9E-09	1.4E-06	9.0E-06	1.4E-06	8.6E-06	1.2E-06
Point Avisadero Area	9.1E-07	2.2E-06	3.8E-07	9.8E-08	8.9E-07	1.5E-06	1.5E-07	4.9E-09	3.7E-06	8.8E-06	1.4E-06	8.6E-06	1.2E-06
South Basin Area X	8.3E-07	2.2E-06	2.1E-06	2.8E-07	8.9E-07	1.5E-06	1.5E-07	4.9E-09	2.3E-06	8.1E-06	1.4E-06	8.6E-06	1.2E-06

Note:

a Previous results based on adult exposure only; updated results based on combined adult and child exposure (cumulative lifetime risk).

B3. Direct Contact with Sediment, Recreational User - Percent Contribution by Area and Ratios of Chemical-Specific RME Cancer Risks

Area	*Previous 2005 HHRA Results*								*Updated HHRA Results (a)*			
	% Contribution to Cumulative HPS RME Risk				Ratio of Individual Risk from HPS Site to Reference				% Contribution to Cumulative HPS RME Risk		Ratio of Individual Risk from HPS Site to Reference	
	Arsenic	Chromium	Benzo(a)pyrene	Total Congeners	Arsenic	Chromium	Benzo(a)pyrene	Total Congeners	BAP (EQ)*	Arsenic	BAP (EQ)*	Arsenic
Eastern Wetland Area	Not calculated				Not calculated				13%	80%	0.78	0.80
India Basin Area I									18%	74%	1.40	0.91
Oil Reclamation Area									12%	78%	1.02	1.05
Point Avisadero Area									26%	63%	2.67	1.03
South Basin Area X									18%	63%	1.68	0.94

Note:

a Updated results based on combined adult and child exposure (cumulative lifetime risk).

C1. Shellfish Consumption, Recreational User - Summary of Noncancer Hazard Indices

Area	*2005 HHRA Results*				*Updated HHRA Results*			
	Hazard Index at HPS	Hazard Index from Reference	Exceedance Above Benchmark (1.0)?	Exceedance Above Reference Levels?	Hazard Index at HPS	Hazard Index from Reference	Exceedance Above Benchmark (1.0)?	Exceedance Above Reference Levels?
	RME Exposure Factors	RME Exposure Factors	RME Risk	RME Risk	RME Exposure Factors	RME Exposure Factors	RME Risk	RME Risk
Eastern Wetland Area	1.1E+01	9.8E+00	Yes	Yes	1.3E+00	7.4E-01	Yes	Yes
India Basin Area I	8.8E+00	9.8E+00	Yes	No	9.3E-01	7.4E-01	No	Yes
Oil Reclamation Area	9.6E+00	9.8E+00	Yes	No	9.4E-01	7.4E-01	No	Yes
Point Avisadero Area	1.0E+01	9.8E+00	Yes	Yes	8.6E-01	7.4E-01	No	Yes
South Basin Area X	8.9E+00	9.8E+00	Yes	No	1.2E+00	7.4E-01	Yes	Yes

Note:

Results based on adult exposure only.

C2. Shellfish Consumption, Recreational User - RME Noncancer Hazard Index Drivers by Area

Area	*2005 HHRA Results*								*Updated HHRA Results*	
	Individual Hazard at HPS				Individual Hazard at Reference				Individual Hazard at HPS	Individual Hazard at Reference
	Arsenic	Chromium	Mercury	Cadmium	Arsenic	Chromium	Mercury	Cadmium	None	None
Eastern Wetland Area	9.8E+00	6.3E-01	1.6E-01	1.6E-01	8.6E+00	6.4E-01	1.6E-01	1.2E-01	--	--
India Basin Area I	7.9E+00	3.7E-01	1.3E-01	6.5E-02	8.6E+00	6.4E-01	1.6E-01	1.2E-01	--	--
Oil Reclamation Area	8.3E+00	5.3E-01	1.8E-01	7.8E-02	8.6E+00	6.4E-01	1.6E-01	1.2E-01	--	--
Point Avisadero Area	8.1E+00	7.5E-01	1.1E+00	6.8E-02	8.6E+00	6.4E-01	1.6E-01	1.2E-01	--	--
South Basin Area X	7.8E+00	4.6E-01	1.6E-01	6.8E-02	8.6E+00	6.4E-01	1.6E-01	1.2E-01	--	--

Note:

Results based on adult exposure only.

TABLE A-19
Comparison of Updated HHRA Results with 2005 HHRA Results
Appendix A - Updated Human Health Risk Assessment for Chemical Exposures

C3. Shellfish Consumption, Recreational User - Percent Contribution by Area and Ratio of Individual Noncancer Hazard Indices

Area	*2005 HHRA Results*								*Updated HHRA Results*	
	% Contribution to Cumulative HPS RME Hazard				Ratio of Individual Hazard from HPS Site to Reference				% Contribution to Cumulative HPS RME Hazard	Ratio of Individual Hazard from HPS Site to Reference
	Arsenic	Chromium	Mercury	Cadmium	Arsenic	Chromium	Mercury	Cadmium	Not Calculated	Not Calculated
Eastern Wetland Area	88%	6%	1%	2%	1.1E+00	1.0E+00	1.0E+00	1.3E+00	--	--
India Basin Area I	90%	4%	2%	1%	9.0E-01	6.0E-01	8.0E-01	5.0E-01	--	--
Oil Reclamation Area	87%	6%	2%	1%	1.0E+00	8.0E-01	1.1E+00	6.0E-01	--	--
Point Avisadero Area	77%	7%	11%	1%	9.0E-01	1.2E+00	6.9E+00	6.0E-01	--	--
South Basin Area X	88%	5%	2%	1%	9.0E-01	7.0E-01	1.0E+00	6.0E-01	--	--

Note:

Results based on adult exposure only.

D1. Direct Contact with Sediment, Recreational User - Summary of Noncancer Hazard Indices

Area	*2005 HHRA Results*				*Updated HHRA Results*			
	Hazard Index at HPS	Hazard Index from Reference	Exceedance Above Benchmark (1.0)?	Exceedance Above Reference Levels?	Hazard Index at HPS	Hazard Index from Reference	Exceedance Above Benchmark (1.0)?	Exceedance Above Reference Levels?
	RME Exposure Factors	RME Exposure Factors	RME Risk	RME Risk	RME Exposure Factors	RME Exposure Factors	RME Risk	RME Risk
Eastern Wetland Area	8.2E-02	6.0E-02	No	Yes	2.9E-01	3.4E-01	No	No
India Basin Area I	7.3E-02	6.0E-02	No	Yes	3.2E-01	3.4E-01	No	No
Oil Reclamation Area	1.1E-01	6.0E-02	No	Yes	3.7E-01	3.4E-01	No	Yes
Point Avisadero Area	8.4E-02	6.0E-02	No	Yes	4.6E-01	3.4E-01	No	Yes
South Basin Area X	7.8E-02	6.0E-02	No	Yes	4.7E-01	3.4E-01	No	Yes

Notes:

Previous and current results based on child only.

E1. Direct Contact with Sediment, Construction Worker - Summary of Cumulative RME Cancer Risks

Area	*Previous HHRA Results*				*Updated HHRA Results*			
	Cumulative Risk at HPS	Cumulative Risk from Reference	Exceedance Above Safe Risk Level (10^{-6})?	Exceedance Above Reference Levels?	Cumulative Risk at HPS	Cumulative Risk from Reference	Exceedance Above Safe Risk Level (10^{-6})?	Exceedance Above Reference Levels?
	RME Exposure Factors	RME Exposure Factors	RME Risk	RME Risk	RME Exposure Factors	RME Exposure Factors	RME Risk	RME Risk
Eastern Wetland Area	5.2E-07	4.1E-07	No	Yes	4.4E-06	5.8E-06	Yes	No
India Basin Area I	5.3E-07	4.1E-07	No	Yes	5.1E-06	5.8E-06	Yes	Yes
Oil Reclamation Area	7.6E-07	4.1E-07	No	Yes	5.9E-06	5.8E-06	Yes	Yes
Point Avisadero Area	6.0E-07	4.1E-07	No	Yes	6.5E-06	5.8E-06	Yes	Yes
South Basin Area X	5.8E-07	4.1E-07	No	Yes	6.2E-06	5.8E-06	Yes	Yes

Notes:

Previous and current results based on child only.

E2. Direct Contact with Sediment, Construction Worker - RME Cancer Risk Drivers by Area

Area	*Previous HHRA Results*		*Updated HHRA Results*	
	Individual Risk at HPS	Individual Risk at Reference	Individual Risk at HPS	Individual Risk at Reference
	None	None	Arsenic	Arsenic
Eastern Wetland Area	--	--	3.9E-06	4.8E-06
India Basin Area I	--	--	4.4E-06	4.8E-06
Oil Reclamation Area	--	--	5.1E-06	4.8E-06
Point Avisadero Area	--	--	5.0E-06	4.8E-06
South Basin Area X	--	--	4.5E-06	4.8E-06

Note:

-- No chemicals were identified as risk drivers (no chemical-specific cancer risks exceeded 1E-06).

Previous and current results based on child only.

TABLE A-19
Comparison of Updated HHRA Results with 2005 HHRA Results
Appendix A - Updated Human Health Risk Assessment for Chemical Exposures

E3. Direct Contact with Sediment, Construction Worker - Percent Contribution by Area and Ratios of Chemical-Specific RME Cancer Risks

Area	*Updated HHRA Results*	
	% Contribution to Cumulative HPS RME Risk	Ratio of Individual Hazard from HPS Site to Reference
	Arsenic	Arsenic
Eastern Wetland Area	88%	0.8
India Basin Area I	86%	0.9
Oil Reclamation Area	86%	1.0
Point Avisadero Area	76%	1.0
South Basin Area X	73%	0.9

F1. Direct Contact with Sediment, Construction Worker - Summary of RME Noncancer Hazard Indices

Area	*Previous HHRA Results*				*Updated HHRA Results*			
	Hazard Index at HPS	Hazard Index from Reference	Exceedance Above Benchmark (1.0)?	Exceedance Above Reference Levels?	Hazard Index at HPS	Hazard Index from Reference	Exceedance Above Benchmark (1.0)?	Exceedance Above Reference Levels?
	RME Exposure Factors	RME Exposure Factors	RME Risk	RME Risk	RME Exposure Factors	RME Exposure Factors	RME Risk	RME Risk
Eastern Wetland Area	7.0E-02	6.0E-02	Yes	No	1.4E+00	1.6E+00	Yes	No
India Basin Area I	7.0E-02	6.0E-02	Yes	No	1.6E+00	1.6E+00	Yes	No
Oil Reclamation Area	1.0E-01	6.0E-02	Yes	Yes	1.8E+00	1.6E+00	Yes	Yes
Point Avisadero Area	8.0E-02	6.0E-02	Yes	Yes	2.4E+00	1.6E+00	Yes	Yes
South Basin Area X	8.0E-02	6.0E-02	Yes	Yes	2.4E+00	1.6E+00	Yes	Yes

F2. Direct Contact with Sediment, Construction Worker - RME Noncancer Hazard Index Drivers by Area

Area	*Updated HHRA Results*	
	Individual Hazard at HPS	Individual Hazard at Reference
	None	None
Eastern Wetland Area	--	--
India Basin Area I	--	--
Oil Reclamation Area	--	--
Point Avisadero Area	--	--
South Basin Area X	--	--

Note:
-- No chemicals were identified as risk drivers (no chemical-specific noncancer hazard indices exceeded 1).

Abbreviations:

BAP (EQ) =	benzo(a)pyrene equivalents
DLC =	dioxin-like congeners
HHRA =	human health risk assessment
HPS =	Hunters Point Shipyard
PCB =	polychlorinated biphenyls
RME =	reasonable maximum exposure
TCDD =	tetrachlorodibenzo-p-dioxin
TEQ =	toxicity equivalent

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Reference Item 10b
Human Health Risk Assessment

Source:

ECC-Insight, LLC and CDM Smith. 2017. *Final Technical Memorandum – Optimized Remedial Alternative for Parcel F, Hunters Point Naval Shipyard, San Francisco, CA*. September.

DCN:

INEC-2004-0014-0004

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Section 2.1

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SECTION 2 PRELIMINARY REMEDIATION GOALS

As discussed in the FFS, PRGs were developed for Parcel F based on risk assessment results and RAOs. Consistent with United States Environmental Protection Agency (USEPA) guidance, RAOs consist of media-specific goals for protecting human health and the environment. RAOs provide a general description of what the cleanup is expected to accomplish and facilitate the development and evaluation of remedial action alternatives in the FFS. PRGs represent concentrations in environmental media that are protective of both human and ecological receptors for each RAO. **Attachment 1** presents information on the exposure assumptions and toxicity criteria from the FFS Report and Validation Study Report used to calculate the Parcel F PRGs (Battelle, BBL and Neptune & Company, 2005).

2.1 Risk Assessment Summary

RAOs were developed in the FFS based on the results of the human health and ecological risk assessments presented in the HPNS Validation Study (Battelle, BBL and Neptune & Company, 2005). The risk assessment characterizes the risks associated with current and reasonably anticipated future exposure at each of three subareas associated with Parcel F. Unacceptable risks identified in the baseline human health and ecological risk assessments are generally the focus of remedial activities.

The ecological risk assessment focused on birds feeding on benthic invertebrates and fishes because they have significant potential for exposure to site COCs through prey ingestion and incidental ingestion of prey. As described in the Validation Study Report (Battelle, BBL and Neptune & Company, 2005), the surf scoter was selected as a representative ecological receptor because they are present at the site in large numbers during the winter, feed primarily on benthic organisms directly exposed to contaminated sediments, and may be exposed to both intertidal and subtidal sediments, and there is a substantial body of relevant literature for this species. Special status fish species such as green sturgeon, steelhead, and longfin smelt were not considered in the risk assessment due to their large home range and limited potential for exposure to site COCs. The ecological risk assessment determined that exposure to Parcel F sediments resulted in unacceptable risks to the surf scoter in Areas III, IX and X. In Area III, copper and mercury were identified as the primary risk drivers, and PCBs were the primary risk drivers in Areas IX and X (Battelle, BBL and Neptune and Company 2005). A summary of the risks to the surf scoter are summarized in **Table 2-1.**

Evaluation of fish tissue in the Validation Study determined that only total PCBs in jacksmelt were present above ambient levels. The human health evaluation similarly concluded that risks to humans from chemicals in Parcel F sediments appear to be similar to risks from ambient conditions with the exception of exposure to PCBs (Battelle, BBL and Neptune and Company, 2005). Risks to human health associated with PCBs were highest in Areas IX and X. A summary of total PCB risks are as follows:

- Direct contact risks ranged between 6×10^{-9} and 3×10^{-7} ,

- Shellfish consumption risk was estimated at 1 x 10^{-5}, and
- Fish (jacksmelt) consumption risk was estimated at 3 x 10^{-4}.

The results of the human health risk assessment (HHRA) were updated in the FS Addendum (KCH, 2017a), which determined that radiological risk resulting from exposure to Parcel F sediments was within USEPA's risk range of 1 x 10^{-4} to 1 x 10^{-6} and did not exceed the risk associated with background levels of radionuclides. The risks associated with exposure to chemicals were also revised to reflect updated USEPA and California Department of Toxic Substances Control (DTSC) recommendations for exposure point concentrations, exposure factors, toxicity criteria, and mode of action (USEPA, 2014; DTSC, 2014). Key exposure factors that were adjusted include the exposure duration and averaging time for cancer and non-cancer risks, adult body weight, and the cancer slope factor for total PCBs. In addition, non-cancer risk associated with exposure to PCBs was evaluated. The updated risk assessment demonstrated that risks to human health were within USEPA's risk range of 1 x 10^{-4} to 1 x 10^{-6} under the Reasonable Maximum Exposure scenario, with the exception of arsenic and the shellfish consumption exposure pathway. The risks associated with arsenic were similar to (and actually lower than) the reference area risks (site risk = 2.5 x 10^{-4}; reference risks = 2.7 x 10^{-4}). The updated total human health PCB risks are as follows **(Table 2-2):**

- Direct contact cancer risks ranged between 1 x 10^{-7} and 5 x 10^{-5},
- Direct contact hazard quotients ranged between 0.002 and 0.1,
- Shellfish consumption risk ranged between 3 x 10^{-7} and 8 x 10^{-6}, and
- Shellfish consumption hazard quotients ranged between 0.02 and 0.4.

The FS Addendum did not reevaluate risks associated with the fish consumption exposure pathway due to uncertainties associated with the fish consumption pathway, such as the difficulty in linking tissue concentrations in larger sport fish to site-specific sediment concentrations (KCH, 2017a). However, fish consumption risks associated with PCBs were recalculated in this Tech Memo using the updated exposure factors and the site-wide jacksmelt tissue concentration of 224 µg/kg presented in the 2005 Validation Study. A summary of the updated human health risks are presented in **Table 2-2.**

- Fish (jacksmelt) consumption risk was estimated at 9 x 10^{-5}, and
- Fish (jacksmelt) non-cancer hazard quotient was estimated at 8.

2.2 Remedial Action Objectives

Consistent with USEPA guidance (USEPA, 1988), RAOs are intended to provide a general description of the cleanup objectives and provide the basis for the development of specific PRGs. RAOs consist of media-specific goals for protecting human health and the environment that specify COCs for each media of interest; exposure pathways, including exposure routes and

Reference Item 11a
Ecological Risk Assessment

Source:

Battelle, Blasland, Bouck & Lee, Inc. (BBL) and Neptune and Company. 2005. *Final Hunters Point Shipyard Parcel F, Validation Study Report, San Francisco Bay, California*. May 2.

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Section 12.1.6

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bioaccumulation), ancillary data, and the human health evaluation to identify pathways and contaminants driving ecological and human health risk in each of the five areas included in the Validation Study.

12.1.4 Human Health Evaluation

Potential human health risks from shellfish consumption and direct contact with sediment during shellfish collection were evaluated on a station-by-station basis and on an area-wide basis using *M. nasuta* tissue data from the laboratory bioaccumulation test. The exposure parameters for direct contact with sediment are similar to those for a wading scenario. Risks from direct contact with sediment were more than 100 times lower than risks from shellfish ingestion. On an area-wide basis, cumulative risks to humans from Parcel F sediments were comparable to risks from ambient conditions in San Francisco Bay with the exception of exposure to PCBs. In general, risks associated with PCBs were highest on the south side of HPS, particularly in Areas IX and X. This conclusion is supported by both the shellfish evaluation and the statistical comparison of recreationally preferred sport fish from HPS and elsewhere in San Francisco Bay. However, the contribution of total PCBs to the area-wide cumulative risk in Areas IX and X is minimal (about 1%) due to the presence of other chemicals (e.g., arsenic, dioxin) that are comparable to ambient conditions.

12.1.5 Identification of Areas for Evaluation in the Parcel F FS

Areas I, III, VIII, IX, and X will be evaluated in the Parcel F FS. RAOs will be developed during the FS scoping process to address ecological and human health risk concerns as well as source control issues. Area III (Point Avisadero) and Areas IX-X (South Basin) pose the greatest potential risk to ecological receptors. Mercury and copper were identified as the primary risk drivers in Area III, and PCBs were identified as the primary risk driver in Areas IX-X. Potential human health risks from consumption of shellfish from Area III are similar to reference. Cumulative human health risk from consuming shellfish in Areas IX-X exceeds reference levels; of the individual chemicals contributing to risk, only the risk from PCBs is elevated above reference levels. Sediments in Areas I (India Basin) and VIII (Eastern Wetland) pose a low potential ecological or human health risk. However, shoreline material in both areas may act as potential future sources of contamination to offshore areas. In addition, radiological surveys will be performed in areas as recommended by the Historical Radiological Assessment (DON, 2004).

12.1.6 Development of PRGs

Sediment PRGs based on risk to benthic invertebrate-feeding birds (i.e., the surf scoter) from PCBs, mercury and copper were developed using the collocated sediment and laboratory-exposed *M. nasuta* tissue data. These data provide a strong, direct link between sediment-associated contaminants and tissue. Ranges of PRGs for sediment based on SUFs of 1 to 0.01 are 135 mg/kg to 13,500 mg/kg dry weight for copper, 0.94 mg/kg to 94 mg/kg dry weight for mercury, and 0.62 mg/kg to 62 mg/kg dry weight for PCBs.

PCB PRGs also were developed for a piscivorous bird receptor (i.e., the DCCO). The PCB PRGs for sediment based on SUFs of 1 to 0.1 for the DCCO range from 0.23 mg/kg to 23 mg/kg dry weight. Because the DCCO is likely to forage over larger areas than the scoter, PRGs for the DCCO should be based on smaller SUFs than those for the scoter. Therefore, PRGs based on the scoter should be adequately protective of piscivorous birds such as the cormorant.

These PRGs will be evaluated in conjunction with contaminant distribution data as part of the FS scoping process to help identify areas for consideration in the FS.

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Reference Item 11b
Ecological Risk Assessment

Source:

ECC-Insight, LLC and CDM Smith. 2017. *Final Technical Memorandum – Optimized Remedial Alternative for Parcel F, Hunters Point Naval Shipyard, San Francisco, CA*. September.

DCN:

INEC-2004-0014-0004

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Section 2.1, Table 2-1, Table 2-2, and Table 2-3

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SECTION 2 PRELIMINARY REMEDIATION GOALS

As discussed in the FFS, PRGs were developed for Parcel F based on risk assessment results and RAOs. Consistent with United States Environmental Protection Agency (USEPA) guidance, RAOs consist of media-specific goals for protecting human health and the environment. RAOs provide a general description of what the cleanup is expected to accomplish and facilitate the development and evaluation of remedial action alternatives in the FFS. PRGs represent concentrations in environmental media that are protective of both human and ecological receptors for each RAO. **Attachment I** presents information on the exposure assumptions and toxicity criteria from the FFS Report and Validation Study Report used to calculate the Parcel F PRGs (Battelle, BBL and Neptune & Company, 2005).

2.1 Risk Assessment Summary

RAOs were developed in the FFS based on the results of the human health and ecological risk assessments presented in the HPNS Validation Study (Battelle, BBL and Neptune & Company, 2005). The risk assessment characterizes the risks associated with current and reasonably anticipated future exposure at each of three subareas associated with Parcel F. Unacceptable risks identified in the baseline human health and ecological risk assessments are generally the focus of remedial activities.

The ecological risk assessment focused on birds feeding on benthic invertebrates and fishes because they have significant potential for exposure to site COCs through prey ingestion and incidental ingestion of prey. As described in the Validation Study Report (Battelle, BBL and Neptune & Company, 2005), the surf scoter was selected as a representative ecological receptor because they are present at the site in large numbers during the winter, feed primarily on benthic organisms directly exposed to contaminated sediments, and may be exposed to both intertidal and subtidal sediments, and there is a substantial body of relevant literature for this species. Special status fish species such as green sturgeon, steelhead, and longfin smelt were not considered in the risk assessment due to their large home range and limited potential for exposure to site COCs. The ecological risk assessment determined that exposure to Parcel F sediments resulted in unacceptable risks to the surf scoter in Areas III, IX and X. In Area III, copper and mercury were identified as the primary risk drivers, and PCBs were the primary risk drivers in Areas IX and X (Battelle, BBL and Neptune and Company 2005). A summary of the risks to the surf scoter are summarized in **Table 2-1.**

Evaluation of fish tissue in the Validation Study determined that only total PCBs in jacksmelt were present above ambient levels. The human health evaluation similarly concluded that risks to humans from chemicals in Parcel F sediments appear to be similar to risks from ambient conditions with the exception of exposure to PCBs (Battelle, BBL and Neptune and Company, 2005). Risks to human health associated with PCBs were highest in Areas IX and X. A summary of total PCB risks are as follows:

- Direct contact risks ranged between 6×10^{-9} and 3×10^{-7} ,

- Shellfish consumption risk was estimated at 1 x 10^{-5}, and
- Fish (jacksmelt) consumption risk was estimated at 3 x 10^{-4}.

The results of the human health risk assessment (HHRA) were updated in the FS Addendum (KCH, 2017a), which determined that radiological risk resulting from exposure to Parcel F sediments was within USEPA's risk range of 1 x 10^{-4} to 1 x 10^{-6} and did not exceed the risk associated with background levels of radionuclides. The risks associated with exposure to chemicals were also revised to reflect updated USEPA and California Department of Toxic Substances Control (DTSC) recommendations for exposure point concentrations, exposure factors, toxicity criteria, and mode of action (USEPA, 2014; DTSC, 2014). Key exposure factors that were adjusted include the exposure duration and averaging time for cancer and non-cancer risks, adult body weight, and the cancer slope factor for total PCBs. In addition, non-cancer risk associated with exposure to PCBs was evaluated. The updated risk assessment demonstrated that risks to human health were within USEPA's risk range of 1 x 10^{-4} to 1 x 10^{-6} under the Reasonable Maximum Exposure scenario, with the exception of arsenic and the shellfish consumption exposure pathway. The risks associated with arsenic were similar to (and actually lower than) the reference area risks (site risk = 2.5 x 10^{-4}; reference risks = 2.7 x 10^{-4}). The updated total human health PCB risks are as follows **(Table 2-2):**

- Direct contact cancer risks ranged between 1 x 10^{-7} and 5 x 10^{-5},
- Direct contact hazard quotients ranged between 0.002 and 0.1,
- Shellfish consumption risk ranged between 3 x 10^{-7} and 8 x 10^{-6}, and
- Shellfish consumption hazard quotients ranged between 0.02 and 0.4.

The FS Addendum did not reevaluate risks associated with the fish consumption exposure pathway due to uncertainties associated with the fish consumption pathway, such as the difficulty in linking tissue concentrations in larger sport fish to site-specific sediment concentrations (KCH, 2017a). However, fish consumption risks associated with PCBs were recalculated in this Tech Memo using the updated exposure factors and the site-wide jacksmelt tissue concentration of 224 µg/kg presented in the 2005 Validation Study. A summary of the updated human health risks are presented in **Table 2-2.**

- Fish (jacksmelt) consumption risk was estimated at 9 x 10^{-5}, and
- Fish (jacksmelt) non-cancer hazard quotient was estimated at 8.

2.2 Remedial Action Objectives

Consistent with USEPA guidance (USEPA, 1988), RAOs are intended to provide a general description of the cleanup objectives and provide the basis for the development of specific PRGs. RAOs consist of media-specific goals for protecting human health and the environment that specify COCs for each media of interest; exposure pathways, including exposure routes and

TABLES

Table 2-1 – Ecological Risk Assessment Summary Risk Drivers

Chemical	Receptor	Area Specific Hazard Quotient (Unitless)				
		I	III	VIII	IX	X
Copper	Surf Scoter	0.5	3	0.7	0.7	0.8
Mercury	Surf Scoter	0.3	4	0.3	0.3	0.3
Total PCBs	Surf Scoter	0.1	0.3	0.2	1	2

Source: Hunters Point Shipyard Parcel F Validation Study Report, San Francisco, California. Battelle, Blasland, Bouck & Lee, Inc. [BBL] and Neptune and Company, 2005.

Table 2-2 – Updated Human Health Risk Assessment Summary Risk Drivers

Chemical	Exposure Pathway	Area Specific Human Health Risk Estimate				
		I	III	VIII	IX	X
Excess Lifetime Cancer Risk						
Total PCBs	Direct Contact Sediment	*3.E-06*	5.E-07	9.E-07	1.E-07	*5.E-05*
Total PCBs	Shellfish Consumption	3.E-07	4.E-07	7.E-07	*6.E-06*	*8.E-06*
Total PCBs	Fish Consumption	*9.E-05*				
Non-Cancer Hazard Quotient						
Total PCBs	Direct Contact Sediment	0.006	0.1	0.002	0.02	0.1
Total PCBs	Shellfish Consumption	0.02	0.04	0.06	0.2	0.4
Total PCBs	Fish Consumption	**8**				

Italic: Exceeds cancer risk of 1 x 10^{-6}**Bold:** Exceeds cancer risk of 1 x 10^{-4} or Hazard Quotient of 1

Acronyms:

PCBs – polychlorinated biphenyls

Source: Final Addendum to the Feasibility Study Report for Parcel F, Hunters Point Naval Shipyard, San Francisco California. KCH, 2017a.

Table 2-3 – Preliminary Remediation Goal Summary

RAO	Copper (mg/kg)	Lead* (mg/kg)	Mercury (mg/kg)	Total PCBs (µg/kg)	Basis
RAO 1	271	NA	1.87	1240	Not to exceed threshold
RAO 2	NA	NA	NA	1350	Area-weighted average
RAO 3	NA	NA	NA	**	Area-weighted average

NA – not applicable

* A numerical PRG was not developed for lead due to uncertainty associated with the bioavailability and toxicity of this analyte. Because lead is collocated with PCBs in sediment, achieving the remedial goals for PCBs is expected to address any risks associated with lead.

** 200 µg/kg total PCBs represents a long-term goal based on background total PCB estimates for nearshore sediments within San Francisco Bay. Post remedy construction followed by MNR will achieve the 200 µg/kg background concentration.

Source: Final Feasibility Study Report for Parcel F, Hunters Point Shipyard, San Francisco, California. Barajas and Associates, 2008.

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Reference Item 12
RAOs

Source:

Barajas and Associates. 2008. *Final Feasibility Study for Parcel F, Hunters Point Shipyard, San Francisco, California*. April 30.

DCN:

BAI-5106-0004-0003

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2.0 REMEDIAL ACTION OBJECTIVES

This section presents the remedial action objectives (RAO) and defines the areas at Parcel F Hunters Point Shipyard (HPS) that require remediation based on the RAOs. RAOs are medium-specific goals for protecting human health and the environment. Each RAO specifies (1) the chemicals of concern (COC), (2) the exposure routes, and (3) the receptors. RAOs include both an exposure pathway and a remediation goal for chemicals for a given medium because protectiveness can be achieved in two ways: by limiting or eliminating the exposure pathway, or by reducing or eliminating chemical concentrations. The RAOs are intended to provide a general description of the cleanup objectives and provide the basis for the development of specific remediation goals. The remediation goals should permit a range of alternatives to be developed, including each of the three major approaches (monitored natural recovery, capping, and removal) identified by the U.S. Environmental Protection Agency (EPA) (2005).

The following RAOs were identified for Parcel F based on the results of the Final Parcel F Validation Study (Battelle, Blasland, Bouck & Lee, Inc. [BBL], and Neptune & Company 2005):

1. Reduce the risk of benthic feeding and piscivorous birds, including surf scoters, to acceptable levels from exposure to copper, lead, mercury, and polychlorinated biphenyls (PCB) through consumption of contaminated prey and incidental ingestion of sediment.

2. Limit or reduce the potential risk to human health from consumption of shellfish from Parcel F.

3. Limit or reduce the potential biomagnifications of total PCBs at higher trophic levels in the food chain to reduce the potential risk to human health from consumption of sport fish.

The COCs (copper, lead, mercury, and total PCBs) in sediment were identified based on potential risks to ecological receptors. PCBs also were shown to cause potential risk to humans who consume shellfish collected at HPS. Section 2.1 describes development of the specific remediation goals to meet the RAOs listed above. Section 2.2 summarizes the potential applicable or relevant and appropriate requirements (ARAR) identified for Parcel F.

A numerical remediation goal was not calculated for lead because of the uncertainty associated with both the bioavailability and toxicity of lead. Instead, lead will be addressed qualitatively. A review of the spatial distribution of lead indicated that lead co-occurs with PCBs. Because the distribution of lead concentrations follows the distribution of PCBs, achieving the remediation goals for PCBs should also reduce risks associated with lead.

Numerical remediation goals were not developed for the third RAO because of the uncertainties associated with the fish consumption pathway such as the difficulty in linking tissue concentrations in larger sport fish to site-specific sediment concentrations. Therefore, reduction of these risks will also be addressed qualitatively to evaluate whether achieving the remediation goals developed for ecological exposures will address human health risks. Specifically, consideration is given to achieving an area-wide average total PCB concentration that is consistent with the upper-bound nearshore ambient concentration for total PCBs (200 micrograms per kilogram [µg/kg]). U.S. Department of the Navy (Navy) guidance, "Policy on Sediment Site Investigation and Response Action," states that all response actions for sediment must be directly linked and scientifically connected to Navy Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)- and Resource Conservation and Recovery Act (RCRA)-contaminated releases (Navy 2002). Although contamination at Parcel F may have contributed to PCB levels in fish tissue, it is difficult to distinguish quantitatively the level from COCs contributed by Navy sources versus those contributed by non-Navy sources (from the surrounding San Francisco Bay).

In addition, EPA guidance states, "when developing RAOs, project managers should evaluate whether the RAO is achievable by remediation of the site or if it requires additional actions outside the control of the project manager. For example, complete biota recovery may depend on the cleanup of sources regulated by other authorities" (EPA 2005, pg 2-15). The entire San Francisco Bay is listed as a toxic hot spot under the Bay Protection and Toxic Cleanup Program because of the elevated PCBs concentrations in fish tissue caught in the bay in 1994. San Francisco Bay was subsequently placed on the Clean Water Act Section (§) 303(d) list based on the concentrations of PCBs in fish tissue. Therefore, elimination of PCB concentration in fish caught at Parcel F would depend upon cleanup of sources other than Parcel F and is not within the purview of the Navy.

2.1 DEVELOPMENT OF REMEDIATION GOALS

This section presents the process used to develop remediation goals for sediment at Parcel F. The process included developing risk-based concentrations for the COCs before the final remediation goals were selected.

2.1.1 Risk-Based Concentrations

Development of preliminary remediation goals to address RAO 1: *Reduce the risk of benthic feeding and piscivorous birds, including surf scoters, to acceptable levels from exposure to copper, mercury, and PCBs through consumption of contaminated prey and incidental ingestion of sediment to an acceptable level.*

Preliminary remediation goals for copper, mercury, and PCBs in sediment were developed to address the first RAO (that is, protection of benthic feeding and piscivorous-eating birds). These goals were developed using the data from collocated sediment and laboratory-exposed *M. nasuta* tissue concentrations in a food chain model based on risk to the surf scoter (see picture to the right). The preliminary remediation goals were strongly influenced by the choice of site use factor (SUF), which is an estimate of the proportion of the surf scoter's daily diet that is obtained from the area under investigation. For example, assuming the surf scoter foraged exclusively at Parcel F (a SUF of 1.0), the preliminary remediation goals would be 135 milligram per kilogram (mg/kg) dry weight for copper, 0.94 mg/kg dry weight for mercury, and 620 micrograms per kilogram (µg/kg) dry weight for PCBs. However, assuming the surf scoter obtained only 10 percent of its daily intake from Parcel F (a SUF of 0.1), then the preliminary remediation goals would be 13,500 mg/kg dry weight for copper, 94 mg/kg dry weight for mercury, and 62,000 µg/kg dry weight for PCBs.

The analysis of ecological exposure and effect relies on several assumptions. Food chain models assume that the animal evaluated is actually exposed to conditions similar to those described by the model and that the effects in individual test animals reported in the literature have some ecological significance to populations of animals in the wild. The assumption of exposure is met because it is well known that the surf scoter ingests sediment and benthic invertebrates in San Francisco Bay. However, actual SUFs for the surf scoter at Parcel F are unknown. The surf scoter is common in San Francisco Bay from late September to early May; many individuals spend approximately 7 to 8 months in the area (Zeiner and others 1990). Large-scale tracking studies have been undertaken to document the movement of surf scoters between winter foraging areas and summer nesting areas. However, no studies of local habitat during winter foraging periods have been done. Surf scoters are numerous at Parcel F, but it is not known whether individuals spend time in a localized area or if the flocks move around throughout the day. Furthermore, there is considerable uncertainly about whether the surf scoter is foraging while present at Parcel F, as explained below. Therefore, the actual SUF remains an uncertainty. The preliminary remediation goals were derived assuming that a substantial proportion of the surf scoter population that winters on San Francisco Bay obtains essentially all of their food from sediments in Areas III, IX, or X; a SUF of 1.0 is the most protective exposure assumption possible.

Along with exposure, the principal assumption concerning risk is that the effects recorded in laboratory studies are actually experienced by animals of interest at the site investigated. The preliminary remediation goals were derived using a standard food chain model that centers on a toxicity reference value (TRV), which is a daily dose of a chemical ingested by test organisms over a period of weeks or months that causes no adverse effect. The low TRVs were used to calculate the preliminary remediation goals presented in the Validation Study (Battelle, BBL, and Neptune & Company 2005); these are conservative values that represent no observed adverse effects levels. The duration of exposure for chemicals that bioaccumulate, such as mercury and PCBs, can significantly affect the amount of the chemical retained by the animal.

Copper

Based on a SUF of 0.5 or greater, estimated ingested doses of copper exceeded the low TRV for surf scoters in Area III only. The exposure scenario for surf scoters is not well represented by the toxicity data used to derive the TRV, resulting in uncertainty about the actual probability of the effects of copper on the surf scoter. The low TRV for copper was derived from a study in which newly hatched chickens were fed copper for 8 weeks, starting on the day they hatched. The effect of interest in the study was weight gain; however, the surf scoters that forage on San

Francisco Bay in the winter are adults. Nesting and chick rearing occur far to the north during the summer. Although weight gain in chicks is of critical importance, this effect is of limited relevance to predicting effects of copper on adult surf scoters that forage at Parcel F.

A recent study of the effects of metals on diving ducks wintering in California showed that concentrations of several inorganic chemicals, including cadmium and mercury, in the tissues of Scaup and canvasbacks are positively correlated with impaired body condition (Takekawa and others 2002). Concentrations of copper were slightly elevated in the diving duck samples collected from San Francisco Bay when compared with other coastal California sites, but no effect of copper on body condition was indicated.

Assuming the surf scoter obtained 100 percent of its daily intake from clams taken from Area III, the preliminary remediation goal for copper would be 135 mg/kg. However, sampling showed that the benthic community in Area III is dominated by soft-bodied invertebrates rather than the clams and mussels that the surf scoter prefers, making it exceedingly unlikely that a SUF of 1.0 represents actual surf scoter foraging in Area III. Using a SUF of 0.5, meaning that the surf scoter obtains half of its daily intake from Area III, the preliminary remediation goal is about the same as the effects range-median (ER-M) value (270 mg/kg). This preliminary remediation goal is considered extremely protective because the favored prey of the surf scoter, hard-bodied clams, are rare or absent in Area III, as described further below.

Mercury

Potential risk to surf scoters ingesting *M. nasuta* exposed to sediment from Area III under laboratory conditions was modeled for Area III. The estimated dose to a surf scoter consuming a diet of nondepurated *M. nasuta* exclusively obtained from Area III (that is, SUF of 1.0) exceeded the low TRV, resulting in a hazard quotient of 4.15. Under these specific circumstances, mercury can be said to pose a risk to the surf scoter in Area III.

However, puzzling issues are raised by the data. For example, the mercury concentrations in depurated clams and in soft-bodied invertebrates collected from Area III were considerably lower than the mercury concentrations in the nondepurated clams. This result contrasts with what is seen for PCBs, where depuration had little effect on *M. nasuta* concentrations, and soft-bodied invertebrates were significantly more contaminated than *M. nasuta*. The small sample size precludes any additional analysis.

The low TRV for mercury was taken from the Great Lakes Water Quality Initiative (EPA 1995), which reviewed toxicological studies on birds. The TRV is based on a study in which mallards were fed methylmercury for three generations; the lowest observed adverse effect level, based on reproductive effects, was converted to a no observed adverse effect level of 0.039 milligram per kilogram per day.

Assuming the surf scoter obtained 100 percent of its daily intake from clams taken from Area III, the preliminary remediation goal for mercury would be 0.94 mg/kg. However, sampling results showed that the benthic community in Area III is dominated by soft-bodied invertebrates rather than the clams and mussels that the surf scoter prefers, making it exceedingly unlikely that a SUF of 1.0 represents actual surf scoter foraging in Area III. In contrast to the test organisms, which were fed a mercury-laced diet throughout their lives, the surf scoters foraging in San Francisco Bay are transient migrants that live part of the year far removed from HPS. They are not exposed to San Francisco Bay sediments throughout their lives. The SUF is a representation only of a daily dose, so the migratory habits of the scoter do not affect this parameter directly. However, because mercury concentrations accumulate in tissues over the animal's lifetime, the annual migration must be considered. Using a SUF of 0.5, meaning that the surf scoter obtains half of its daily intake from Area III, the preliminary remediation goal is 1.87 mg/kg. A SUF of 0.5 greatly overestimates the actual foraging of the surf scoter in Area III, and is thus considered protective. Additional evidence for the limited foraging of surf scoters in Area III is presented below in the discussion of PCBs.

Regarding risk to benthic invertebrates, sediments in Area III fall into two spatial groups. Mercury in 5 of the 19 samples collected during the Parcel F Validation Study (Battelle, BBL, and Neptune & Company 2005) exceeded the ER-M value, although the concentrations in 4 of those samples were less than twice the ER-M value. Only one sample contained mercury at concentrations five times the ER-M value. Mercury contamination is not widespread throughout Area III. Samples with mercury at concentrations that exceed the ER-M value were clustered near the tip of the pier. The highest concentration of mercury measured during the Validation Study was in the same sample that contained the maximum concentration of copper. However, this sample demonstrated no toxicity either to amphipods (survival was 89 percent) or to sea urchin larvae (normal development was 97 percent), raising questions about the actual toxicity of copper and mercury to invertebrates in Area III. The highest copper and mercury concentrations from the Feasibility Study Data Gaps Investigation found in Area III were in subsurface samples (Battelle, Neptune & Company, and Sea Engineering, Inc. 2007).

PCBs

The low TRV for PCBs, which was used to derive the preliminary remediation goal, was based on a study by Platonow and Reinhart (1973) in which Aroclor-1254 was administered in feed to chickens for 39 weeks. A dose of 880 micrograms per kilogram per day (µg/kg-day) resulted in reduced egg production. This study reported that PCBs accumulated in tissues were transferred to the egg during laying. Concentrations passed to the egg reached a maximum after several months of ingestion by the hen. This finding suggests that longer exposure durations may more accurately predict reproductive effects caused by PCBs. An uncertainty factor of 10 was applied to the dose to convert the effect level to a no-effect-level equivalent. The resulting bird low TRV is 90 µg/kg-day. Back-calculating a concentration in sediment that would result in a daily dose equal to the low TRV provides a preliminary remediation goal of 620 µg/kg dry weight for PCBs, averaged over the area, if the surf scoter obtained 100 percent of its daily intake of clams from Area III.

A single composite sample of hard-bodied invertebrates, composed of clams and mussels, was collected from each area in Parcel F except in Area III, where no clams were found. Despite the small sample size, the preliminary remediation goal was derived using the hard body invertebrate data in place of the laboratory *M. nasuta* data as an exploratory step toward validating the protectiveness of the preliminary remediation goal based on the *M. nasuta* data. When results for the field-collected clam samples were substituted in the dose equation as the prey of the surf scoter, assuming a SUF of 1.0, the preliminary remediation goal for PCBs was 27 percent higher than the goal based on the laboratory-exposed *M. nasuta* as prey. This comparison supports the protectiveness of the preliminary remediation goal developed using laboratory *M. nasuta* data.

Soft-bodied invertebrates collected from Parcel F generally contained more PCBs than clams or mussels. However, surf scoters are not known to eat soft-bodied invertebrates in San Francisco Bay. Stable isotope signatures in tissues of diving ducks (surf scoter and greater Scaup) in San Francisco Bay indicated these birds eat the bivalve *Corbula* (formerly *Potamocorbula*) *amurensis* (Schlekat and others 2004). This is consistent with dietary preferences of the surf scoter reported elsewhere in the literature (Zeiner and others 1990 and references within), and with the well-documented presence of the invasive *Corbula* in the North Bay. However, no *Corbula* occurred in samples collected from Area III. Furthermore, in 2004 a rapid bioassessment team searched for exotic species, including *Corbula*, in shoreline habitats around San Francisco Bay where exotic species were expected to be found. The nearest sampling location to Hunters Point was Brisbane Lagoon, and no *Corbula* were found in the lagoon (Cohen and others 2005). Circumstantial evidence from other sources indicated that bivalves may be declining in the South Bay possibly because of increased predation. A 75 percent increase in chlorophyll in the Central and South Bay regions has been attributed in part to the absence or scarcity of filtering bivalves, including *Corbula*; in contrast, declining phytoplankton are of concern in Suisun Bay, where *Corbula* is dominant (Cloern and others 2006).

According to a recent report by the San Francisco Estuary Institute (SFEI) (2007), little is known about the distribution of shellfish beds in San Francisco Bay. An effort to compile known information is underway. Sample figures of the distribution of two clams, the Manila or Japanese Littleneck Clam (*Venerupis philippinarum*) and the Atlantic Softshell Clam (*Mya arenaria*), show the location and size of beds. No beds of either of these clams are present in Area III of HPS (SFEI 2007, page 47).

The evidence to date indicates that the surf scoter is eating hard clams somewhere in San Francisco Bay, and because hard clams are not present in significant numbers in Area III, a reasonable conclusion is that surf scoters are not eating clams from Area III. The final preliminary remediation goal for PCBs is 1,240 µg/kg, based on a SUF of 0.5, which means the surf scoter is consuming half of its daily intake in Area III. This is known to be a gross overestimation, since clams are scarce or absent in this area; however, if clams were present in Area III, a preliminary remediation goal of 1,240 µg/kg would be protective of surf scoters.

The preliminary remediation goal for the surf scoter exposed to PCBs was compared with the preliminary remediation goal developed for the double-crested cormorant, which feeds predominantly on fish rather than clams. The preliminary remediation goal developed for surf scoters was lower than for the cormorant; thus, it was considered protective of both feeding guilds.

Development of preliminary remediation goals to address the RAO 2: *Limit or reduce the potential risk to human health from consumption of shellfish from Parcel F.*

Potential human health risks from shellfish consumption and direct contact with sediment during shellfish collection were evaluated using *M. nasuta* tissue data from the laboratory bioaccumulation test to address the second RAO. Future residents were assumed to harvest and consume shellfish from the intertidal areas of HPS and be incidentally exposed to sediment during harvesting. The direct contact exposure scenario associated with harvesting was also assumed to be representative of individuals wading in nearshore areas. Risks associated with direct contact were more than 100 times lower than risks associated with ingestion (Battelle, BBL, and Neptune & Company 2005).

Preliminary remediation goals were calculated using parameters specific to consumption of shellfish (see Attachment 1). Exposure point concentrations (EPC) were developed to model exposures under both a reasonable maximum exposure (RME) scenario and a central tendency exposure (CTE) scenario. The RME scenario relies on conservative exposure factors to estimate the reasonable maximum exposures anticipated for the site, whereas the CTE scenario describes a more typical or average exposure to an individual. EPCs for shellfish tissue were derived from the sediment EPC using the relationship between sediments and fish described below.

Using the risk model developed for the Parcel F Validation Study, a range of preliminary remediation goals for PCBs was calculated using assumptions appropriate for a shellfish ingestion scenario. Table 2-1 lists the parameters used to develop a preliminary remediation goal at a targeted risk level of 10^{-5}. Preliminary remediation goals were also calculated based on the upper and lower bounds of EPA's targeted risk management range for health protectiveness at Superfund sites (135 µg/kg to 13,500 µg/kg based on risk levels of 10^{-6} to 10^{-4}, respectively).

TABLE 2-1: INGESTION OF SHELLFISH SCENARIO
Feasibility Study Report for Parcel F, Hunters Point Shipyard, San Francisco, California

Body Weight (kilogram)	70
Averaging Time Cancer (days)	25,550
Risk Level (unitless)	10^{-5}
Shellfish Ingestion Rate (kilograms per day)	0.00213
Fraction Ingested from Source (unitless)	0.1
Exposure Frequency (days per year)	365
Exposure Duration (years)	30
Oral Cancer Slope Factor (µg/kg-day)-1	5,000
Acceptable Shellfish Tissue Concentration (µg/kg)	1,540
Preliminary Remediation Goal for PCBs in Sediment (µg/kg)	**1,350**

This evaluation used the following equations:

$$Acceptable\ Shellfish\ Tissue\ Concentration = (BW \times AT \times RL) / (IR_s \times FI \times EF \times ED \times CSF)$$

where:

BW	=	Body Weight
AT	=	Averaging Time
RL	=	Risk Level
IR_s	=	Shellfish Ingestion Rate
FI	=	Fraction Ingested from Source
EF	=	Exposure Frequency
ED	=	Exposure Duration
CSF	=	Cancer Slope Factor

$$Sediment\ Remediation\ Goal = \%TOC \times FT \times MCF / BAF \times \%lipid$$

where:

%TOC	=	Percent Total Organic Carbon (1.3 unitless)
FT	=	Acceptable Shellfish Tissue Concentration (µg/kg)
MCF	=	Moisture conversion factor (4 unitless, assuming 75% moisture)
BAF	=	Bioaccumulation Factor (1.96 unitless [Tracey and Hansen 1996])
%lipid	=	Percent lipids in fish tissue (3 unitless)

The BAF, MCF, %TOC, and % lipid values were based on assumptions presented in the California Regional Water Quality Control Board's (Water Board 2003) letter to the Navy regarding comments on the PCB cleanup goals for Parcel F). A summary of the assumptions used to derive each of the other exposure parameter values is provided.

Body Weight, Averaging Time, and Exposure Frequency

These values represent standard, default exposure assumptions recommended by EPA (1989).

Risk Level

To calculate a remediation goal, it is necessary to define an appropriate risk level for site conditions. EPA guidance recommends an acceptable target risk range of 10^{-4} to 10^{-6} (EPA 1991).

Shellfish Ingestion Rate

The HPS Validation Study (Battelle, BBL, and Neptune & Company 2005) used a seafood consumption study conducted by San Francisco Estuary Institute (2002) to estimate consumption rates for shellfish ingestion, resulting in a value of 48 grams per day (90th percentile) for the RME scenario. As noted in the Validation Study, this value was used to illustrate the potential risks associated with exposures at the site, but in fact provides a conservative estimate and reflects consumption rates appropriate for sport fish, and not shellfish. Wong (1997) reported that shellfish typically make up only 5 percent of total seafood consumption among San Francisco Bay anglers. Therefore, the 5 percent of the assumed fish consumption rates were used to estimate remediation goals, resulting in a shellfish ingestion rate of 0.00213 kilogram per day.

Fraction Ingested from the Source

The Validation Study assumed that the fraction ingested from the source was 1 for the RME scenario and 0.5 for the CTE scenario to evaluate risks (Battelle, BBL, and Neptune & Company 2005). These values assumed that 100 percent of the shellfish consumed under the RME scenario and 50 percent of the shellfish consumed under the CTE scenario would have been collected from Parcel F. However, because of the nature of the habitat along the shoreline, only limited mussel burrows actually exist at Parcel F and the mussel population may not be large enough to support that level of consumption. Given the abundance of other, more attractive, shellfish beds in the San Francisco Area, the fraction ingested was adjusted down to a value of 0.1 or 10 percent.

Exposure Duration

An exposure duration of 30 years was used based on recommendations by EPA (1989). This value represents the upper-bound residential tenure at a single location.

San Francisco Bay Watershed Concerns

The San Francisco Bay was included on the Clean Water Act § 303(d) list in 1998 for total PCBs as a result of an interim health advisory for fish consumption. The advisory was based on elevated concentrations of PCBs in fish tissue caught in San Francisco Bay in 1994 that may cause harmful effects on people who consume fish caught in the Bay. Follow-up studies in 1997 and 2000 confirmed the presence of PCBs in bay fish tissue at concentrations that may be harmful to fish consumers (Water Board 2004).

The application of the human health remediation goals developed for the shellfish consumption pathway and the ecological remediation goals developed for the protection of benthic- and piscivorous-eating birds will help to address this sport fish pathway by lowering the average chemical concentrations in sediment throughout Parcel F.

2.1.2 Background Concentration for Each Chemical of Ecological Concern

Background concentrations or ambient concentrations are chemical concentrations that occur naturally in the environment and from human activities. Data for copper and mercury were compared with San Francisco Bay ambient sediment concentrations (68.1 mg/kg for copper and 0.43 mg/kg for mercury) (Water Board 1998). The estimated nearshore PCB ambient sediment concentration of 200 µg/kg was used as the ambient threshold value for total PCBs (Water Board 2003). The results of the sediment trap data collected in 2004 were also used in this Feasibility Study (FS) Report. Sediment traps were placed in Area X at four stations during three periods to characterize sediment deposition during winter, spring, and summer conditions. The data were used to estimate the concentration of sediment entering the South Basin, since the sediment traps capture suspended sediment that advects into South Basin from San Francisco Bay, as well as suspended sediment derived from runoff and local resuspension. Based on sediment trap data averaged over three deployment periods from the mouth of the South Basin, a PCB concentration of 121 µg/kg for incoming sediments was used for the ambient concentration of PCBs in sediment in the sediment transport model (Battelle, BBL, and Neptune & Company 2005). This result is consistent with the nearshore ambient concentration for PCBs in sediment (200 µg/kg), which is considered the upper bound value (Water Board 2003).

2.1.3 Range of Preliminary Remediation Goals for Sediment at Parcel F

As described in Section 2.1.1, the range of preliminary remediation goals for ecological receptors was calculated using results from 28-day bioaccumulation tests. Regulatory agency concerns remained that the field-collected tissue data should be incorporated into the development of the remediation goals. Preliminary remediation goals using the field-collected tissue data were not used alone because of the insufficient data set. Therefore, a risk management approach was taken by using the field-collected tissue data results to bound the range (or SUF to be considered) of preliminary remediation goals derived using the laboratory bioaccumulation. This resulted in a range of preliminary remediation goals that corresponded to a range of SUFs between 0.5 and 1.0. Similarly, the preliminary remediation goals for human consumption of shellfish were calculated based on EPA's acceptable target risk range between 10^{-4} and 10^{-6}. The NCP preamble explains that preliminary remediation goals for carcinogens are set at a 10^{-6} excess cancer risk as a point of departure, but they may be revised to a different risk level within the risk range based on the consideration of site-specific and remedy-specific factors. The range of preliminary remediation goals for Parcel F sediments is shown in Table 2-2.

TABLE 2-2: RANGE OF PRELIMINARY REMEDIATION GOALS FOR CHEMICALS OF CONCERN IN SEDIMENT AT PARCEL F
Feasibility Study Report for Parcel F, Hunters Point Shipyard, San Francisco, California

Preliminary Remediation Goal	Copper (mg/kg)	Mercury (mg/kg)	Total PCBs (µg/kg)
Surf Scoter			
Based on a SUF of 1.0	135	0.94	620
Based on a SUF of 0.5	271	1.87	1,240
Human Consumption of Shellfish[a]			
Based on a cancer risk 10^{-6}	Not applicable	Not applicable	135
Based on a cancer risk 10^{-4}	Not applicable	Not applicable	13,500

Notes:

a Unacceptable risk was not shown to occur for copper and mercury for the consumption of shellfish.

2.1.4 Application of Remediation Goals

This section discusses the approach for applying remediation goals in this FS Report. The application of site-specific remediation goals focused on achieving an area-weighted average concentration for each COC in sediment. The goal of the approach was to define remediation goals as a "do-not-exceed" value that resulted in an area-weighted average for the COCs representing the ecological preliminary remediation goal based upon a SUF of 1.0 and the human health target risk level of 10^{-6} in areas where exposure to shellfish could occur. The area-weighted average of each COC was calculated for each area (I, III, VIII, IX, and X) to evaluate which areas in Parcel F should be carried forward for remedial evaluation. First, the size of each area was calculated using the Thiessen polygon method of interpolation (Naval Facilities Engineering Services Center 2001). Thiessen polygons were constructed around individual sampling locations, so the sides of each polygon are equidistant from adjacent sampling locations.

Concentrations of COCs detected in sediment from a sampling location were assumed to represent all sediment within the polygon. The top 2-foot sediment depths were evaluated for each of the five areas. A conservative approach was taken by using the highest chemical concentration detected at any depth within the interval evaluated (0 to 2 feet) to calculate the surface-weighted average concentrations. The area of each Thiessen polygon was calculated and mapped using a geographic information system (GIS). The offshore GIS model and Access™ database are included in Appendix A. Figure 2-1 shows the Thiessen polygons and related sampling locations at Parcel F evaluated as part of this FS Report. As illustrated on the figure, the area-weighted average for each COC within each subarea was calculated. Only Areas III and X exceeded the preliminary remediation goals on an area-weighted average basis. PCBs in sediment exceeded the lower bound range of the preliminary remediation goals in Area X. Copper and mercury exceeded the lower bound range of preliminary remediation goal in Area III.

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Reference Item 13
Pilot Study

Source:

KCH, 2018. *Final Demonstration of Activated Carbon Amendments to Reduce PCB Bioavailability, Hunters Point Naval Shipyard*. May.

DCN:

KCH-2622-0059-0095

Excerpt includes the following:

Sections 5.2.2 through Section 5.2.3, Section 8

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were significantly different from baseline (ANOVA, p=0.038), but not in Plot 2 (ANOVA, p=0.094). In the 26-month post-placement event, total PCBs in Plot 1 were not statistically different from baseline (ANOVA, p=0.085), but were different in Plot 2 relative to baseline (ANVOA, p=0.033).

The application of AC influences the bioavailability of PCBs but is not expected to substantively reduce total PCB concentrations in the sediment. Rather, the decreases in PCB concentrations during the 8-month post-placement monitoring, and to a lesser degree during 14-month and 26-month post-placement monitoring may be related to deposition of cleaner background sediment transported into the South Basin from the San Francisco Bay (Battelle et al., 2007). This dilution of contaminated sediments with relatively cleaner overlying sediment would result in lower concentration in surface grab samples. Measurement variability and sediment heterogeneity may also contribute to these site-wide trends that vary between sampling events, particularly the apparent increases in concentrations observed in the buffer and reference areas during the 14-month and 26-month events. It is unlikely that the exact same set of locations is sampled from one event to the next and even small differences, on the order of a few feet in any direction, can yield different total PCB concentrations.

5.2.2 PCB Concentrations in Pore Water

The following section briefly summarizes the pore water analysis performed using passive samplers by Texas Tech University during the baseline and post-placement monitoring events. The reports provided by Texas Tech are provided in Appendices E1 through E4 and each include a detailed description of the analytical methodology and associated data evaluation, as well as an expanded discussion of the observations during each sampling event.

5.2.2.1 Baseline Monitoring Event

During the baseline monitoring event, the average total PCB concentration (as the sum of 42 congeners) at all locations and depths was 2.4 nanograms per liter (ng/L) with a standard deviation of 0.2 ng/L (Table 5-4). Concentrations showed little variation across the site laterally or with depth.

5.2.2.2 8-Month Post-Placement Monitoring Event

Pore water PCB concentrations were relatively uniform across the individual amendment sites during the 8-month post-placement monitoring event. Total pore water PCB concentrations were also lower throughout sediment depths measured by SPME (to 10.2 inches or 26 cm) in pilot amendment areas than at the reference site. These reductions occurred below depths where AC was present.

The estimated total PCB pore water concentration in the upper sediment layer (0.39 to 2.36 inches or 1 to 6 cm) decreased from 2.26±0.25 ng/L in Plot 1 and 2.14 ± 0.09 ng/L in Plot 2 during the baseline monitoring event to 0.30±0.23 ng/L in Plot 1 (AquaGate) and to 0.42±0.20 ng/L in Plot 2 (SediMite) (Table 5-4). These data suggest reductions in mean surficial pore water total PCBs of 82 and 75 percent in Plot 1 and Plot 2, respectively, compared to the reference area 8 months post-placement. Surficial pore water concentrations at the reference site during the 8-month post-placement sampling were 1.67

ng/L (n=1). Reductions were greater when surficial pore water concentrations are compared to the baseline condition. Surficial (0.39 to 2.36 inches or 1 to 6 cm) pore water PCBs in Plot 1 after 8 months was an average of 86 percent lower than the baseline PCB concentrations, and were 81 percent lower in Plot 2. These trends in surficial pore water were similar for the deeper pore water fractions measured.

Ex situ samples in samples from Plots 1 and 2 generally showed lower concentrations than in situ samples because of the greater equilibration between the AC and the sediments in the mixed ex situ analyses. At reference locations (no AC placement, Stations 45 and 48), pore water concentrations were higher ex situ compared to PCB concentration obtained via in situ exposures.

5.2.2.3 14-Month Post-Placement Monitoring Event

During the 14-month post-placement sampling event, total pore water PCB concentrations were lower throughout sediment depths measured by SPME (to 10.2 inches or 26 cm) in pilot amendment areas than at the reference site. These reductions occur below depths where AC is present.

The estimated total PCB pore water concentrations in the upper sediment layer (0.39 to 2.36 inches or 1 to 6 cm) were 0.23±0.12 ng/L in Plot 1 (AquaGate) and to 0.28±0.10 ng/L in Plot 2 (SediMite) in 14-month post-placement samples (Table 5-4). These changes correspond with reductions in mean surficial pore water total PCBs of 82 and 78 percent in Plot 1 and Plot 2, respectively, compared to the reference area 14 months post-placement. Average pore water concentrations at the reference site after 14 months of post-placement was 1.26±0.13 ng/L (n=2). The relative percent reduction in surficial pore water PCBs relative to the baseline condition was 89 and 87 percent in Plot 1 and Plot 2, respectively.

Ex situ pore water PCBs measured after 14 months post-placement were below detection (< 0.15 ng/L total PCBs) in samples from the AC placement areas. At reference locations (no AC placement, Stations 45 and 48) pore water concentrations were higher ex situ compared to PCB concentration obtained by in situ exposures. The ex situ measurements of reference sediments are more conservative than in situ measurements of reference sediments where PCBs in pore water can be diluted because of mixing or flux from cleaner overlying water.

5.2.2.4 26-Month Post-Placement Monitoring Event

During the final sampling event, both AC treatments demonstrated consistent and substantial reductions in pore water PCB concentrations. At 26 months post-placement, the average total PCB pore water concentration in the upper sediment layer (0.39 to 2.36 inches or 1 to 6 cm) was 0.24±0.08 ng/L in Plot 1 (AquaGate) and 0.19±0.09 ng/L in Plot 2 (SediMite), demonstrating average reductions in surficial pore water concentrations of 78 percent in the AquaGate treatment (Plot 1) and 83 percent in the SediMite treatment (Plot 2) relative to the reference area (Table 5-4). Average pore water concentrations in the reference area were 1.10±0.22 ng/L (n=2) 26 months post-placement. Surficial pore water PCB concentrations in Plot 1 were reduced by 89 percent and by 91 percent in Plot 2 when compared to the baseline condition. Pore water PCB concentrations were generally laterally uniform across the individual amendment sites at 26 months post-placement. One-way ANOVA indicated pore water PCB concentrations in both Plot 1 and Plot 2 were significantly lower than in the reference area ($p<0.001$).

There were lower PCB concentrations in pore water at all depth horizons during each of the post-placement monitoring events and in each area. These reductions in pore water PCB concentrations demonstrate the effectiveness of AC at depths up to the maximum measured (i.e., 8.26 to 10.2 inches or 21 to 26 cm). A decrease of total pore water PCB concentrations of approximately 74 percent was observed at depths below 11 cm (to maximum measurement depth of 10.2 inches or 26 cm below sediment surface) in Plot 1, relative to reference. In Plot 2, the SediMite application resulted in approximately 79 percent decrease in the average PCB concentrations at the deeper horizons.

Pore water concentrations from the upper two or three horizons of surficial pore water were averaged to evaluate if there were any statistically significant differences in pore water concentrations 26 months post-amendment. There were no statistically significant differences in pore water PCB concentrations between Plot 1 and Plot 2 at depths of 1 to 11 cm (t-test; $p>0.05$). However, PCB concentrations in Plot 2 pore water were significantly lower than in Plot 1 (0.284 ng/L in Plot 1 and 0.213 ng/L in Plot 2) (Mann-Whitney Rank Sum Test; $P=0.035$) when considering an average of the top three intervals (representing 1 to 16 cm). This difference is not great and may not be ecologically relevant as it did not contribute to statistically significant differences in tissue PCB concentrations in clams.

The concentration reductions were most dramatic in the low molecular weight, low chlorine number PCBs, which may reflect a kinetic effect in that the high molecular weight PCBs would be expected to require longer to fully equilibrate with AC. Compared to baseline conditions, average reductions of 95 percent were obtained for the mono- to tetra-chlorobiphenyl (CB) homologue groups for both amendments. Reductions of 71 percent and 76 percent for penta- to octa-CBs were observed in the AquaGate and SediMite treatment areas, respectively. These results suggest higher effectiveness of AC treatments for binding lower chlorinated compounds which became less bioavailable in sediment pore water.

5.2.3 PCB Accumulation in Bivalve Tissue

This section summarizes the results of field and laboratory PCB bioaccumulation in the soft tissue of *Macoma* following 28-day exposures to field sediments. These bioaccumulation tests were performed under baseline conditions and 8, 14, 20, and 26 months post-placement. These tissue chemistry data are detailed in Appendix F with an assessment of data quality in Appendix G.

As described in Section 4.5.2, the laboratory testing approach was developed to evaluate baseline PCB bioaccumulation in bivalves after field exposures did not yield enough surviving organisms for analyses and there was insufficient time to conduct another 28-day field deployment. The purpose of the pilot study was not to directly compare the results of field and laboratory exposures, particularly because numeric success criteria were not established.

5.2.3.1 Baseline Monitoring Event

There were few surviving clams (i.e., 5 percent) retrieved from the chambers at the end of baseline field deployments in June 5, 2015. Five live clams were collected from three stations after 28-days in the field. These white sand clams were sent to Vista Lab for tissue PCB analysis. However, the five clams had insufficient mass for separate analyses for each sampling station and so they were composited into a single sample (Table 5-5).

The reason for this poor survival in field-deployed white sand clams became clear after conducting baseline 28-day laboratory bioaccumulation testing and a pilot field study with lab controls using both the white sand clams and the bent-nosed clam (Appendix B). The white sand clams, locally sourced by the contract lab, were not as tolerant of testing conditions as bent-nosed clams. Bent-nosed clams were used to assess bioaccumulation in post-placement monitoring based on these results.

Laboratory bioaccumulation testing with white sand clams was completed and tissues were submitted to Vista Lab for chemical analyses; however, organism survival of 23 percent under these ideal conditions was also poor (Table 5-6). These quantitative results supported initial qualitative observations by Pacific EcoRisk and the Bodega Marine Lab that white sand clams in culture tanks were not surviving well under laboratory conditions.

Tissue PCB concentrations in white sand clams after 28-day lab exposures ranged from 42.9 ng/g dry weight (DW) in sediments collected from Plot 2 to 46.0 ng/g DW in sediments collected from Plot 1 and the buffer area. Field exposures resulted in a tissue concentration of 205 ng/g DW in the single composite sample. There were no significant differences in average bioaccumulation in untreated (i.e., baseline) sediment collected from Plot 1, Plot 2, or the reference area during lab exposures (analysis of variance [ANOVA]; $p>0.05$). Comparisons between baseline tissue PCB concentrations and post-placement monitoring tissue concentrations may not be appropriate because of differences between species, and the potentially stressed state of white sand clams, and such comparisons will be limited. However, tissue samples were deployed at the reference area (i.e., areas not amended with activated carbon) during each post-placement event, and comparisons between the two amended plots and the reference area during the post-placement events are appropriate for determining amendment efficacy.

5.2.3.2 8-Month Post-Placement Monitoring Event

Bent-nosed clams were used to assess bioaccumulation in the 8-month post-placement monitoring event with survival of 99 percent after 28-days in both lab and field exposures. A summary of the resulting field and laboratory exposure tissue PCB concentrations are presented in Table 5-7 and shown on Figures 5-11 and 5-12. PCBs are hydrophobic and partition to lipids in tissues. Normalizing the tissue PCB concentrations per gram of lipid allows a less biased comparison among organism samples. However, there were very low lipid concentrations in the clams (i.e., less than 1 percent) and the error associated with these measurements may increase the uncertainty associated with lipid-normalized PCB tissue concentrations, which are shown on Figures 5-13A and 5-13B.

Mean total PCB concentrations were lower in clams exposed to sediment from Plot 1 (AquaGate) and Plot 2 (SediMite) than in the reference area 8 months after amendment placement. This was expected after the addition of AC, which binds PCBs and reduces bioavailability, and was observed in both field and laboratory exposures. Tissue PCB concentrations in bent-nosed clams after 28-day field exposures were 60.2±35 ng/g DW in Plot 1 and 44.3±11 ng/g DW in Plot 2 (SediMite). The observed decreases were statistically significant for the clams from Plot 2 (ANOVA, $p=0.01$).

Tissues were 28.9±30 ng/g DW in Plot 1 and 23.6±14 ng/g DW in Plot 2 following lab exposures. Reference site exposures resulted in tissue PCB concentrations of 191±100 ng/g DW in the field and 117±25 ng/g DW in the lab. The average results show a significant reduction from baseline concentrations in tissues collected from Plot 1 and Plot 2 (ANOVA, p=0.044 in Plot 1 and p=0.024 in Plot 2). When compared to the reference area, the lab exposed tissues were significantly lower in Plot 1 (ANOVA, p=0.043), but not in Plot 2 (p=0.05).

Total PCB tissue concentrations in lab exposures were reduced by 75 and 80 percent in Plot 1 and Plot 2, respectively, compared to baseline tissue concentrations; 81 and 82 percent reductions were observed in lipid normalized tissue concentrations. Total PCB tissue concentrations in field exposures were reduced by 69 and 77 percent in Plot 1 and Plot 2, respectively, compared to baseline tissue concentrations; 66 and 70 percent reductions were observed in lipid normalized tissue concentrations. Total PCB bioaccumulation at individual clam deployment locations or by sediment collection location are shown on Figures 5-14A and 5-15A.

5.2.3.3 14-Month Post-Placement Monitoring Event

Bent-nosed clams were used to assess bioaccumulation in the 14-month post-placement monitoring event. A summary of the results from the field and laboratory exposure scenarios are presented in Table 5-7 and shown on Figures 5-11 and 5-12. Lipid normalized PCB tissue concentrations are shown on Figures 5-13A and 5-13B.

Mean total PCB concentrations were lower in clams exposed to sediment from Plot 1 (AquaGate) and Plot 2 (SediMite) than in the reference area 14 months after amendment placement. This was observed in both field and laboratory exposure scenarios. Tissue PCB concentrations in bent-nosed clams after 28-day field exposures were 37.2±15 ng/g DW in Plot 1 and 67.7±21 ng/g DW in Plot 2 (SediMite). When the field-exposed samples were compared to reference, concentration in clams from Plot 1 were significantly lower (ANOVA, p=0.008). The difference noted in Plot 2 was not significant.

Tissues were 17.0±6.6 ng/g DW in Plot 1 and 21.6±4.2 ng/g DW in Plot 2 following lab exposures. Reference site exposures resulted in tissue PCB concentrations of 199±22 ng/g DW in the field and 134±14 ng/g DW in the lab. The average lab-exposure results show a significant reduction from baseline concentrations in tissues collected from Plots 1 and 2 (ANOVA, p=0.015 in Plot 1; p=0.022 in Plot 2). Total PCB tissue concentrations in lab exposures were reduced by 87 and 84 percent in Plots 1 and 2, respectively, compared to reference area tissue concentrations, and 85 percent reductions in lipid-normalized tissue concentrations in both Plot 1 and Plot 2. Total PCB tissue concentrations in field exposures were reduced by 81 and 66 percent in Plot 1 and Plot 2, respectively, compared to baseline tissue concentrations; 67 and 62 percent reductions were observed in lipid-normalized tissue concentrations. Maps of the total PCB bioaccumulation at individual clam deployment locations or by sediment collection location are shown on Figures 5-14B and 5-15B.

5.2.3.4 20-Month Post-Placement Monitoring Event

Bent-nosed clams were used to assess bioaccumulation in the 20-month post-placement monitoring event. Field sediments were collected for laboratory bioaccumulation testing at the start of this monitoring event and field-deployed clams were placed in sediment exposure chambers. Laboratory bioaccumulation testing proceeded as planned; however, severe winter storms disturbed the field exposures. Clams were deployed on January 24 and retrieved on February 21 and 22, 2017. During this time, salinity in the South Basin was decreased to approximately 10 parts per thousand because of storm runoff (Appendix D) and likely contributed to elevated clam mortality in field exposures. Further, sample locations were disrupted when a silt curtain adjacent to the pilot plots came loose and dragged across the site. Samples from the compromised field exposures were discarded and a complete monitoring event was rescheduled for 26 months post-placement. A summary of the results from laboratory exposure scenarios are presented in Table 5-7 and shown on Figure 5-11. Lipid-normalized PCB tissue concentrations are shown on Figure 5-13A.

Mean 20-month post-placement tissue PCB concentrations in laboratory bioaccumulation exposures were lower in clams exposed to sediment from Plot 1 (AquaGate) and Plot 2 (SediMite) than in the reference area 20 months after amendment placement. Tissue PCB concentrations in bent-nosed clams after 28-day lab exposures were 34.6±4.8 ng/g DW in Plot 1 and 36.9±17 ng/g DW in Plot 2 (SediMite), whereas reference site exposures resulted in 169±15 ng/g DW. The average results show a significant reduction from baseline concentrations in tissues collected from Plots 1 and 2 (ANOVA, $p<0.05$), but no significant difference between bioaccumulation in Plot 1 versus Plot 2. Total PCB tissue concentrations in lab exposures were reduced by 79 and 78 percent in Plots 1 and 2, respectively, compared to reference area tissue concentrations; 85 and 79 percent reductions were observed in lipid-normalized tissue concentrations in Plots 1 and 2, respectively. Maps of the total PCB bioaccumulation by sediment collection location are shown on Figure 5-15C.

5.2.3.5 26-Month Post-Placement Monitoring Event

Bent-nosed clams were used to assess bioaccumulation in the 26-month post-placement monitoring event. A summary of the results from the field and laboratory exposure scenarios are presented in Table 5-7 and shown on Figures 5-11 and 5-12. Lipid normalized PCB tissue concentrations are shown on Figures 5-13A and 5-13B.

Mean total PCB concentrations were lower in clams exposed to sediment from Plot 1 (AquaGate) and Plot 2 (SediMite) than in the reference area 26 months after amendment placement. This was observed in both field and laboratory exposure scenarios. Tissue PCB concentrations in bent-nosed clams after 28-day field exposures were 51.9±21 ng/g DW in Plot 1 and 67.4±26 ng/g DW in Plot 2 (SediMite). Although reductions were still observed in the tissue data, the results were not determined to be statistically significant during the 26-month sampling event.

Tissues were 12.0±7.9 ng/g DW in Plot 1 and 25.9±15.3 ng/g DW in Plot 2 following lab exposures. Reference site exposures resulted in tissue PCB concentrations of 130±25 ng/g DW in the field and 120±13.4 ng/g DW in the lab. The average results show a significant reduction from baseline concentrations in tissues collected from Plot 1 (ANOVA, $p=0.002$).

Total PCB tissue concentrations in lab exposures were reduced by 90 and 78 percent in Plots 1 and 2, respectively, compared to reference area tissue concentrations; 82 and 72 percent reductions were noted in lipid-normalized tissue concentrations in Plots 1 and 2, respectively. Total PCB tissue concentrations in field exposures were reduced by 60 and 48 percent in Plots 1 and 2, respectively, compared to baseline tissue concentrations; 80 and

73 percent reductions were observed in lipid-normalized tissue concentrations in Plots 1 and 2, respectively. Maps of the total PCB bioaccumulation at individual clam deployment locations or by sediment collection location are shown on Figures 5-14C and 5-15D.

5.3 Benthic Community Health

This section presents the results of the benthic community analyses.

5.3.1 Traditional Benthic Community Analysis

BCA samples were collected during the baseline and all post-placement monitoring events, including the attempt at 20 months post-placement. Abundance of benthic invertebrates and taxa richness were not significantly different among treatment areas (i.e., Plot 1, Plot 2, and Buffer) and were not significantly different from the reference area during each sampling event (ANOVA, $p>0.05$; Figures 5-16 and 5-17). Average Shannon Wiener Diversity Index (H') and number of taxa are presented on Figure 5-18, with additional community analysis measures presented in Table 5-8. The Shannon-Wiener Diversity Index is one of the most common diversity indices used to evaluate benthic community diversity. The index accounts for both abundance and evenness of species present. The baseline diversity index shows a similar average diversity across all treatment areas prior to amendment placement. Average diversity was similar in Plots 1 and 2 and the reference area during baseline and each post-placement monitoring event. Differences among plots were not significantly different within each sampling event. The 26-month post-placement event showed greater diversity across both study plots and the reference area compared to all other monitoring events. Differences among sampling periods may reflect seasonal variability as baseline, 14-month, and 26-month monitoring were performed in the summer while 8-month and 20-month monitoring events were performed in the winter. Results to date do not suggest any negative effect on species diversity from 8 months through 26 months post-placement.

5.3.2 Benthic Community Analysis Using Sediment Profile Imaging

Benthic community health was evaluated using SPI imagery performed during the baseline, initial placement, and the three post-placement monitoring events. Analysis of baseline SPI images indicated that the HPNS South Basin in the pilot amendment and reference areas is a healthy shallow water benthic habitat (Appendix C-1). Benthic community health was evaluated using the organism sediment index (OSI), which is calculated based on observations of apparent redox potential discontinuity depth, estimated successional stage, gas voids, and apparent dissolved oxygen conditions (details in Appendix C). Values can range from -10 (poorest quality habitats) to +11 (highest quality habitats); estuarine benthic habitats with OSI greater than 6 indicate good conditions not heavily influenced by stressors. Baseline OSI averaged from 7 to 8 for all stations, with a range of 4 to 10, indicative of variability at the site. Analysis of the OSI average and standard deviation for the pilot area and reference area (presented on Figure 5-19 and Table 5-9) showed no significant differences in OSI among Plot 1, Plot 2, the buffer zone, and the reference area during baseline monitoring and post-placement monitoring after 8 months, 14 months, and 26 months.

8.0 Summary

The pilot test performed at HPNS Parcel F was sufficient to demonstrate that AC amendments could meet all three performance objectives: 1) placement, 2) stability, and 3) effectiveness of AC amendments in controlling contaminant bioavailability over time. Carbon amendments can be accurately and efficiently placed within the South Basin, remain in place, and are effective in reducing exposures to ecological receptors. Both amendments tested in this pilot study were shown to be effective and demonstrated comparable reduction in PCB concentrations in both pore water and clam tissue. Pore water PCB concentrations were reduced by over 80 percent in the surface sediment interval relative to baseline conditions and by 78 to 83 percent in surficial sediments relative to the reference site after 26 months post-placement in Plots 1 and 2, respectively. The amendments also did not result in any long-term negative impacts to the local benthic community. New sediment deposition supported the reduction of bioavailable PCB concentrations in surficial sediments as the depth to contaminated layers increased.

Clam tissue PCB concentrations in both treatment types were significantly reduced by 70 to 90 percent in laboratory exposures and by 50 to 70 percent in field exposures compared to reference sediment exposures, and these reductions were maintained even though the area was affected by several storm events (see Section 7.2). Tissue concentrations were not significantly different between Plots 1 and 2 during each sampling event and the average post-placement bent-nosed clam tissue concentrations during all monitoring events in both Plots 1 and 2 were also less than the 68.6 ng/g DW Reference Threshold Value (BBL, 2005) during all post-placement monitoring events. These results suggest that site-associated risks from PCBs to wildlife and human health from consumption of clams in areas amended with AC in South Basin are not greater than those in reference areas of San Francisco Bay.

The overall cost incurred for AC placement were about $23 per square foot and the monitoring costs for the 26-month event were approximately $450,000. For full-scale application, the monitoring program would not likely use such a high sampling density and could be optimized for cost effectiveness based on the data quality objectives established for the remedy performance monitoring. The performance measures used as part of the pilot study (i.e., SPI, passive samplers, bulk sediment analyses, benthic community analyses, and tissue analyses) all provided helpful data for interpreting treatment effectiveness and could all be incorporated to varying degrees into a full-scale monitoring program. The salient lessons learned from the pilot test are listed in Section 7.3 and should be considered during the remedial design. The decisions on the a) specific commercially available amendment that will be appropriate for full scale application, and b) the final dosing requirements will require consideration of numerous factors that will be performed during the remedial design and remedial action work plan phase of the CERCLA program.

Reference Item 14
Costs

Source:

Barajas and Associates. 2008. *Final Feasibility Study for Parcel F, Hunters Point Shipyard, San Francisco, California*. April 30.

DCN:

BAI-5106-0004-0003

Excerpt includes the following:

Appendix D

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ACRONYMS AND ABBREVIATIONS

EPA	U.S. Environmental Protection Agency
FS	Feasibility study
gpm	Gallon per minute
HPS	Hunters Point Shipyard
MLLW	Mean lower low water
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
O&M	Operation and maintenance
OMB	Office of Management and Budget
PCB	Polychlorinated biphenyl
PV	Present value

D1.0 INTRODUCTION

This appendix presents cost estimates developed for the various alternatives evaluated for the Feasibility Study (FS) at Parcel F of Hunters Point Shipyard (HPS).

The remaining sections of this appendix are organized as follows:

- Section D2.0 describes the purpose of the estimates.
- Section D3.0 summarizes the components of the cost-estimating methods used.
- Section D4.0 describes the components of each alternative's cost estimate.
- Section D5.0 lists the references used in preparing the cost estimates.

Cost estimate tables are included at the end of this appendix following Section D5.0.

D2.0 PURPOSE OF ESTIMATES

Cost estimates developed during the detailed analysis phase are used to compare alternatives and support remedy selection. The National Oil and Hazardous Substances Pollution Contingency Plan (NCP) includes the following language in its description of the cost criterion for the detailed analysis and remedy selection:

> "The types of costs that shall be assessed include the following: (1) Capital costs, including both direct and indirect costs; (2) Annual operations and maintenance costs; and (3) Net present value of capital and O&M costs (Title 40 Code of Federal Regulations 300.430 (e)(9)(iii)(G))" (EPA 2000).

D3.0 COST ESTIMATE COMPONENTS

Cost estimates for the remediation alternatives include capital costs, annual operations and maintenance (O&M) costs or periodic costs (or both), cost of capital, the present value (PV) of O&M costs or periodic costs, and contingency allowances. Each of these components is discussed in further detail in the following sections.

D3.1 CAPITAL COSTS

Capital costs include direct and indirect costs. Costs incurred for equipment, material, labor, construction, development and implementation of remedial technologies are included as direct costs. Indirect costs include health and safety items, site supervision, engineering, overhead and profit, and start up. Indirect costs are included in the estimate as either a separate line item or as a percentage of the direct capital cost.

D3.2 ANNUAL OPERATION AND MAINTENANCE AND/OR PERIODIC COSTS

Annual O&M costs include costs incurred after construction. These costs are necessary to assure the effectiveness of a remedial action. Annual O&M costs typically include labor, consumable materials, purchased services (for example, laboratory analyses), sampling, permit fees, annual reports, and site reviews.

Periodic costs occur once every few years or once during the entire O&M period. Examples include 5-year reviews, site closeout, and remedy failure and replacement.

D3.3 PRESENT VALUE ANALYSIS

Remedial action projects typically involve construction costs that are expended at the beginning of a project (capital costs) and costs in subsequent years (operation and maintenance or periodic costs). PV analysis is a method to evaluate expenditures that occur over different periods of time. This standard methodology allows for cost comparisons of various remedial alternatives on the basis of a single cost value for each alternative. This single value, referred to as the PV, is the amount needed to be set aside at the initial point in time (the base year) to assure that funds will be available in the future as they are needed. PV analysis uses a discount rate and period of analysis to calculate the PV of each expenditure.

D3.3.1 Discount Rate

A discount rate is the difference between interest and inflation rates. When inflation is neglected, the discount rate is simply an interest rate and is used to account for the time value of money. A dollar is worth more today than in the future because, if invested today, the dollar would earn interest. The choice of a discount rate is important because the rate selected directly affects the present value of a cost estimate, which is then used in making a remedy selection decision.

The U.S. Environmental Protection Agency (EPA) policy on the use of discount rates for cost analysis is stated in the preamble to the NCP (55FR8722) and in Office of Solid Waste and Emergency Response Directive 9355.3-20 (EPA 2000). Discount rates used in economic analysis by the federal government are specified in Office of Management and Budget (OMB) Circular A-94. The current discount rate for a 30-year stream of payments is 3.1 percent (OMB 2006).

D3.3.2 Present Value

The PV of a series of equal annual future payments such as annual O&M payments is calculated using the following equation:

$$PV = \sum_{t=1}^{n} \frac{x_t}{(1+i)^t}$$

where

PV	=	Present value
x_t	=	Payment in year t (t = 0 for present or base year)
i	=	Discount factor
t	=	Number of years after construction that expenditures start
n	=	Number of years that the stream of equal annual future payments will run

The PV of a single periodic future payment is calculated using the following equation:

$$PV = \frac{x_t}{(1+i)^t}$$

where

PV	=	Present value
x_t	=	Payment in year t (t = 0 for present or base year)
i	=	Discount factor
t	=	Number of years after construction that expenditures occur

The PV of a remedial alternative represents the sum of the present values of all future payments associated with the project. PV for this cost estimate is calculated using 2006 dollars.

D3.4 TYPES OF COST ESTIMATING METHODS

The cost estimates presented in this appendix were developed using both detailed and parametric approaches, both of which are accepted by EPA, as described below.

> "The detailed approach estimates cost on an item-by-item basis. Detailed methods typically rely on quantity take-offs and compiled sources of unit cost data for each item, taken from either a built-in database (if part of a software package, for example) or other sources (e.g., cost estimating references). This method, also known as 'bottom up' estimating, is used when design information is available" (EPA 2000).

> "The parametric approach relies on relationships between cost and design parameters. These relationships are usually 'statistically-based' or 'model-based.' Statistically-based approaches rely on 'scaled-up' or 'scaled-down' versions of projects where historical cost data is available. Model-based approaches utilize a generic design that is linked to a cost database and adjusted by the user for site-specific information. This method, also known as 'top down' estimating, is used when design information is not available" (EPA 2000).

D3.5 METHODOLOGY

Cost estimates for this FS Report were prepared in accordance with the "Guide for Developing and Documenting Cost Estimates During the Feasibility Study" (EPA 2000). The Remedial Action Cost Engineering and Requirements System (RACER™) 2006 was the primary source of cost data (Earth Tech, Inc. 2006). Costs for unique line items not included in RACER™ were based on vendor quotes and Means Environmental Cost Estimating unit prices (Means 2005).

D3.6 CONTINGENCY ALLOWANCES

Contingency is factored into a cost estimate to cover unknowns, unforeseen circumstances, or unanticipated conditions that are not possible to evaluate from the data on hand at the time the estimate is prepared. The two main types of contingency are scope and bid. Scope contingency covers unknown costs resulting from scope changes that may occur during design. Bid contingency covers unknown costs associated with constructing or implementing a given project scope.

D3.7 ESCALATION COSTS

RACER™ output costs are expressed in 2006 dollars (Earth Tech, Inc. 2006). Escalation costs are included to reflect the increase in project costs over time as a result of inflation. RACER™ output costs were escalated to convert them from 2006 dollars 2007 dollars for initial capital costs and for the projected year in which the dollars will be spent for O&M costs. The RACER™ default escalation values were applied, as shown in Tables D-2 through D-13.

D4.0 INDIVIDUAL COST ESTIMATE ASSUMPTIONS

This section identifies the assumptions and parameters used in developing the cost estimates. Table D-1 summarizes the total remedial costs for each remedial alternative. Figure D-1 provides a graphical comparison of the costs.

D4.1 AREA III ALTERNATIVES

D4.1.1 Area III Alternative 2: Removal/Backfill and Off-Site Disposal

The major components of this alternative are (1) removal (by dredging or excavating) of contaminated sediment and backfilling the excavation and (2) off-site disposal of the sediment. Table D-2 presents the costs for Alternative 2.

The cost assumptions for Area III Alternative 2 are provided below.

- The remediation area is accessible, and no specialized equipment or services (aside from those described in this FS Report) would be necessary to gain access to the site.
- All activities would be performed using modified EPA Level D personal protective equipment.

Removal (Dredging) – Area III

- Approximately 26,500 cubic yards would be dredged from Area III, at a depth of 1 to 5 feet (see Figure 4-3 of the FS Report).
- Dredging would be conducted by clamshell-type dredging equipment outfitted with an environmental bucket. The dredging estimate is based on a vendor quote from Dutra Dredging, December 14, 2005, of approximately $18 per cubic yard for dredging, transport to shore, and unloading at HPS.
- No rocks are present that would require ripping or blasting. No drums or other debris would need to be removed.
- Initial dewatering of the dredged material would take place on the barge, with the water returned to the site within the silt curtain. Further onshore dewatering would be included. Water from the onshore dewatering operations would be disposed of in the sanitary sewer system after appropriate waste characterization analysis. If the water does not meet sanitary sewer discharge requirements, treatment or off-site disposal may be necessary, but is not included in the estimate.
- A silt curtain would be installed around the excavation area for the duration of the dredging operation.
- For cost estimating purposed it was assumed that confirmation samples would be collected on a 250-foot by 250-foot grid. In Area III, a total of six confirmation samples would be analyzed for copper, mercury, and total polychlorinated biphenyls (PCB).
- The removal area would be backfilled with sand material. The backfill volume was calculated at 130 percent of the excavated volume. Costs for placing the backfill material are based on the costs for placing of the capping material in Alternatives 3/3A and 4/4A.

Decontamination Facilities

- A new decontamination pad would be constructed (medium equipment rating), measuring 800 square feet in area, using a flexible membrane liner. A pressure washer would be in use approximately 25 percent of the time, or one shift per day.

- Wastewater generated from the decontamination area would be contained, sampled, and transported for disposal into the wastewater collection system operated by the local publicly owned treatment works.

- Equipment decontamination operations would last 6 months.

- Personnel decontamination trailers and portable restrooms would be included on site for the duration of remediation activities.

Residual Waste Management

- Excavated and dewatered sediment would be tested for hazardous characteristics and disposed of at a Class 1 or Class 2 off-site landfill as appropriate. However, based on the available data, hazardous levels of chemicals are not expected, so the costs shown include disposal at a Class 2 landfill. The costs would be $30 per ton for disposal at a Class II facility (Altamont Landfill in Livermore, California).

Dewatering Facilities

- The dewatering pad would measure approximately 38,000 square feet in area and would consist of a lined, bermed containment cell. The cell would be graded to promote surface runoff toward a collection area, and water would be pumped to a collection tank.

- A 4,000-gallon wastewater collection tank would be installed for the collection of water. Wastewater generated from the dewatering area would be contained, sampled, and piped for disposal into the wastewater collection system operated by the local publicly owned treatment works.

Other

- Engineering (design, permitting, and manifesting) and professional management costs are calculated as a percent of the total direct labor cost, depending on the remedial alternative type.

D4.1.2 Area III Alternatives 3 and 3A: Focused Removal/Backfill, Off-Site Disposal, Armored Cap (3) or AquaBlok Cap (3A), and Institutional Controls

The major components of this alternative are (1) focused removal (by dredging) and off-site disposal of contaminated sediment in areas above mean lower low water (MLLW) that are not amenable to capping in Area III and backfilling the excavation, (2) an armored cap (Alternative 3) or AquaBlok cap (Alternative 3A) in deeper areas in Area III, and (4) institutional controls. Tables D-3 and D-4 present the costs for Alternatives 3 and 3A.

The cost assumptions for Alternatives 3 and 3A are provided below.

- The remediation area is accessible, and no specialized equipment or services (aside from those described in this report) would be necessary to gain access to the site.
- All activities would be performed using modified EPA Level D personal protective equipment.

<u>Focused Removal (Dredging) and Off-Site Disposal – Area III</u>

- The focused removal in Area III would consist of approximately 1,790 cubic yards. The sediment type is a sand-silt/sand-clay mixture. Removal depth would be from 1 to 2 feet (see Figure 4-8 of the FS Report).
- The dredging unit would be outfitted with an environmental clamshell bucket.
- No rocks or other debris are present that would hinder dredging operations; dewatering would be included for the duration of activities.
- A centralized area at HPS would be used for temporary sediment storage, segregation, and characterization sampling (see waste staging area below).
- Volume expected to be transported off site for disposal would be 2,320 cubic yards based on a 30 percent bulking factor.
- For cost estimating purposes it was assumed that confirmation samples would be collected on a 250-foot grid for a total of four samples. Samples would be analyzed for copper, mercury, and total PCBs.
- The focused removal area would be backfilled with sand material. Costs for placing the backfill material are based on the costs for placing the capping material, scaled down to the volume of the focused removal area.

- Confirmation sampling would be conducted using a Vibracore sampler. A bathymetry survey would be conducted after the removal. Costs for bathymetry surveys and vibracore sampling were obtained from vendor quote from TEG Ocean Services, January 9, 2006, as follows:

  <u>Class I Hydrographic Surveys</u> (DGPS HYPACK Survey software, 200 kHz single beam survey fathometer):

  Area III: $8,500

  <u>Vibracore Sampling</u> (Production in the outer areas will be likely be six to eight cores per day based on currents):

  Area III:

  1. Mob/Demobilization (Vibracore System no vessel mob. cost) $1,500
  2. Vibracoring Daily Rate (6 cores/day, includes vessel, DGPS positioning, coring system, personnel and per diems) $3,550/day
  3. Consumables (billed as used, includes core barrels, liners, etc.) estimated $400/day

<u>Capping – Area III</u>

- An approximately 454,550-square foot area would be capped.

- Two types of caps are proposed:

  - Armor Cap: Consists of 1.5 feet of sand covered by 0.5 foot of armor stone.
  - AquaBlok Cap: Consists of 4.5 inches of AquaBlok covered by 0.5 foot of armor stone.

- Vendor quotes obtained from AquaBlok, Limited were used to develop costs for placement of the caps, as follows:

  <u>Pre-Application Activities</u> (vendor laboratory studies and design): $335,000

  <u>Capping Materials</u> (target 10-inch effective cap = 4.5 inches saltwater compatible Aquablok™ plus 6 inches of stone armor):

AquaBlock™ 4060W	$1,690,000	*
Armor (5"-6" agg.)	<u>$424,000</u>	**
Total	$2,114,000	

*Amount includes 5 percent additional material to allow for product loss during placement, transport, and so forth.
**Includes allowance for local freight, on-site storage, manufacture site rental, and manufacture site preparation.

Application (Application using barge-based conveyor supplied with capping material from shore-based operations):

Equipment Mobilization (barges, work boat, telebelt, etc.)	$60,000
Application ~1/2 acre per day (25 days total) @ $20,000 day	$500,000
Material Staging	$50,000
Post-Application Quality Control and Documentation	$150,000
Total Cost for Application	$760,000
Total AquaBlok Costs	$3,209,000

- Cap repair costs are based on the assumption that one-fifth of the area would require repair within a 30-year period. The repair costs include equipment mobilization, application for 5 days, material staging and post-application quality control and documentation.

D4.1.3 Area III Alternatives 4 and 4A: Focused Removal/Backfill, Off-Site Disposal, Modified Armored Cap (4) or AquaBlok Cap (4A), and Institutional Controls

The major components of this alternative are (1) focused removal (by dredging) and off-site disposal of contaminated sediment in areas above the MLLW that are not amenable to capping in Area III; (2) placement of an armored cap (Alternative 4) or AquaBlok cap (Alternative 4A) in a limited portion of Area III; and (3) institutional controls.

The cost assumptions for Alternatives 4 and 4A are provided below.

- The remediation area is accessible, and no specialized equipment or services (aside from those described in this report) would be necessary to gain access to the site.
- All activities would be performed using modified EPA Level D personal protective equipment.
- Activities are expected to last 6 months.

Focused Removal (Dredging) and Off-Site Disposal – Area III

The parameters are the same as for Alternatives 3 and 3A.

Modified Capping – Area III

- An approximately 68,670 square foot area would be capped.
- All other capping parameters are the same as Alternatives 3 and 3A.

D4.2 AREA IX/X REMEDIAL ALTERNATIVES

D4.2.1 Area IX/X Alternative 2: Excavation/Backfill and Off-Site Disposal

The major components of this alternative are (1) removal (by dredging or excavating) of contaminated sediment and backfilling the excavation and (2) off-site disposal of the sediment. Table D-7 presents the costs for Alternative 2.

The cost assumptions for Area IX/X Alternative 2 are provided below.

- The remediation area is accessible, and no specialized equipment or services (aside from those described in this FS Report) would be necessary to gain access to the site.
- All activities would be performed using modified EPA Level D personal protective equipment.

Cost assumptions for decontamination, residual waste management, and dewatering are the same as for Area III Alternative 2.

Removal (Excavating) – Area IX/X

- The area would be dewatered using cofferdams and centrifugal pumps before excavation.
- Approximately 150,520 cubic yards would be excavated from Area IX/X using conventional excavation equipment.
- Ten crane mats would be on site for the duration of excavation and site restoration activities.
- No rocks are present that would require ripping or blasting. No drums would need to be removed; dewatering is included for the duration of activities.
- A centralized area at HPS would be used for dewatering and characterization sampling (see dewatering area below).
- The excavation would be from 0.5 to 5 feet deep as shown on Figure 4-4 of the FS Report and would not require steel sheeting to protect sidewalls. The sediment type is a sand-silt/sand-clay mixture.
- None of the excavated sediment is expected to be suitable for use as backfill, and all backfill would come from an off-site source.
- Volume expected to be transported off site for disposal is 195,680 cubic yards based on a 30 percent bulking factor.

- For cost estimating purposes it was assumed that confirmation samples would be collected on a 250-foot by 250-foot grid. A total of 30 confirmation samples would be analyzed for total PCBs, copper, and mercury for Area IX/X.

- Dewatering the excavation area would consist of placement of 2,000 feet of 8-foot-high cofferdam (AquaDam) and operation of four 300-gallon per minute (gpm) pumps for approximately 2 weeks. An additional 150 feet of cofferdam would be placed in Yosemite Creek approximately 100 feet upstream of the excavation area. Aboveground piping is included to allow discharge into the bay. Minimal flow is expected during the dry season; however, two 300-gpm pumps would be on standby to pump out any water that may accumulate behind the cofferdams.

- Costs for cofferdam rental are based on a vendor quote from Water Structure Unlimited (December 6, 2006), as shown in the table below.

Item	Description	Quantity	Unit	Rate	Amount
Rental	AquaDam Rental 8-feet high x 2,000 feet long w/c	2,000	Feet	$58.80	$117,600
Installation	Includes pumps, hoses, etc. for installation; six days, three personnel	1	Each	$5,000.00	$5,000
		6	Day	$2,000.00	$12,000
Removal		1	Each	$16,000.00	$16,000
				Total	**$150,600**

Note: Additional labor and equipment needed for installation include an excavator and four to six laborers as needed. The costs shown above are unloaded costs; markups are applied in the cost estimate spreadsheets.

- Original contours would be maintained and, if appropriate, regraded to aid surface runoff. Replacement cover would be similar to existing material.

D4.2.2 Area IX/X Alternative 3: In-Situ Stabilization and Institutional Controls

Alternative 3 consists of in-situ stabilization of the top 1 foot of sediment in Area IX/X and institutional controls. Table D-8 presents the costs for Alternatives 3.

In-Situ Treatment – Area IX/X

- Sediment contaminated with PCBs would be stabilized by adding 3.4 percent activated carbon to the top 1 foot of sediments.

- Approximately 66,200 cubic yards of sediment would be treated, requiring approximately 1,670,000 pounds of carbon (at a carbon density of 743 pounds per cubic yard).

- Costs for in-situ treatment are extrapolated from costs for pilot studies conducted by Stanford University (Environmental Security Technology Certification Program 2005). According to Dennis Smithenry of Stanford, Aquamog equipment was used during the initial pilot study to mix carbon into the sediments at a cost of $5,000 per day and a production rate of about 5,000 square feet per day. The cost for 30NS regenerated activated carbon is $1.88 per lb.

- A crane would be included for loading the carbon onto a barge for the duration of the project (291 days).

Decontamination Facilities, Residual Waste Management, and Dewatering Facilities

These parameters would be the same as described in Alternative 2.

D4.2.3 Area IX/X Alternative 4: Monitored Natural Recovery and Institutional Controls

The major components of this alternative are monitored natural recovery and institutional controls. See Table D-9 for Alternative 4 cost details.

Monitored Natural Recovery – Area IX/X

- Costs for deed restrictions include documentation, posting, and enforcement.

- Baseline monitoring would consist of a bathymetry survey and sediment core sampling using a vibracore sampler. Thirty fine sediment cores would be collected and analyzed for copper, mercury, and total PCBs. A benthic survey also would be conducted.

- Costs for bathymetry surveys and vibracore sampling were obtained from a vendor quote from TEG Ocean Services, January 9, 2006, as follows:

  Class I Hydrographic Surveys (DGPS HYPACK Survey software, 200 kHz single beam survey fathometer):

  Area IX/X: $14,500

  Vibracore Sampling (Different vessels would be required for Areas III and IX/X. Production in the outer areas will be likely be six to eight cores per day based on currents):

  Area IX/X:

  1. Mob/Demobilization (shallow water drill rig and tender vessel, vibracore system) $4,500

2. Vibracoring Daily Rate (8-10 cores/day, includes vessel, DGPS positioning, coring system, personnel and per diems) $4,050/day
3. Consumables (billed as used, includes core barrels, liners, etc.) estimated $400/day

- Annual monitoring would be conducted for the same parameters for the first five years, followed by monitoring every 5 years for years 25 through 30, and reported in 5-year review documents.

D4.2.4 Area IX/X Alternatives 5 and 5A: Focused Removal, Backfill (5) or Activated Backfill (5A), Off-Site Disposal, Monitored Natural Recovery, and Institutional Controls

The major components of this alternative are (1) focused removal (by excavating) of contaminated sediment to a depth of 1.0 feet where chemical concentrations in sediment exceed the remediation goals in Area IX/X; (2) off-site disposal, (3) backfill (Alternative 5) or backfill mixed with activated carbon (Alternative 5A); (4) monitored natural recovery in remaining areas in Area IX/X; and (5) institutional controls. Tables D-10 and D-11 present the costs for Alternative 5 and 5A.

The cost assumptions for Alternative 5 and 5A are provided below.

- The remediation area is accessible, and no specialized equipment or services (aside from those described in this report) would be necessary to gain access to the site.
- All activities would be performed using modified EPA Level D personal protective equipment.

Focused Removal (Excavation), Off-Site Disposal, and Backfill – Area IX/X

- The area would be dewatered using cofferdams and centrifugal pumps before excavation of sediment.
- Approximately 57,850 cubic yards would be excavated from Area IX/X using conventional excavation equipment.
- Ten crane mats would be on site for the duration of excavation and site restoration activities.
- No rocks are present that would require ripping or blasting. No drums would need to be removed; dewatering is included for the duration of activities.
- A centralized area at HPS would be used for dewatering and characterization sampling (see dewatering area below).

- The excavation would be 1 foot deep as shown on Figure 4-15 of the FS Report, and would not require steel sheeting to protect sidewalls. The sediment type is a sand-silt/sand-clay mixture.

- None of the excavated sediment is expected to be suitable for use as backfill, and all backfill would come from an off-site source. In Alternative 5, the excavation would be backfilled with clean material, while in Alternative 5A, clean backfill material would be mixed with activated carbon. The activated carbon application rate and method would be the same as discussed in Alternative 3.

- Volume expected to be transported off site for disposal is 75,210 cubic yards based on a 30 percent bulking factor.

- For cost-estimating purposes, it was assumed that confirmation samples would be collected on a 250-foot-by-250-foot grid. For Area III, a total of 20 confirmation samples would be analyzed for copper, mercury, and total PCBs.

- Dewatering the excavation area would consist of placement of 2,000 feet of 8-foot high cofferdam (Aquadam) and operation of four 300-gpm pumps for approximately 2 weeks. An additional cofferdam would be placed in Yosemite Creek approximately 100 feet upstream of the excavation area. Aboveground piping would be included to allow discharge into the bay. Minimal flow is expected during the dry season; however, two 300-gpm pumps would be placed on standby to pump out any water that may accumulate behind the cofferdams.

- Original contours would be maintained and, if appropriate, regraded to aid surface runoff.

- Replacement cover would be similar to existing material, with the addition of activated carbon to the backfill material.

Monitored Natural Recovery – Area IX/X

- Costs for deed restrictions include documentation, posting, and enforcement.

- Baseline monitoring would consist of a bathymetry survey and sediment core sampling using a Vibracore sampler. Thirty sediment cores would be collected and analyzed for copper, mercury, and total PCBs. A benthic survey also would be conducted.

- Annual monitoring would be conducted for the same parameters over a 30 years period. A 5-year review would be included.

Decontamination Facilities, Residual Waste Management, Dewatering Facilities

These parameters would be the same as described in Alternative 2.

D4.2.5 Area IX/X Alternatives 6 and 6A: Focused Removal, Modified Shoreline Removal, Backfill (6) or Activated Backfill (6A), Off-Site Disposal, Monitored Natural Recovery, and Institutional Controls

The major components of this alternative are (1) focused removal (by excavating) of contaminated sediment to a depth of 1 foot similar to Alternatives 5 and 5A, plus additional removal along the shoreline to a maximum depth of 2.5 feet. Area IX/X; (2) off-site disposal, (3) backfill with clean fill (Alternative 6) or placement of clean fill mixed with activated carbon (Alternative 6A); (4) monitored natural recovery in remaining areas; and (5) institutional controls. Tables D-12 and D-13 present the costs for Alternative 6 and 6A.

The cost assumptions for Alternative 6 and 6A are provided below.

- The remediation area is accessible, and no specialized equipment or services (aside from those described in this report) would be necessary to gain access to the site.
- All activities would be performed using modified EPA Level D personal protective equipment.

Focused Removal (Excavation), Off-Site Disposal, or Activated Backfill – Area IX/X

- The area would be dewatered using cofferdams and centrifugal pumps before excavation of sediment.
- Approximately 61,940 cubic yards would be excavated from Area IX/X using conventional excavation equipment.
- Ten crane mats would be on site for the duration of excavation and site restoration activities.
- No rocks are present that would require ripping or blasting. No drums would need to be removed; dewatering is included for the duration of activities.
- A centralized area at HPS would be used for dewatering and characterization sampling (see dewatering area below).
- The excavation would be from 1 to 2.5 feet deep as shown on Figure 4-19 of the FS Report, and would not require steel sheeting to protect sidewalls. The sediment type is a sand-silt/sand-clay mixture.
- None of the excavated sediment is expected to be suitable for use as backfill, and all backfill would come from an off-site source. In Alternative 6, the excavation would be backfilled with clean material, while in Alternative 6A, clean backfill material would be mixed with activated carbon. The activated carbon application rate and method would be the same as discussed in Alternative 3.

- Volume expected to be transported off site for disposal is 80,630 cubic yards based on a 30 percent bulking factor.

- For cost estimating purposes it was assumed that confirmation samples would be collected on a 250-foot-by-250-foot grid. For Area III, a total of 20 confirmation samples would be analyzed for copper, mercury, and total PCBs.

- Dewatering the excavation area would consist of placement of 2,000 feet of 8-foot high cofferdam (Aquadam) and operation of four 300-gpm pumps for approximately 2 weeks. An additional cofferdam would be placed in Yosemite Creek approximately 150 feet upstream of the excavation area. Aboveground piping would be included to allow discharge into the bay. Minimal flow is expected during the dry season; however, two 300-gpm pumps would be placed on standby to pump out any water that may accumulate behind the cofferdams.

- Original contours would be maintained and, if appropriate, regraded to aid surface runoff.

- Replacement cover would be similar to existing material, with the addition of activated carbon to the backfill material.

Monitored Natural Recovery – Area IX/X

The parameters would be the same as described in Alternative 5.

Decontamination Facilities, Residual Waste Management, Dewatering Facilities

The parameters would be the same as described in Alternative 2.

D5.0 REFERENCES

Earth Tech, Inc. 2006. Remedial Action Cost Engineering and Requirements System (RACER) Cost Database Software, Version 8.1.0.

Environmental Security Technology Certification Program. 2005. “Demonstration Plan for Field Testing of Activated Carbon Mixing and In Situ Stabilization of PCBs in Sediment at Hunters Point Shipyard Parcel F San Francisco Bay, California.” November 17.

Means. 2005. “Means Environmental Remediation Cost Data – Unit Cost Book, 2005.”

Office of Management and Budget. 2006. “Guidelines and Discount Rates for Benefit-Cost Analysis of Federal Programs.” Circular A-94. Revised January.

U.S. Environmental Protection Agency (EPA). 2000. “A Guide to Developing and Documenting Cost Estimates during the Feasibility Study.” EPA 540-R-00-002, OSWER 9355.0-75. July.

FIGURES

Figure D-1: Present Value Cost Summary - Area III
Feasibility Study Report for Parcel F, Hunters Point Shipyard, San Francisco, California

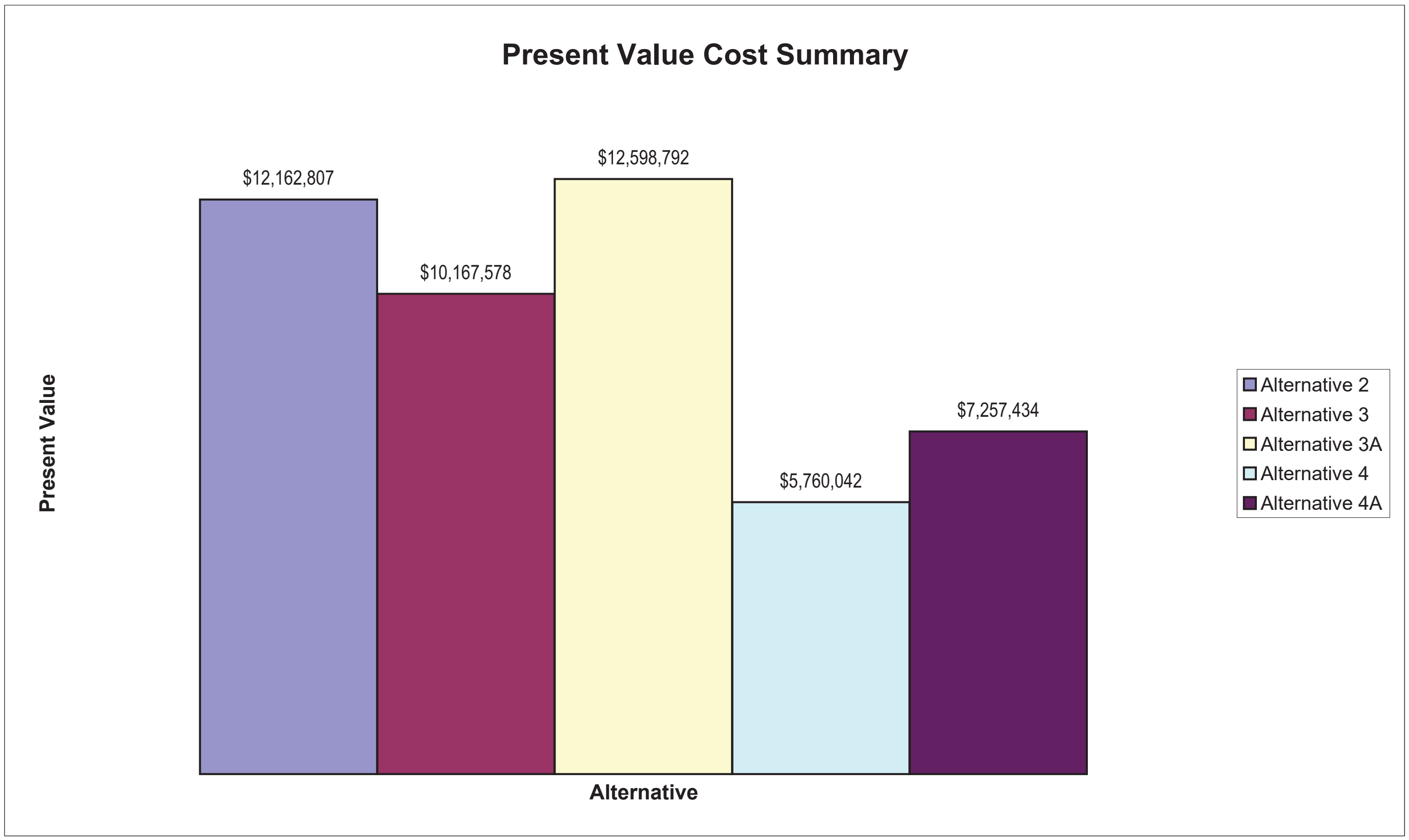
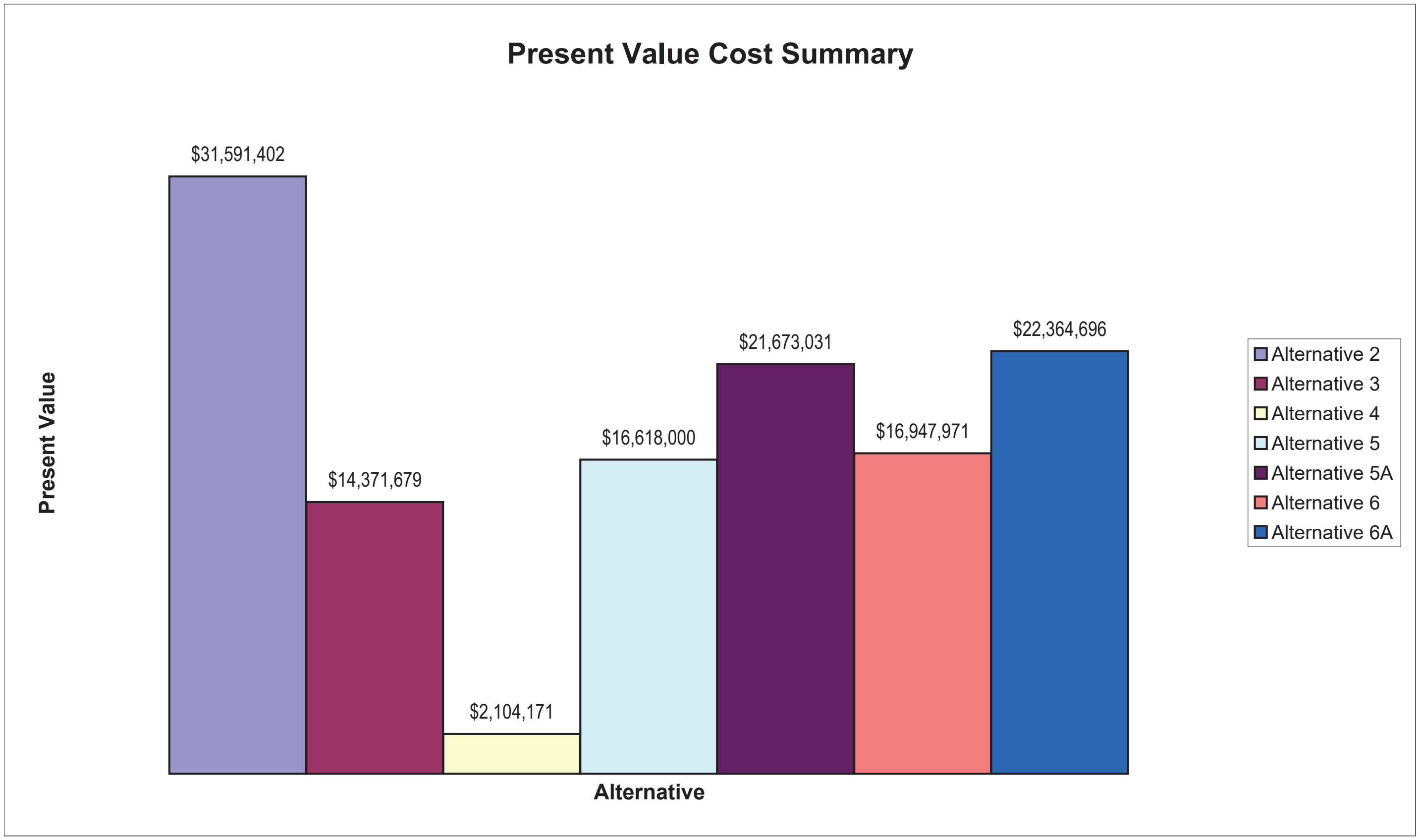


Figure D-2: Present Value Cost Summary - Area IX/X
Feasibility Study Report for Parcel F, Hunters Point Shipyard, San Francisco, California



TABLES

TABLE D-1: PRESENT VALUE COST SUMMARY FOR REMEDIAL ALTERNATIVES
Feasibility Study Report for Parcel F, Hunters Point Shipyard, San Francisco, California

	Description	Base Cost[1]	30-Year O&M	Total
Area III				
Alternative 2	Removal/Backfill and Off-Site Disposal	$12,162,807	$0	$12,162,807
Alternative 3	Focused Removal/Backfill, Off-Site Disposal, Armored Cap, and Institutional Controls	$8,384,582	$1,782,996	$10,167,578
Alternative 3A	Focused Removal/Backfill, Off-Site Disposal, AquaBlok Cap, and Institutional Controls	$10,701,084	$1,897,707	$12,598,792
Alternative 4	Focused Removal/Backfill, Off-Site Disposal, Modified Armored Cap, and Institutional Controls	$4,195,872	$1,564,170	$5,760,042
Alternative 4A	Focused Removal/Backfill, Off-Site Disposal, Modified AquaBlok Cap, and Institutional Controls	$5,507,120	$1,750,314	$7,257,434
Area IX/X				
Alternative 2	Removal/Backfill and Off-Site Disposal	$31,591,402	$0	$31,591,402
Alternative 3	In-Situ Stabilization and Institutional Controls	$12,934,193	$1,437,486	$14,371,679
Alternative 4	Monitored Natural Recovery and Institutional Controls	$745,231	$1,358,940	$2,104,171
Alternative 5	Focused Removal, Backfill, Off-Site Disposal, Monitored Natural Recovery, and Institutional Controls	$14,826,287	$1,791,713	$16,618,000
Alternative 5A	Focused Removal, Activated Backfill, Off-Site Disposal, Monitored Natural Recovery, and Institutional Controls	$19,881,318	$1,791,713	$21,673,031
Alternative 6	Modified Shoreline Removal, Backfill, Off-Site Disposal, Monitored Natural Recovery, and Institutional Controls	$15,156,257	$1,791,713	$16,947,971
Alternative 6A	Modified Shoreline Removal, Activated Backfill, Off-Site Disposal, Monitored Natural Recovery, and Institutional Controls	$20,572,983	$1,791,713	$22,364,696

Notes:

1 Base costs include remedial design and construction.

O&M Operation and maintenance

TABLE D-2: COST ESTIMATE -- AREA III ALTERNATIVE 2
Feasibility Study Report for Parcel F, Hunters Point Shipyard, San Francisco, California

Alternative 2:			**Location Modifiers**					
Area III: Removal/Backfill and Off-Site Disposal					**Material:**	*1.152*		
					Labor:	*1.67*		
					Equipment:	*1.076*		
					Contingency on Direct Costs:	*20%*		
Prepared by: M. Berry - BAI, September 2006			**Options**					
Checked by: S. Delhomme - Tetra Tech, December 2006					**RACER Database:**	Modified System		
					Cost Database Date:	2006		

Description	**Quantity**	**Unit of Measure**	**Material Unit Cost**	**Labor Unit Cost**	**Equipment Unit Cost**	**Unit Cost**	**Extended Cost**	**Source**
REMOVAL (DREDGING) - AREA III								
DREDGING (26,462 cubic yards)								
Testing, turbidity	20.00	EA	23.58	0.00	0.00	$23.58	$472	*1*
Mechanical Dredging	26,462.00	CY	31.23	0.00	0.00	$31.23	$826,408	*4*
						Subtotal	**$826,880**	
BACKFILL PLACEMENT								
Sand Capping - Materials	34,401.00	CY	58.03	0.00	0.00	$58.03	$1,996,290	*5*
Cap Application - Barge	1.00	EACH	2,608,016.00	0.00	0.00	$2,608,016.00	$2,608,016	*5*
						Subtotal	**$4,604,306**	
CONFIRMATION SAMPLING								
Analysis, mercury (7041)	7.00	EA	52.80	0.00	0.00	$52.80	$370	*1*
Pesticides/PCBs (SW	7.00	EA	306.06	0.00	0.00	$306.06	$2,142	*1*
Analysis, copper (6010)	7.00	EA	20.34	0.00	0.00	$20.34	$142	*1*
Bathymetry Survey - Area III	1.00	EACH	13,131.00	0.00	0.00	$13,131.00	$13,131	*6*
Vibracore mob/demobilization - Area III	1.00	EACH	2,317.23	0.00	0.00	$2,317.23	$2,317	*6*
Vibracore daily rate - Area III	2.00	DAY	5,484.12	0.00	0.00	$5,484.12	$10,968	*6*
Vibracore consumables	2.00	DAY	617.93	0.00	0.00	$617.93	$1,236	*6*
						Subtotal	**$30,307**	
LOAD AND HAUL - SEDIMENT DISPOSAL (35,480 cubic yards disposed at Altamont Landfill)								
Dump Charges	34,401.00	CY	50.90	0.00	0.00	$50.90	$1,751,011	*3*
988, 7.0 CY, Wheel Loader	110.00	HR	0.00	139.10	287.75	$426.85	$46,954	*1*
32 CY, Semi Dump	5,015.00	HR	0.00	109.77	128.84	$238.61	$1,196,629	*1*
						Subtotal	**$2,994,594**	
DEWATERING PAD								
Grub and stack, 140 H.P. dozer	186.00	CY	0.00	6.75	2.29	$9.04	$1,681	*1*
Excavating, trench, normal soil, to 2 to 6' deep, excavate by hand, piled only	212.00	BCY	0.00	165.78	0.00	$165.78	$35,145	*1*
953, 2.0 CY, Track Loader	506.00	HR	0.00	119.96	104.04	$224.00	$113,344	*1*
Backfill Trench, Borrow Material, Delivered & Dumped Only	119.00	CY	10.16	4.46	1.89	$16.51	$1,965	*1*
4" Extra-strength Vitrified Clay Pipe, Class 200, Premium Joints	1,000.00	LF	4.24	20.43	3.32	$27.99	$27,990	*1*
18" x 18" Underground French Drain	644.45	LF	6.15	3.81	0.58	$10.54	$6,793	*1*
Pump, pedestal sump, single stage, 75 GPM, 1-1/2 H.P., 2" discharge	1.00	EA	4,242.65	1,769.93	0.00	$6,012.58	$6,013	*1*
Storage Tanks, plastic, ground level, horizontal cylinder, 550 gallons	1.00	EA	2,570.88	1,067.48	0.00	$3,638.36	$3,638	*1*
Storage Tanks, plastic, ground level, horizontal cylinder, 6" NP, 4,000 gallons	1.00	EA	6,685.01	1,673.48	0.00	$8,358.49	$8,358	*1*
Polymeric Liner Anchor Trench, 3'x15'	701.00	LF	0.06	4.45	0.42	$4.93	$3,456	*1*
Secure burial cell construction, polymeric liner and cover system, polyvinyl chloride (PVC), 40mil	29,968.00	SF	0.59	0.93	0.04	$1.56	$46,750	
Waste Pile Cover, 135 Lb Tear,	2,881.00	SY	2.88	0.83	0.00	$3.71	$10,689	*1*
Sewage connection charge	1.00	EA	1,370.32	0.00	0.00	$1,370.32	$1,370	*1*
Wastewater Disposal Fee	343.00	KGA	3.06	0.00	0.00	$3.06	$1,050	*1*
Pump, submersible sump, automatic, 15 GPM, 1-1/2" discharge, 15' head	1.00	EA	1,336.83	286.89	0.00	$1,623.72	$1,624	*1*
Operator, dewatering pad	240.00	HR	0.00	171.00	0.00	$171.00	$41,040	
						Subtotal	**$310,906**	

TABLE D-2: COST ESTIMATE -- AREA III ALTERNATIVE 2 (CONTINUED)
Feasibility Study Report for Parcel F, Hunters Point Shipyard, San Francisco, California

Alternative 2:		Location Modifiers	
Area III:	Removal/Backfill and Off-Site Disposal	Material:	1.152
		Labor:	1.67
		Equipment:	1.076
		Contingency on Direct Costs:	20%
Prepared by:	M. Berry - BAI, September 2006	**Options**	
Checked by:	S. Delhomme - Tetra Tech, December 2006	RACER Database:	Modified System
		Cost Database Date:	2006

Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Unit Cost	Extended Cost	Source
DECONTAMINATION FACILITIES								
Pad Subgrade Preparation	35.56	CY	0.00	12.01	1.96	$13.97	$497	1
Excavating, trench, medium soil, 4' to 6' deep, 1 C.Y. bucket, gradall, excludes sheeting or dewatering	1.78	BCY	0.00	1.73	0.44	$2.17	$4	1
Compaction, subgrade, 18" wide, 8" lifts, walk behind, vibrating plate	35.56	ECY	0.00	5.28	0.20	$5.48	$195	1
Dry Roll Gravel, Steel Roller	106.67	SY	0.00	1.55	0.44	$1.99	$212	1
Gravel, Delivered & Dumped	14.81	CY	36.68	6.64	2.67	$45.99	$681	1
Gravel (90%) & Sand Base (10%), with Calcium Chloride 3/4 - 1 Lb/CY	14.81	CY	29.44	6.68	3.45	$39.57	$586	1
Asphalt Curb 8" W x 6" H	120.00	LF	2.59	7.63	5.83	$16.05	$1,926	1
Prime Coat	88.89	SY	0.53	0.08	0.02	$0.63	$56	1
Asphalt Wearing Course, 1 Pass (Line Item Includes 5% Waste)	19.33	TON	55.11	16.17	3.73	$75.01	$1,450	1
26" x 26", 5' Deep Area Drain with Grate	1.00	EA	1,663.98	4,663.80	71.06	$6,398.84	$6,399	1
5' x 5' x 5' Reinforced Concrete Sump	1.00	EA	2,277.14	7,663.76	83.78	$10,024.68	$10,025	1
12" x 12" CIP Concrete In-Ground Trench Drain with Metal Grate	20.00	LF	66.78	151.37	0.49	$218.64	$4,373	1
Storage Tanks, steel, above ground, single wall, 1,500 gallon, incl. cradles, coating & fittings, excl. foundation, pumps or piping	1.00	EA	4,776.17	1,173.24	0.00	$5,949.41	$5,949	1
Polymeric Liner Anchor Trench, 3' x 1.5'	144.00	LF	0.06	4.45	0.42	$4.93	$710	1
8 oz/sy Erosion Control/Drainage Filter Fabric (80 Mil)	106.67	SY	1.27	1.57	0.04	$2.88	$307	1
Secure burial cell construction, polymeric liner and cover system, rough textured H.D. polyethylene (HDPE), 40 mil	960.00	SF	0.53	0.50	0.02	$1.05	$1,008	1
Spray washers, cold water, electric, 1800 psi, 5 GPM, 5 HP, rent/month	2.00	MO	1,970.89	0.00	0.00	$1,970.89	$3,942	1
Decontamination trailers, 4 showers, HVAC, 2 sinks (monthly rental), 8' x 24'	1.00	MO	4,411.02	0.00	0.00	$4,411.02	$4,411	1
Operation of Pressure Washer, Including Water, Soap, Electricity, Labor	50.00	HR	11.73	150.95	0.00	$162.68	$8,134	1
DOT steel drums, 55 gal., open, 17C	7.00	EA	145.97	0.00	0.00	$145.97	$1,022	1
Field Technician	300.00	HR	0.00	171.18	0.00	$171.18	$51,354	1
High Sump Level Switch for Avoiding Overflow	1.00	EA	386.54	503.57	0.00	$890.11	$890	1
(2 1/2", 4") PVC Double-wall Piping, with Fittings	30.00	LF	38.15	77.03	0.00	$115.18	$3,455	1
Pump, pedestal sump, single stage, 25 GPM, 1 H.P., 1-1/2" discharge	1.00	EA	4,011.30	1,474.94	0.00	$5,486.24	$5,486	1
						Subtotal	**$113,072**	
RESIDUAL WASTE MANAGEMENT - DECON								
Secondary containment and storage, loading hazardous waste for shipment into 5,000 gal. bulk tank truck	2.00	EA	0.00	1,158.99	433.66	$1,592.65	$3,185	1
Subcontracted shipping of hazardous waste, transport bulk sludge/liquid hazardous waste, 5000 gal.	140.00	MI	3.26	0.00	0.00	$ 3.26	$ 456	1
Commercial RCRA landfills, additional landfill disposal costs, waste stream evaluation, 50% rebate on first	1.00	EA	871.12	0.00	0.00	$ 871.12	$ 871	1
Commercial RCRA landfills, liquid/sludge, non-fuel, non-hazardous	6,000.00	GAL	4.06	0.00	0.00	$ 4.06	$24,360	1
						Subtotal	**$28,873**	

TABLE D-2: COST ESTIMATE -- AREA III ALTERNATIVE 2 (CONTINUED)
Feasibility Study Report for Parcel F, Hunters Point Shipyard, San Francisco, California

Alternative 2:		**Location Modifiers**	
Area III:	Removal/Backfill and Off-Site Disposal	**Material:**	*1.152*
		Labor:	*1.67*
		Equipment:	*1.076*
		Contingency on Direct Costs:	*20%*
Prepared by:	M. Berry - BAI, September 2006	**Options**	
Checked by:	S. Delhomme - Tetra Tech, December 2006	**RACER Database:**	Modified System
		Cost Database Date:	2006

Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Unit Cost	Extended Cost	Source
PROFESSIONAL LABOR MANAGEMENT - REMOVAL AREA III								
Project Management Labor Cost	1.00	LS	0.00	555,192.55	0.00	$555,192.55	$555,193	*1*
Planning Documents Labor Cost	1.00	LS	0.00	610,711.80	0.00	$610,711.80	$610,712	*1*
Construction Oversight Labor Cost	1.00	LS	0.00	832,788.83	0.00	$832,788.83	$832,789	*1*
Reporting Labor Cost	1.00	LS	0.00	92,532.09	0.00	$92,532.09	$92,532	*1*
As-Built Drawings Labor Cost	1.00	LS	0.00	92,532.09	0.00	$92,532.09	$92,532	*1*
Public Notice Labor Cost	1.00	LS	0.00	9,253.21	0.00	$9,253.21	$9,253	*1*
Permitting Labor Cost	1.00	LS	0.00	462,660.48	0.00	$462,660.48	$462,660	*1*
						Subtotal	**$2,655,671**	
						SUBTOTAL AREA III	**$11,564,608**	

REMEDIAL DESIGN

Phase Name	Design Approach	Total Capital	%	Design
Dredging - Area III	Ex Situ Removal - Off-site Treatment or Disposal	$ 8,879,605	8%	$710,368
			Subtotal Design	**$710,368**

Base Cost	$12,274,976
30-Year O&M	$0
Total Future Cost	$12,274,976

PRESENT VALUE

Description	Total Cost	Year From Start	Calendar Year	Escalation Factor[a]	Discount Factor[b]	Total Present Value Cost
Design	$710,368	0	2006	1	1	$710,368
Remedial Action Construction	$11,564,608	1	2007	1.021	0.970	$11,452,439
	$40,020,000					$12,162,807

TOTAL PRESENT VALUE- AREA III ALTERNATIVE 2 $12,162,807

Sources:
1 Racer 2005 Database
2 Vendor Quote - Aquadam - Water Structures Unlimited, 12/6/05
3 Altamont Landfill tipping fee, non-hazardous material.
4 Vendor Quote - Dutra Dredging, 12/14/05.
5 Vendor Quote - AquaBlok Limited, 12/13/05.
6 Vendor Quote - TEG Ocean Services, 1/9/06.

[c]Annual Discount Rate (i) = 3.10%

Notes:
a. Escalation factors from RACER 2005.
b. Annual discount factor = 1/(1+i)t, where i = 3.10% and t=year.
c. Annual discount rate obtained from OMB Circular No. A-94, 2005.

TABLE D-3: COST ESTIMATE -- AREA III ALTERNATIVE 3
Feasibility Study Report for Parcel F, Hunters Point Shipyard, San Francisco, California

Alternative 3:	Location Modifiers	
Area III: Focused Removal/Backfill and Off-Site Disposal of Sediment Armored Cap, and Institutional Controls	Material:	1.152
	Labor:	1.67
	Equipment:	1.076
	Contingency on Direct Costs:	20%
Prepared by: M. Berry - BAI, September 2006	**Options**	
Checked by: S. Delhomme - Tetra Tech, December 2006	RACER Database:	Modified System
	Cost Database Date:	2006

Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Unit Cost	Extended Cost	Source
FOCUSED REMOVAL AREA III								
DREDGING								
Mechanical Dredging	1,788.00	CY	31.23	0.00	0.00	$ 31.23	$55,839	4
						Subtotal	**$55,839**	
BACKFILL PLACEMENT								
Sand Capping - Materials	2,324.00	CY	58.03	0.00	0.00	$ 58.03	$134,862	5
Cap Application - Barge	1.00	EACH	205,896.01	0.00	0.00	$205,896.01	$205,896	5
						Subtotal	**$340,758**	
LOAD AND HAUL - SEDIMENT DISPOSAL								
Dump Charges, Class II facility, Altamont	2,324.00	CY	50.90	0.00	0.00	$ 50.90	$118,292	3
926, 2.0 CY, Wheel Loader	32.00	HR	0.00	131.77	76.21	$ 207.98	$6,655	1
20 CY, Semi Dump	563.00	HR	0.00	109.77	121.40	$ 231.17	$130,149	1
						Subtotal	**$255,096**	
CONFIRMATION SAMPLING								
Testing, turbidity	10.00	EA	21.00	0.00	0.00	$ 21.00	$ 210	1
Analysis, mercury (7041)	5.00	EA	52.80	0.00	0.00	$ 52.80	$ 264	1
Analysis PCBs (8081/8082)	5.00	EA	306.06	0.00	0.00	$ 306.06	$1,530	1
Analysis, lead (6010)	5.00	EA	20.34	0.00	0.00	$20.34	$ 102	1
Analysis, copper (6010)	5.00	EA	20.34	0.00	0.00	$ 20.34	$ 102	1
Bathymetry Survey - Area III	1.00	EACH	13,131.00	0.00	0.00	$13,131.00	$13,131	6
Vibracore mob/demobilization - Area III	1.00	EACH	2,317.23	0.00	0.00	$2,317.23	$2,317	6
Vibracore daily rate - Area III	1.00	DAY	5,484.12	0.00	0.00	$5,484.12	$5,484	6
Vibracore consumables	1.00	DAY	617.93	0.00	0.00	$ 617.93	$ 618	6
						Subtotal	**$23,758**	
DEWATERING PAD								
Grub and stack, 140 H.P. dozer	186.00	CY	0.00	6.75	2.29	$ 9.04	$1,681	1
Excavating, trench, normal soil, to 2' - 6' deep	212.00	BCY	0.00	165.78	0.00	$ 165.78	$35,145	1
953, 2.0 CY, Track Loader	506.00	HR	0.00	119.96	104.04	$ 224.00	$113,344	1
Backfill Trench, Borrow Material, Delivered & Dumped Only	119.00	CY	10.16	4.46	1.89	$ 16.51	$1,965	1
4" Extra-strength Vitrified Clay Pipe, Class 200, Premium Joints	1,000.00	LF	4.24	20.43	3.32	$ 27.99	$27,990	1
18" x 18" Underground French Drain	644.45	LF	6.15	3.81	0.58	$ 10.54	$6,793	1
Pump, pedestal sump, single stage, 75 GPM, 1-1/2 H.P., 2" discharge	1.00	EA	4,242.65	1,769.93	0.00	$6,012.58	$6,013	1
Storage Tanks, plastic, ground level, horizontal cylinder, 550 gallons	1.00	EA	2,570.88	1,067.48	0.00	$3,638.36	$3,638	1
Storage Tanks, plastic, ground level, horizontal cylinder, 4000 gallons	1.00	EA	6,685.01	1,673.48	0.00	$8,358.49	$8,358	1
Polymeric Liner Anchor Trench, 3'x15'	701.00	LF	0.06	4.45	0.42	$ 4.93	$3,456	1
Secure burial cell construction, polymeric liner and cover system, polyvinyl chloride (PVC), 40mil	29,968.00	SF	0.59	0.93	0.04	$ 1.56	$46,750	
Waste Pile Cover, 135 Lb Tear	2,881.00	SY	2.88	0.83	0.00	$ 3.71	$10,689	1
Sewage connection charge	1.00	EA	1,370.32	0.00	0.00	$1,370.32	$1,370	1
Wastewater Disposal Fee	62.00	KGA	3.06	0.00	0.00	$ 3.06	$ 190	1
Pump, submersible sump, automatic, 15 GPM, 15' head	1.00	EA	1,336.83	286.89	0.00	$1,623.72	$1,624	1
Operator, dewatering pad	240.00	HR	0.00	171.00	0.00	$171.00	$41,040	
						Subtotal	**$310,046**	
DECONTAMINATION FACILITIES (See Alternative 2, Area III for details								
Decon pad for heavy equipment and personnel						**Subtotal**	**$113,072**	1
RESIDUAL WASTE MANAGEMENT - DECON								
Secondary containment and storage, loading hazardous waste for shipment into 5,000 gal. bulk tank truck	2.00	EA	0.00	1,158.99	433.66	$1,592.65	$3,185	1
Subcontracted shipping of hazardous waste, transport bulk sludge/liquid hazardous waste, 5000 gal.	140.00	MI	3.26	0.00	0.00	$ 3.26	$ 456	1
Commercial RCRA landfills, additional landfill disposal costs, waste stream evaluation, 50% rebate on first	1.00	EA	871.12	0.00	0.00	$ 871.12	$ 871	1
Commercial RCRA landfills, liquid/sludge, non-fuel, non-hazardous	6,000.00	GAL	4.06	0.00	0.00	$ 4.06	$24,360	1
						Subtotal	**$28,873**	

TABLE D-3: COST ESTIMATE -- AREA III ALTERNATIVE 3 (CONTINUED)
Feasibility Study Report for Parcel F, Hunters Point Shipyard, San Francisco, California

Alternative 3:		**Location Modifiers**	
Area III:	Focused Removal/Backfill and Off-Site Disposal of Sediment Armored Cap, and Institutional Controls	**Material:**	*1.152*
		Labor:	*1.67*
		Equipment:	*1.076*
		Contingency on Direct Costs:	*20%*
Prepared by:	M. Berry - BAI, September 2006	**Options**	
Checked by:	S. Delhomme - Tetra Tech, December 2006	**RACER Database:**	Modified System
		Cost Database Date:	2006

Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Unit Cost	Extended Cost	Source
PROFESSIONAL LABOR MANAGEMENT - FOCUSED REMOVAL AREA II								
Project Management Labor Cost	1.00	LS	0.00	$114,906.90	0.00	$178,949.39	$114,907	1
Planning Documents Labor Cost	1.00	LS	0.00	$114,906.90	0.00	$178,949.39	$114,907	1
Construction Oversight Labor Cost	1.00	LS	0.00	$126,397.60	0.00	$223,686.72	$126,398	1
Reporting Labor Cost	1.00	LS	0.00	$16,086.97	0.00	$22,368.67	$16,087	1
As-Built Drawings Labor Cost	1.00	LS	0.00	$16,086.97	0.00	$22,368.67	$16,087	1
Public Notice Labor Cost	1.00	LS	0.00	$3,447.21	0.00	$3,131.61	$3,447	1
Permitting Labor Cost	1.00	LS	0.00	$229,813.81	0.00	$223,686.72	$229,814	1
						Subtotal	**$621,646**	
						SUBTOTAL FOCUSED REMOVAL - AREA III	**$1,749,088**	
ARMOR CAP - AREA III								
ARMORED CAPPING (10-acre cap, 1.5 feet sand and 0.5 foot armor stone								
Sand Capping - Materials	25,253.00	CY	58.03	0.00	0.00	$ 58.03	$1,465,432	5
Armor Stone Capping - Materials	12,500.00	TON	51.47	0.00	0.00	$ 51.47	$643,375	5
Cap Application - Barge	1.00	EACH	1,647,168.10	0.00	0.00	$1,647,168.10	$1,647,168	5
						Subtotal	**$3,755,975**	
CONSTRUCTION QC MONITORING								
Geotechnical Characteristics Analysis	6.00	EA	173.14	0.00	0.00	$ 173.14	$1,039	1
Water Quality Parameter Testing Device, DO, Temp., pH, Conductivity, Salinity, Turbidity, Daily Rent	5.00	DAY	122.43	0.00	0.00	$ 122.43	$ 612	1
Testing, turbidity	20.00	EA	21.00	0.00	0.00	$ 21.00	$ 420	1
Analysis, mercury (7041)	10.00	EA	52.80	0.00	0.00	$ 52.80	$ 528	1
Analysis, lead (6010)	10.00	EA	20.34	0.00	0.00	$ 20.34	$ 203	1
Analysis, copper (6010)	10.00	EA	20.34	0.00	0.00	$ 20.34	$ 203	1
Analysis PCBs (8081/8082)	10.00	EA	306.06	0.00	0.00	$ 306.06	$3,061	1
Bathymetry Survey - Area III	1.00	EACH	13,131.00	0.00	0.00	$13,131.00	$13,131	6
						Subtotal	**$19,197**	
PROFESSIONAL LABOR MANAGEMENT - CAPPING								
Project Management Labor Cost	1.00	LS	0.00	319,022.71	0.00	$319,022.71	$319,023	1
Planning Documents Labor Cost	1.00	LS	0.00	319,022.71	0.00	$319,022.71	$319,023	1
Construction Oversight Labor Cost	1.00	LS	0.00	398,778.36	0.00	$398,778.36	$398,778	1
Reporting Labor Cost	1.00	LS	0.00	39,877.84	0.00	$39,877.84	$39,878	1
As-Built Drawings Labor Cost	1.00	LS	0.00	39,877.84	0.00	$39,877.84	$39,878	1
Public Notice Labor Cost	1.00	LS	0.00	5,582.90	0.00	$5,582.90	$5,583	1
Permitting Labor Cost	1.00	LS	0.00	398,778.36	0.00	$398,778.36	$398,778	1
						Subtotal	**$1,520,941**	
LONG TERM MONITORING - ARMOR CAP								
Five-Year Review								
Project Manager	35.00	HR	0.00	232.33	0.00	$ 232.33	$8,132	1
Project Engineer	67.00	HR	0.00	225.30	0.00	$ 225.30	$15,095	1
Project Scientist	33.00	HR	0.00	260.79	0.00	$ 260.79	$8,606	1
Staff Scientist	55.00	HR	0.00	193.29	0.00	$ 193.29	$10,631	1
Draftsman/CADD	24.00	HR	0.00	131.14	0.00	$ 131.14	$3,147	1
						Subtotal	**$45,611**	
Monitoring - Sample Collection								
Analysis, mercury (7041)	6.00	EA	49.01	0.00	0.00	$ 49.01	$ 294	1
Analysis, lead (6010)	6.00	EA	21.24	0.00	0.00	$ 21.24	$ 127	1
Analysis, copper (6010)	6.00	EA	21.24	0.00	0.00	$ 21.24	$ 127	1
Analysis PCBs (8081/8082)	6.00	EA	383.53	0.00	0.00	$ 383.53	$2,301	1
Bathymetry Survey - Area III	1.00	EACH	13,712.01	0.00	0.00	$13,712.01	$13,712	6
Vibracore mob/demobilization - Area III	1.00	EACH	2,419.77	0.00	0.00	$2,419.77	$2,420	6
Vibracore daily rate - Area III	2.00	DAY	5,726.78	0.00	0.00	$5,726.78	$11,454	6
Vibracore consumables	2.00	DAY	645.27	0.00	0.00	$ 645.27	$1,291	6
General Monitoring and Reporting								
Sample collection, vehicle mileage	100.00	MI	0.49	0.00	0.00	$ 0.49	$ 49	1
Project Manager	4.00	HR	0.00	281.40	0.00	$ 281.40	$1,126	1
Project Engineer	30.00	HR	0.00	272.88	0.00	$ 272.88	$8,186	1
Project Scientist	44.00	HR	0.00	315.87	0.00	$ 315.87	$13,898	1
Staff Scientist	81.00	HR	0.00	234.11	0.00	$ 234.11	$18,963	1
Field Technician	2.00	HR	0.00	174.41	0.00	$ 174.41	$ 349	1
Word Processing/Clerical	13.00	HR	0.00	121.50	0.00	$ 121.50	$1,580	1
Draftsman/CADD	9.00	HR	0.00	158.84	0.00	$ 158.84	$1,430	1
						Subtotal	**$77,306**	
						Annual Monitoring for First Four Years	**$309,224**	
						Monitoring Every 5 Years and 5-yr Review Cost for Years 5 through 3(	**$737,503**	

TABLE D-3: COST ESTIMATE -- AREA III ALTERNATIVE 3 (CONTINUED)
Feasibility Study Report for Parcel F, Hunters Point Shipyard, San Francisco, California

Alternative 3:	**Location Modifiers**
Area III: Focused Removal/Backfill and Off-Site Disposal of Sediment Armored Cap, and Institutional Controls	**Material:** *1.152* **Labor:** *1.67* **Equipment:** *1.076* **Contingency on Direct Costs:** *20%*
Prepared by: M. Berry - BAI, September 2006 Checked by: S. Delhomme - Tetra Tech, December 2006	**Options** **RACER Database:** Modified System **Cost Database Date:** 2006

Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Unit Cost	Extended Cost	Source
CAP REPAIR (Year 10)								
Sand Capping - Materials	400.00	CY	58.03	0.00	0.00	$ 58.03	$23,212	*1*
Armor Stone Capping - Materials	500.00	TON	51.47	0.00	0.00	$ 51.47	$25,735	*6*
Armor cap repair - application	1.00	EACH	506,161.03	0.00	0.00	$506,161.03	$506,161	*5*
Bathymetry Survey - Area III	1.00	EACH	14,584.30	0.00	0.00	$14,584.30	$14,584	*6*
						Subtotal	**$569,692**	
PROFESSIONAL LABOR MANAGEMENT - CAP REPAIR								
Project Management Labor Cost	1.00	LS	0.00	90,215.70	0.00	$90,215.70	$90,216	*1*
Planning Documents Labor Cost	1.00	LS	0.00	84,201.33	0.00	$84,201.33	$84,201	*1*
Construction Oversight Labor Cost	1.00	LS	0.00	72,172.56	0.00	$72,172.56	$72,173	*1*
Reporting Labor Cost	1.00	LS	0.00	12,028.76	0.00	$12,028.76	$12,029	*1*
As-Built Drawings Labor Cost	1.00	LS	0.00	12,028.76	0.00	$12,028.76	$12,029	*1*
Public Notice Labor Cost	1.00	LS	0.00	3,608.63	0.00	$3,608.63	$3,609	*1*
Permitting Labor Cost	1.00	LS	0.00	120,287.61	0.00	$120,287.61	$120,288	*1*
						Subtotal	**$394,543**	
ADMINISTRATIVE LAND USE CONTROLS								
Planning Docs								
Project Manager	130.00	HR	0.00	226.48	0.00	$ 226.48	$29,442	*1*
Project Engineer	360.00	HR	0.00	219.62	0.00	$ 219.62	$79,063	*1*
Staff Engineer	820.00	HR	0.00	192.19	0.00	$ 192.19	$157,596	*1*
QA/QC Officer	121.00	HR	0.00	185.23	0.00	$ 185.23	$22,413	*1*
Word Processing/Clerical	520.00	HR	0.00	97.78	0.00	$ 97.78	$50,846	*1*
Draftsman/CADD	550.00	HR	0.00	127.83	0.00	$ 127.83	$70,307	*1*
Attorney, Partner, Real Estate	30.00	HR	0.00	200.00	0.00	$ 200.00	$ 6,000	*1*
Other Direct Costs	1.00	LS	4,367.26	0.00	0.00	$ 4,367.26	$ 4,367	*1*
						Subtotal	**$420,034**	
Planning Meetings								
Per Diem (per person)	16.00	DAY	194.00	0.00	0.00	$ 194.00	$ 3,104	*1*
Project Manager	160.00	HR	0.00	226.48	0.00	$ 226.48	$36,237	*1*
Project Engineer	128.00	HR	0.00	219.62	0.00	$ 219.62	$28,111	*1*
Word Processing/Clerical	128.00	HR	0.00	97.78	0.00	$ 97.78	$12,516	*1*
Draftsman/CADD	64.00	HR	0.00	127.83	0.00	$ 127.83	$ 8,181	*1*
Other Direct Costs	1.00	LS	906.62	0.00	0.00	$ 906.62	$ 907	*1*
						Subtotal	**$89,056**	
Implementation								
Overnight Delivery, 8 oz Letter	18.00	EA	22.21	0.00	0.00	$ 22.21	$ 400	*1*
Project Manager	82.00	HR	0.00	226.48	0.00	$ 226.48	$18,571	*1*
Project Engineer	180.00	HR	0.00	219.62	0.00	$ 219.62	$39,532	*1*
Staff Engineer	220.00	HR	0.00	192.19	0.00	$ 192.19	$42,282	*1*
QA/QC Officer	51.00	HR	0.00	185.23	0.00	$ 185.23	$ 9,447	*1*
Word Processing/Clerical	165.00	HR	0.00	97.78	0.00	$ 97.78	$16,134	*1*
Draftsman/CADD	370.00	HR	0.00	127.83	0.00	$ 127.83	$47,297	*1*
Computer Data Entry	200.00	HR	0.00	87.86	0.00	$ 87.86	$17,572	*1*
Attorney, Senior Associate, Real Estate	8.00	HR	0.00	175.00	0.00	$ 175.00	$ 1,400	*1*
Paralegal, Real Estate	8.00	HR	0.00	100.00	0.00	$ 100.00	$ 800	*1*
Other Direct Costs	1.00	LS	2,034.38	0.00	0.00	$ 2,034.38	$ 2,034	*1*
Construction Signs	96.00	SF	21.35	0.00	0.00	$ 21.35	$ 2,050	*1*
Surveying - 3-man Crew	4.00	DAY	0.00	2,696.95	390.12	$ 3,087.07	$12,348	*1*
Portable GPS Set with Mapping	1.00	MO	1,161.52	0.00	0.00	$ 1,161.52	$ 1,162	*1*
Local Fees	2.00	LS	308.96	0.00	0.00	$ 308.96	$ 618	*1*
						Subtotal	**$211,646**	
Modification/Termination								
Project Manager	56.00	HR	0.00	226.48	0.00	$ 226.48	$12,683	*1*
Project Engineer	104.00	HR	0.00	219.62	0.00	$ 219.62	$22,840	*1*
Staff Engineer	120.00	HR	0.00	192.19	0.00	$ 192.19	$23,063	*1*
QA/QC Officer	19.00	HR	0.00	185.23	0.00	$ 185.23	$ 3,519	*1*
Word Processing/Clerical	46.00	HR	0.00	97.78	0.00	$ 97.78	$ 4,498	*1*
Draftsman/CADD	36.00	HR	0.00	127.83	0.00	$ 127.83	$ 4,602	*1*
Other Direct Costs	1.00	LS	759.08	0.00	0.00	$ 759.08	$ 759	*1*
						Subtotal	**$71,964**	
						SUBTOTAL INSTITUTIONAL CONTROLS:	**$792,699**	
						SUBTOTAL ARMOR CAP - AREA III	**$8,099,775**	

TABLE D-3: COST ESTIMATE -- AREA III ALTERNATIVE 3 (CONTINUED)
Feasibility Study Report for Parcel F, Hunters Point Shipyard, San Francisco, California

Alternative 3:		**Location Modifiers**	
Area III:	Focused Removal/Backfill and Off-Site Disposal of Sediment Armored Cap, and Institutional Controls	**Material:**	*1.152*
		Labor:	*1.67*
		Equipment:	*1.076*
		Contingency on Direct Costs:	*20%*
Prepared by:	M. Berry - BAI, September 2006	**Options**	
Checked by:	S. Delhomme - Tetra Tech, December 2006	**RACER Database:**	Modified System
		Cost Database Date:	2006

Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Unit Cost	Extended Cost	Source
DESIGN COSTS								
Phase Name	**Design Approach**			**Total Capital**		**%**	**Design Cost**	
Focused Removal - Area III	Ex Situ Removal - Off-site			$1,127,131		10%	$112,713	
Armored Capping - Area III	In Situ Containment			$3,775,181		12%	$453,022	
Cap Repair	In Situ Containment			$569,694		10%	$ 56,969	
						Subtotal Design	**$622,704**	
						Total Capital Costs	$8,460,604	
						30-Year O&M	$2,010,963	
						Total Future Costs	$10,471,567	

PRESENT VALUE

Description	Total Cost	Year From Start	Calendar Year	Escalation Factor[a]	Discount Factor[b]	Total Present Value Cost
Design	$ 622,704	0	2006	1	1	$ 622,704
Remedial Action Construction	$ 7,837,900	1	2007	1.021	0.970	$ 7,761,878
Monitoring	$ 77,306	2	2008	1.042	0.941	$ 75,811
Monitoring	$ 77,306	3	2009	1.064	0.912	$ 75,076
Monitoring	$ 77,306	4	2010	1.087	0.885	$ 74,351
Monitoring	$ 77,306	5	2011	1.110	0.858	$ 73,629
Monitoring, 5-Year Review	$ 122,917	6	2012	1.133	0.833	$ 115,935
Monitoring, cap repair, 5-Yr review	$ 1,087,153	11	2017	1.257	0.715	$ 976,589
Monitoring, 5-Year Review	$ 122,917	16	2022	1.395	0.614	$ 105,170
Monitoring, 5-Year Review	$ 122,917	21	2027	1.547	0.527	$ 100,168
Monitoring, 5-Year Review	$ 122,917	26	2032	1.717	0.452	$ 95,402
Monitoring, 5-Year Review	$ 122,917	31	2037	1.905	0.388	$ 90,865
	$ 10,471,567					$ 10,167,578

TOTAL PRESENT VALUE- ALTERNATIVE 3: $10,167,578

Souces:
1 Racer 2005 Database
2 Vendor Quote - Aquadam - Water Structures Unlimited, 12/6/05
3 Altamont Landfill tipping fee, non-hazardous material.
4 Vendor Quote - Dutra Dredging, 12/14/05.
5 Vendor Quote - AquaBlok Limited, 12/13/05.
6 Vendor Quote - TEG Ocean Services, 1/9/06.
7 Carbon application costs were extrapolated from the 2005 Parcel F pilot test conducted by Stanford University.

[c]**Annual Discount Rate (i) = 3.10%**

Notes:
a. Escalation factors from RACER 2005.
b. Annual discount factor = 1/(1+i)t, where i = 3.10% and t=year.
c. Annual discount rate obtained from OMB Circular No. A-94, 2005.

TABLE D-4: COST ESTIMATE -- AREA III ALTERNATIVE 3A
Feasibility Study Report for Parcel F, Hunters Point Shipyard, San Francisco, California

Alternative 3A:	Location Modifiers	
Area III: Focused Removal/Backfill, Offsite Disposal AquaBlok Cap, and Institutional Controls	Material:	*1.152*
	Labor:	*1.67*
	Equipment:	*1.076*
	Contingency on Direct Costs:	*20%*
Prepared by: M. Berry - BAI, September 2006	**Options**	
Checked by: S. Delhomme - Tetra Tech, December 2006	RACER Database:	Modified System
	Cost Database Date:	2006

Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Unit Cost	Extended Cost	Source
FOCUSED REMOVAL - AREA III (See Alternative 3A for details)								
				SUBTOTAL FOCUSED REMOVAL - AREA III			**$1,749,088**	
AQUABLOK CAP - AREA III								
AQUABLOK CAPPING (10-acre cap, 4.5 inches of AquaBlok and 6 inches armor stone)								
AquaBlok Capping Material	5,966.00	TON	463.27	0.00	0.00	$ 463.27	$2,763,869	*5*
Armor Stone Capping Material	12,500.00	TON	51.47	0.00	0.00	$ 51.47	$643,375	*5*
Cap Application - Barge	1.00	EACH	1,304,008.08	0.00	0.00	$1,304,008.08	$1,304,008	*5*
Pre-Application Activities	1.00	EACH	574,793.04	0.00	0.00	$574,793.04	$574,793	*5*
						Subtotal	**$5,286,045**	
CONSTRUCTION QC MONITORING								
Geotechnical Characteristics Analysis	6.00	EA	173.14	0.00	0.00	$ 173.14	$1,039	*1*
Water Quality Parameter Testing Device, DO, Temp., pH, Conductivity, Salinity, Turbidity, Daily Rent	5.00	DAY	122.43	0.00	0.00	$ 122.43	$ 612	*1*
Testing, turbidity	20.00	EA	21.00	0.00	0.00	$ 21.00	$ 420	*1*
Analysis, mercury (7041)	10.00	EA	52.80	0.00	0.00	$ 52.80	$ 528	*1*
Analysis, lead (6010)	10.00	EA	20.34	0.00	0.00	$ 20.34	$ 203	*1*
Analysis, copper (6010)	10.00	EA	20.34	0.00	0.00	$ 20.34	$ 203	*1*
Analysis PCBs (8081/8082)	10.00	EA	306.06	0.00	0.00	$ 306.06	$3,061	*1*
Bathymetry Survey - Area III	1.00	EACH	13,131.00	0.00	0.00	$13,131.00	$13,131	*6*
						Subtotal	**$19,197**	
PROFESSIONAL LABOR MANAGEMENT - CAPPING								
Project Management Labor Cost	1.00	LS	0.00	448,250.48	0.00	$448,250.48	$448,250	*1*
Planning Documents Labor Cost	1.00	LS	0.00	448,250.48	0.00	$448,250.48	$448,250	*1*
Construction Oversight Labor Cost	1.00	LS	0.00	560,313.06	0.00	$560,313.06	$560,313	*1*
Reporting Labor Cost	1.00	LS	0.00	56,031.31	0.00	$ 56,031.31	$ 56,031	*1*
As-Built Drawings Labor Cost	1.00	LS	0.00	56,031.31	0.00	$ 56,031.31	$ 56,031	*1*
Public Notice Labor Cost	1.00	LS	0.00	7,844.38	0.00	$ 7,844.38	$ 7,844	*1*
Permitting Labor Cost	1.00	LS	0.00	560,313.06	0.00	$560,313.06	$560,313	*1*
						Subtotal	**$2,137,034**	
LONG-TERM MONITORING - ARMOR CAP								
Five-Year Review								
Project Manager	35.00	HR	0.00	232.33	0.00	$ 232.33	$8,132	*1*
Project Engineer	67.00	HR	0.00	225.30	0.00	$ 225.30	$15,095	*1*
Project Scientist	33.00	HR	0.00	260.79	0.00	$ 260.79	$8,606	*1*
Staff Scientist	55.00	HR	0.00	193.29	0.00	$ 193.29	$10,631	*1*
Draftsman/CADD	24.00	HR	0.00	131.14	0.00	$ 131.14	$3,147	*1*
						Subtotal	**$45,611**	
Monitoring - Sample Collection								
Analysis, mercury (7041)	6.00	EA	49.01	0.00	0.00	$ 49.01	$ 294	*1*
Analysis, lead (6010)	6.00	EA	21.24	0.00	0.00	$ 21.24	$ 127	*1*
Analysis, copper (6010)	6.00	EA	21.24	0.00	0.00	$ 21.24	$ 127	*1*
Analysis PCBs (8081/8082)	6.00	EA	383.53	0.00	0.00	$ 383.53	$2,301	*1*
Bathymetry Survey - Area III	1.00	EACH	13,712.01	0.00	0.00	$13,712.01	$13,712	*6*
Vibracore mob/demobilization - Area III	1.00	EACH	2,419.77	0.00	0.00	$2,419.77	$2,420	*6*
Vibracore daily rate - Area III	2.00	DAY	5,726.78	0.00	0.00	$5,726.78	$11,454	*6*
Vibracore consumables	2.00	DAY	645.27	0.00	0.00	$ 645.27	$1,291	*6*
General Monitoring and Reporting								
Sample collection, vehicle mileage	100.00	MI	0.49	0.00	0.00	$ 0.49	$ 49	*1*
Project Manager	4.00	HR	0.00	281.40	0.00	$ 281.40	$1,126	*1*
Project Engineer	30.00	HR	0.00	272.88	0.00	$ 272.88	$8,186	*1*
Project Scientist	44.00	HR	0.00	315.87	0.00	$ 315.87	$13,898	*1*
Staff Scientist	81.00	HR	0.00	234.11	0.00	$ 234.11	$18,963	*1*
Field Technician	2.00	HR	0.00	174.41	0.00	$ 174.41	$ 349	*1*
Word Processing/Clerical	13.00	HR	0.00	121.50	0.00	$ 121.50	$1,580	*1*
Draftsman/CADD	9.00	HR	0.00	158.84	0.00	$ 158.84	$1,430	*1*
						Subtotal	**$77,306**	
						Annual Monitoring for First Four Years	**$309,224**	
						Monitoring Every 5 Years and 5-yr Review Cost for Years 5 through 30	**$737,503**	

TABLE D-4: COST ESTIMATE -- AREA III ALTERNATIVE 3A (CONTINUED)
Feasibility Study Report for Parcel F, Hunters Point Shipyard, San Francisco, California

Alternative 3A:		Location Modifiers	
Area III:	Focused Removal/Backfill, Offsite Disposal AquaBlok Cap, and Institutional Controls	Material:	*1.152*
		Labor:	*1.67*
		Equipment:	*1.076*
		Contingency on Direct Costs:	*20%*
Prepared by:	M. Berry - BAI, September 2006	**Options**	
Checked by:	S. Delhomme - Tetra Tech, December 2006	RACER Database:	Modified System
		Cost Database Date:	2006

Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Unit Cost	Extended Cost	Source
CAP REPAIR (Year 10)								
AquaBlok Cap	250.00	TON	463.27	0.00	0.00	$ 463.27	$115,818	*5*
Armor Stone Capping - Materials	500.00	TON	51.47	0.00	0.00	$ 51.47	$ 25,735	*5*
AquaBlok cap repair - application	1.00	EACH	489,003.04	0.00	0.00	$489,003.04	$489,003	*5*
Bathymetry Survey - Area III	1.00	EACH	14,584.30	0.00	0.00	$ 14,584.30	$ 14,584	*6*
						Subtotal	**$645,140**	
PROFESSIONAL LABOR MANAGEMENT - CAP REPAIR								
Project Management Labor Cost	1.00	LS	0.00	102,163.38	0.00	$102,163.38	$102,163	*1*
Planning Documents Labor Cost	1.00	LS	0.00	95,352.49	0.00	$95,352.49	$95,352	*1*
Construction Oversight Labor Cost	1.00	LS	0.00	81,730.71	0.00	$81,730.71	$81,731	*1*
Reporting Labor Cost	1.00	LS	0.00	13,621.78	0.00	$13,621.78	$13,622	*1*
As-Built Drawings Labor Cost	1.00	LS	0.00	13,621.78	0.00	$13,621.78	$13,622	*1*
Public Notice Labor Cost	1.00	LS	0.00	4,086.54	0.00	$4,086.54	$4,087	*1*
Permitting Labor Cost	1.00	LS	0.00	136,217.85	0.00	$136,217.85	$136,218	*1*
						Subtotal	**$446,795**	
ADMINISTRATIVE LAND USE CONTROLS (See Alternative 3 - Area III for details)								
						SUBTOTAL INSTITUTIONAL CONTROLS:	**$792,699**	
						SUBTOTAL AQUABLOK CAP - AREA III	**$10,373,637**	

DESIGN COSTS

Phase Name	Design Approach	Total Capital	%	Design Cost
Focused Removal - Area III	Ex Situ Removal - Off-site	$1,127,131	10%	$112,713
AquaBlok Capping - Area III	In Situ Containment	$5,305,269	12%	$636,632
Cap Repair	In Situ Containment	$645,141	10%	$ 64,514
			Subtotal Design	**$813,859**

Base Cost	$10,797,923
30-Year O&M	$2,138,661
Total Future Cost	$12,936,584

PRESENT VALUE

Description	Total Cost	Year From Start	Calendar Year	Escalation Factor[a]	Discount Factor[b]	Total Present Value Cost
Design	$ 813,859	0	2006	1	1	$ 813,859
Remedial Action Construction	$ 9,984,063	1	2007	1.021	0.970	$ 9,887,225
Monitoring	$ 77,306	2	2008	1.042	0.941	$ 75,811
Monitoring	$ 77,306	3	2009	1.064	0.912	$ 75,076
Monitoring	$ 77,306	4	2010	1.087	0.885	$ 74,351
Monitoring	$ 77,306	5	2011	1.110	0.858	$ 73,629
Monitoring, 5-Year Review	$ 122,917	6	2012	1.133	0.833	$ 115,935
Monitoring, cap repair, 5-Yr review	$ 1,214,851	11	2017	1.257	0.715	$ 1,091,300
Monitoring, 5-Year Review	$ 122,917	16	2022	1.395	0.614	$ 105,170
Monitoring, 5-Year Review	$ 122,917	21	2027	1.547	0.527	$ 100,168
Monitoring, 5-Year Review	$ 122,917	26	2032	1.717	0.452	$ 95,402
Monitoring, 5-Year Review	$ 122,917	31	2037	1.905	0.388	$ 90,865
	$ 12,936,584					$ 12,598,792

TOTAL PRESENT VALUE- ALTERNATIVE 3A: $12,598,792

Sources:

1 Racer 2005 Database
2 Vendor Quote - Aquadam - Water Structures Unlimited, 12/6/05
3 Altamont Landfill tipping fee, non-hazardous material.
4 Vendor Quote - Dutra Dredging, 12/14/05.
5 Vendor Quote - AquaBlok Limited, 12/13/05.
6 Vendor Quote - TEG Ocean Services, 1/9/06.
7 Carbon application costs were extrapolated from the 2005 Parcel F pilot test conducted by Stanford University.

[c]Annual Discount Rate (i) = 3.10%

Notes:
a. Escalation factors from RACER 2005.
b. Annual discount factor = 1/(1+i)t, where i = 3.10% and t=year.
c. Annual discount rate obtained from OMB Circular No. A-94, 2005.

TABLE D-5: COST ESTIMATE -- AREA III ALTERNATIVE 4
Feasibility Study Report for Parcel F, Hunters Point Shipyard, San Francisco, California

Alternative 4:		**Location Modifiers**	
Area III:	Focused Removal/Backfill, Offsite Disposal, Modified Armored Cap, and Institutional Controls	**Material:**	*1.152*
		Labor:	*1.67*
		Equipment:	*1.076*
		Contingency on Direct Costs:	*20%*
Prepared by:	M. Berry - BAI, September 2006	**Options**	
Checked by:	S. Delhomme - Tetra Tech, December 2006	**RACER Database:**	Modified System
		Cost Database Date:	2006

Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Unit Cost	Extended Cost	Source
FOCUSED REMOVAL - AREA III (See Alternative 3A for details)								
						SUBTOTAL FOCUSED REMOVAL - AREA III	**$1,749,088**	
MODIFIED ARMOR CAP - AREA III (See Alternative 3 for details)								
ARMORED CAPPING (2-acre cap, 1.5 feet sand and 0.5 foot armor stone)								
Sand Capping - Materials	3,815.00	CY	58.03	0.00	0.00	$ 58.03	$221,384	*5*
Armor Stone Capping - Materials	1,889.00	TON	51.47	0.00	0.00	$ 51.47	$97,227	*5*
Cap Application - Barge	1.00	EACH	570,503.54	0.00	0.00	$570,503.54	$570,504	*5*
						Subtotal	**$889,115**	
CONSTRUCTION QC MONITORING								
Geotechnical Characteristics Analysis	6.00	EA	173.14	0.00	0.00	$ 173.14	$1,039	*1*
Water Quality Parameter Testing Device, DO, Temp., pH, Conductivity, Salinity, Turbidity, Daily Rent	5.00	DAY	122.43	0.00	0.00	$ 122.43	$ 612	*1*
Testing, turbidity	20.00	EA	21.00	0.00	0.00	$ 21.00	$ 420	*1*
Analysis, mercury (7041)	10.00	EA	52.80	0.00	0.00	$ 52.80	$ 528	*1*
Analysis, lead (6010)	10.00	EA	20.34	0.00	0.00	$ 20.34	$ 203	*1*
Analysis, copper (6010)	10.00	EA	20.34	0.00	0.00	$ 20.34	$ 203	*1*
Analysis PCBs (8081/8082)	10.00	EA	306.06	0.00	0.00	$ 306.06	$3,061	*1*
Bathymetry Survey - Area III	1.00	EACH	13,131.00	0.00	0.00	$13,131.00	$13,131	*6*
						Subtotal	**$19,197**	
PROFESSIONAL LABOR MANAGEMENT - CAPPING								
Project Management Labor Cost	1.00	LS	0.00	96,116.95	0.00	$96,116.95	$96,117	*1*
Planning Documents Labor Cost	1.00	LS	0.00	96,116.95	0.00	$96,116.95	$96,117	*1*
Construction Oversight Labor Cost	1.00	LS	0.00	105,728.64	0.00	$105,728.64	$105,729	*1*
Reporting Labor Cost	1.00	LS	0.00	13,456.37	0.00	$13,456.37	$13,456	*1*
As-Built Drawings Labor Cost	1.00	LS	0.00	13,456.37	0.00	$13,456.37	$13,456	*1*
Public Notice Labor Cost	1.00	LS	0.00	2,883.51	0.00	$2,883.51	$2,884	*1*
Permitting Labor Cost	1.00	LS	0.00	192,233.90	0.00	$192,233.90	$192,234	*1*
						Subtotal	**$519,993**	
LONG TERM MONITORING - ARMOR CAP (See Alternative 3 - Area III for details.)								
Five-Year Review						**Subtotal**	**$45,611**	
Monitoring						**Subtotal**	**$77,306**	
						Annual Monitoring for First Four Years	**$309,224**	
						Monitoring Every 5 Years and 5-yr Review Cost for Years 5 through 30	**$737,503**	
CAP REPAIR								
CAP REPAIR (Year 10)								
Sand Capping - Materials	300.00	CY	58.03	0.00	0.00	$ 58.03	$17,409	*1*
Armor Stone Capping - Materials	400.00	TON	51.47	0.00	0.00	$ 51.47	$20,588	*6*
Armor cap repair - application	1.00	EACH	373,186.52	0.00	0.00	$373,186.52	$373,187	*5*
Bathymetry Survey - Area III	1.00	EACH	14,584.30	0.00	0.00	$14,584.30	$14,584	*6*
						Subtotal	**$425,768**	
PROFESSIONAL LABOR MANAGEMENT - CAP REPAIR								
Project Management Labor Cost	1.00	LS	0.00	67,424.03	0.00	$67,424.03	$67,424	*1*
Planning Documents Labor Cost	1.00	LS	0.00	62,929.10	0.00	$62,929.10	$62,929	*1*
Construction Oversight Labor Cost	1.00	LS	0.00	53,939.22	0.00	$53,939.22	$53,939	*1*
Reporting Labor Cost	1.00	LS	0.00	8,989.87	0.00	$8,989.87	$8,990	*1*
As-Built Drawings Labor Cost	1.00	LS	0.00	8,989.87	0.00	$8,989.87	$8,990	*1*
Public Notice Labor Cost	1.00	LS	0.00	2,696.96	0.00	$2,696.96	$2,697	*1*
Permitting Labor Cost	1.00	LS	0.00	89,898.70	0.00	$89,898.70	$89,899	*1*
						Subtotal	**$294,868**	
ADMINISTRATIVE LAND USE CONTROLS (See Alternative 3 - Area III for details)								
						Subtotal:	**$792,699**	
						SUBTOTAL ARMOR CAP - AREA III	**$3,988,367**	

DESIGN COSTS				
Phase Name	**Design Approach**	**Total Capital**	**%**	**Design Cost**
Focused Removal - Area III	Ex Situ Removal - Off-site	$1,127,131	10%	$112,713
Armored Capping - Area III	In Situ Containment	$ 908,314	12%	$108,998
Cap Repair	In Situ Containment	$425,769	10%	$42,577
			Subtotal Design	**$264,288**
			Base Cost	$4,234,380
			30-Year O&M	$1,767,362
			Total Future Cost	$6,001,742

TABLE D-5: COST ESTIMATE -- AREA III ALTERNATIVE 4 (CONTINUED)
Feasibility Study Report for Parcel F, Hunters Point Shipyard, San Francisco, California

Alternative 4:	**Location Modifiers**
Area III: Focused Removal/Backfill, Offsite Disposal, Modified Armored Cap, and Institutional Controls	**Material:** *1.152* **Labor:** *1.67* **Equipment:** *1.076* **Contingency on Direct Costs:** *20%*
Prepared by: M. Berry - BAI, September 2006 Checked by: S. Delhomme - Tetra Tech, December 2006	**Options** **RACER Database:** Modified System **Cost Database Date:** 2006

Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Unit Cost	Extended Cost	Source

PRESENT VALUE

Description	Total Cost	Year From Start	Calendar Year	Escalation Factor[a]	Discount Factor[b]	Total Present Value Cost
Design	$ 264,288	0	2006	1	1	$ 264,288
Remedial Action Construction	$ 3,970,092	1	2007	1.021	0.970	$ 3,931,585
Monitoring	$ 77,306	2	2008	1.042	0.941	$ 75,811
Monitoring	$ 77,306	3	2009	1.064	0.912	$ 75,076
Monitoring	$ 77,306	4	2010	1.087	0.885	$ 74,351
Monitoring	$ 77,306	5	2011	1.110	0.858	$ 73,629
Monitoring, 5-Year Review	$ 122,917	6	2012	1.133	0.833	$ 115,935
Monitoring, cap repair, 5-Yr review	$ 843,553	11	2017	1.257	0.715	$ 757,763
Monitoring, 5-Year Review	$ 122,917	16	2022	1.395	0.614	$ 105,170
Monitoring, 5-Year Review	$ 122,917	21	2027	1.547	0.527	$ 100,168
Monitoring, 5-Year Review	$ 122,917	26	2032	1.717	0.452	$ 95,402
Monitoring, 5-Year Review	$ 122,917	31	2037	1.905	0.388	$ 90,865
	$ 6,001,742					$ 5,760,042

TOTAL PRESENT VALUE - ALTERNATIVE 4: $5,760,042

Sources:
1 Racer 2005 Database
2 Vendor Quote - Aquadam - Water Structures Unlimited, 12/6/05
3 Altamont Landfill tipping fee, non-hazardous material.
4 Vendor Quote - Dutra Dredging, 12/14/05.
5 Vendor Quote - AquaBlok Limited, 12/13/05.
6 Vendor Quote - TEG Ocean Services, 1/9/06.

[c]**Annual Discount Rate (i) = 3.10%**

Notes:
a. Escalation factors from RACER 2005.
b. Annual discount factor = 1/(1+i)t, where i = 3.10% and t=year.
c. Annual discount rate obtained from OMB Circular No. A-94, 2005.

TABLE D-6: COST ESTIMATE -- AREA III ALTERNATIVE 4A
Feasibility Study Report for Parcel F, Hunters Point Shipyard, San Francisco, California

Alternative 4A:		Location Modifiers	
Area III:	Focused Removal/Backfill, Off-Site Disposal, Modified AquaBlok Cap, and Institutional Controls	Material:	1.152
		Labor:	1.67
		Equipment:	1.076
		Contingency on Direct Costs:	20%
Prepared by:	M. Berry - BAI, September 2006	**Options**	
Checked by:	S. Delhomme - Tetra Tech, December 2006	RACER Database:	Modified System
		Cost Database Date:	2006

Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Unit Cost	Extended Cost	Source
FOCUSED REMOVAL - AREA III (See Alternative 3A for details)								
						SUBTOTAL FOCUSED REMOVAL - AREA III	**$1,749,088**	
AQUABLOK CAP - AREA III (see Alternative 3A for details)								
AQUABLOK CAPPING (2-acre cap, 4.5 inches of AquaBlok and 6 inches armor stone								
AquaBlok Capping Material	901.00	TON	463.27	0.00	0.00	$ 463.27	$417,406	5
Armor Stone Capping Material	1,889.00	TON	51.47	0.00	0.00	$ 51.47	$ 97,227	5
Cap Application - Barge	1.00	EACH	574,793.04	0.00	0.00	$574,793.04	$574,793	5
Pre-Application Activities	1.00	EACH	574,793.04	0.00	0.00	$574,793.04	$574,793	5
						Subtotal	**$1,664,219**	
CONSTRUCTION QC MONITORING								
Geotechnical Characteristics Analysis	6.00	EA	173.14	0.00	0.00	$ 173.14	$1,039	1
Water Quality Parameter Testing Device, DO, Temp., pH, Conductivity, Salinity, Turbidity, Daily Rent	5.00	DAY	122.43	0.00	0.00	$ 122.43	$ 612	1
Testing, turbidity	20.00	EA	21.00	0.00	0.00	$ 21.00	$ 420	1
Analysis, mercury (7041)	10.00	EA	52.80	0.00	0.00	$ 52.80	$ 528	1
Analysis, lead (6010)	10.00	EA	20.34	0.00	0.00	$ 20.34	$ 203	1
Analysis, copper (6010)	10.00	EA	20.34	0.00	0.00	$ 20.34	$ 203	1
Analysis PCBs (8081/8082)	10.00	EA	306.06	0.00	0.00	$ 306.06	$3,061	1
Bathymetry Survey - Area III	1.00	EACH	13,131.00	0.00	0.00	$13,131.00	$13,131	6
						Subtotal	**$19,197**	
PROFESSIONAL LABOR MANAGEMENT - CAPPING								
Project Management Labor Cost	1.00	LS	0.00	177,946.69	0.00	$177,946.69	$177,947	1
Planning Documents Labor Cost	1.00	LS	0.00	177,946.69	0.00	$177,946.69	$177,947	1
Construction Oversight Labor Cost	1.00	LS	0.00	195,741.35	0.00	$195,741.35	$195,741	1
Reporting Labor Cost	1.00	LS	0.00	24,912.54	0.00	$ 24,912.54	$ 24,913	1
As-Built Drawings Labor Cost	1.00	LS	0.00	24,912.54	0.00	$ 24,912.54	$ 24,913	1
Public Notice Labor Cost	1.00	LS	0.00	5,338.40	0.00	$ 5,338.40	$ 5,338	1
Permitting Labor Cost	1.00	LS	0.00	355,893.38	0.00	$355,893.38	$355,893	1
						Subtotal	**$962,692**	
LONG-TERM MONITORING - ARMOR CAP (see Alternative 3A for details)								
Five-Year Review						**Subtotal**	**$45,611**	
Monitoring - Sample Collection						**Subtotal**	**$77,306**	
						Annual Monitoring for First Four Years	**$309,224**	
						Monitoring Every 5 Years and 5-yr Review Cost for Years 5 through 30	**$737,503**	
CAP REPAIR (see Alternative 3A for details)								
CAP REPAIR (Year 10)								
AquaBlok Cap	200.00	TON	463.27	0.00	0.00	$ 463.27	$ 92,654	5
Armor Stone Capping - Materials	400.00	TON	51.47	0.00	0.00	$ 51.47	$ 20,588	5
Armor cap repair - application	1.00	EACH	420,371.03	0.00	0.00	$420,371.03	$420,371	5
Bathymetry Survey - Area III	1.00	EACH	14,584.30	0.00	0.00	$14,584.30	$14,584	6
						Subtotal	**$548,197**	
PROFESSIONAL LABOR MANAGEMENT - CAP REPAIR								
Project Management Labor Cost	1.00	LS	0.00	86,811.71	0.00	$86,811.71	$86,812	1
Planning Documents Labor Cost	1.00	LS	0.00	81,024.26	0.00	$81,024.26	$81,024	1
Construction Oversight Labor Cost	1.00	LS	0.00	69,449.36	0.00	$69,449.36	$69,449	1
Reporting Labor Cost	1.00	LS	0.00	11,574.89	0.00	$11,574.89	$11,575	1
As-Built Drawings Labor Cost	1.00	LS	0.00	11,574.89	0.00	$11,574.89	$11,575	1
Public Notice Labor Cost	1.00	LS	0.00	3,472.47	0.00	$3,472.47	$3,472	1
Permitting Labor Cost	1.00	LS	0.00	115,748.94	0.00	$115,748.94	$115,749	1
						Subtotal	**$379,657**	
ADMINISTRATIVE LAND USE CONTROLS (See Alternative 3 - Area III for details)						**Subtotal:**	**$792,699**	
						SUBTOTAL AQUABLOK CAP - AREA II	**$5,413,388**	

DESIGN COSTS

Phase Name	Design Approach	Total Capital	%	Design Cost
Focused Removal - Area III	Ex Situ Removal - Off-site	$1,127,131	10%	$112,713
AquaBlok Capping - Area III	In Situ Containment	$1,683,421	12%	$202,011
Cap Repair	In Situ Containment	$548,198	10%	$54,820
			Subtotal Design	**$369,543**

TABLE D-6: COST ESTIMATE -- AREA III ALTERNATIVE 4A (CONTINUED)
Feasibility Study Report for Parcel F, Hunters Point Shipyard, San Francisco, California

Alternative 4A:	**Location Modifiers**
Area III: Focused Removal/Backfill, Off-Site Disposal, Modified AquaBlok Cap, and Institutional Controls	**Material:** *1.152* **Labor:** *1.67* **Equipment:** *1.076* **Contingency on Direct Costs:** *20%*
Prepared by: M. Berry - BAI, September 2006 Checked by: S. Delhomme - Tetra Tech, December 2006	**Options** **RACER Database:** Modified System **Cost Database Date:** 2006

Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Unit Cost	Extended Cost	Source
						Base Cost	$5,557,439	
						30-Year O&M	$1,974,581	
						Total Future Cost	$7,532,019	

PRESENT VALUE

Description	Total Cost	Year From Start	Calendar Year	Escalation Factor[a]	Discount Factor[b]	Total Present Value Cost
Design	$ 369,543	0	2006	1	1	$ 369,543
Remedial Action Construction	$ 5,187,895	1	2007	1.021	0.970	$ 5,137,576
Monitoring	$ 77,306	2	2008	1.042	0.941	$ 75,811
Monitoring	$ 77,306	3	2009	1.064	0.912	$ 75,076
Monitoring	$ 77,306	4	2010	1.087	0.885	$ 74,351
Monitoring	$ 77,306	5	2011	1.110	0.858	$ 73,629
Monitoring, 5-Year Review	$ 122,917	6	2012	1.133	0.833	$ 115,935
Monitoring, cap repair, 5-Yr review	$ 1,050,771	11	2017	1.257	0.715	$ 943,907
Monitoring, 5-Year Review	$ 122,917	16	2022	1.395	0.614	$ 105,170
Monitoring, 5-Year Review	$ 122,917	21	2027	1.547	0.527	$ 100,168
Monitoring, 5-Year Review	$ 122,917	26	2032	1.717	0.452	$ 95,402
Monitoring, 5-Year Review	$ 122,917	31	2037	1.905	0.388	$ 90,865
	$ 7,532,019					$ 7,257,434

TOTAL PRESENT VALUE - ALTERNATIVE 4A **$7,257,434**

Sources:
1 Racer 2005 Database
2 Vendor Quote - Aquadam - Water Structures Unlimited, 12/6/05
3 Altamont Landfill tipping fee, non-hazardous material.
4 Vendor Quote - Dutra Dredging, 12/14/05.
5 Vendor Quote - AquaBlok Limited, 12/13/05.
6 Vendor Quote - TEG Ocean Services, 1/9/06.

[c]Annual Discount Rate (i) = 3.10%

Notes:
a. Escalation factors from RACER 2005.
b. Annual discount factor = 1/(1+i)t, where i = 3.10% and t=year.
c. Annual discount rate obtained from OMB Circular No. A-94, 2005.

TABLE D-7: COST ESTIMATE -- AREA IX/X ALTERNATIVE 2
Feasibility Study Report for Parcel F, Hunters Point Shipyard, San Francisco, California

Alternative 2:	Location Modifiers
Area IX/X: Removal/Backfill and Off-Site Disposal	Material: 1.152 Labor: 1.67 Equipment: 1.076 Contingency on Direct Costs: 20%
Prepared by: M. Berry - BAI, September 2006 Checked by: S. Delhomme - Tetra Tech, December 2006	Options RACER Database: Modified System Cost Database Date: 2006

Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Unit Cost	Extended Cost	Source
REMOVAL (EXCAVATION) - AREA IX/X								
COFFER DAM - SOUTH BASIN (2,000 linear feet)								
Construction Labor	240.00	HR	0.00	101.21	0.00	$101.21	$24,290	1
Maintenance Labor	120.00	HR	0.00	101.21	0.00	$101.21	$12,145	1
Crawler-mounted, 2.0 CY, 235 Hydraulic Excavator	48.00	HR	0.00	137.97	206.56	$344.53	$16,537	1 1
4" Diameter Contractor's Trash Pump, 300 GPM	253.00	DAY	87.42	60.30	0.00	$147.72	$37,373	1 1
4", Class 150, PVC Piping	1,000.00	LF	3.12	18.25	0.94	$22.31	$22,310	1
AquaDam Rental	2,000.00	LF	0.00	0.00	97.27	$97.27	$194,540	2
Mobilization AquaDam	2.00	EACH	8,199.05	0.00	0.00	$8,199.05	$16,398	2
Installation AquaDam	6.00	DAY	3,279.62	0.00	0.00	$3,279.62	$19,678	2
						Subtotal	**$343,272**	
COFFER DAM - YOSEMITE CREEK (150 linear feet)								
Construction Labor	40.00	HR	0.00	101.21	0.00	$101.21	$4,048	1
Crawler-mounted, 2.0 CY, 235 Hydraulic Excavator	8.00	HR	0.00	137.97	206.56	$344.53	$2,756	1 1
4" Diameter Contractor's Trash Pump, 300 GPM	60.00	DAY	87.42	60.30	0.00	$147.72	$8,863	1 1
4", Class 150, PVC Piping	1,000.00	LF	3.12	18.25	0.94	$22.31	$22,310	1
AquaDam Rental	150.00	LF	0.00	0.00	97.27	$97.27	$14,591	2
Mobilization AquaDam	1.00	EACH	1,639.81	0.00	0.00	$1,639.81	$1,640	2
Installation AquaDam	1.00	DAY	3,279.62	0.00	0.00	$3,279.62	$3,280	2
						Subtotal	**$57,488**	
EXCAVATION AND BACKFILL (150,520 cubic yards)								
4 CY, Crawler-mounted, Hydraulic Excavator	150,520.00	CY	0.00	2.29	3.47	$5.76	$866,995	1
Delivered & Dumped, Backfill	37,037.04	BCY	44.01	1.99	1.48	$47.48	$1,758,519	1
Unclassified Fill, 6" Lifts, Off-Site, Includes Delivery, Spreading, and Compaction	185,195.20	CY	10.54	4.56	3.05	$18.15	$3,361,293	1
Spray washing, decontaminate heavy equipment, decontaminate heavy equipment	1.00	EA	0.00	1,072.83	0.00	$1,072.83	$1,073	1
Crane Mats	10.00	EACH	3,852.82	0.00	0.00	$3,852.82	$38,528	1
						Subtotal	**$6,026,408**	
CONFIRMATION SAMPLING								
Surface Soil Sampling Equipment	1.00	EA	658.43	0.00	0.00	$658.43	$658	1
Analysis, mercury (7041)	36.00	EA	46.93	0.00	0.00	$46.93	$1,689	1
Analysis, lead (6010)	36.00	EA	20.34	0.00	0.00	$20.34	$732	1
Analysis, copper (6010)	36.00	EA	20.34	0.00	0.00	$20.34	$732	1
Analysis PCBs, (8081/8082)	36.00	EA	306.06	0.00	0.00	$306.06	$11,018	1
Field Technician	32.00	HR	0.00	171.18	0.00	$171.18	$5,478	1
Surveying - 2-man Crew	5.00	DAY	0.00	2,288.95	383.39	$2,672.34	$13,362	1
						Subtotal	**$33,670**	
LOAD AND HAUL - SEDIMENT DISPOSAL (35,480 cubic yards disposed at Altamont Landfill)								
Dump Charges	195,680.00	CY	50.90	0.00	0.00	$50.90	$9,960,112	3
988, 7.0 CY, Wheel Loader	630.00	HR	0.00	139.10	287.75	$426.85	$268,916	1
32 CY, Semi Dump	28,524.00	HR	0.00	109.77	128.84	$238.61	$6,806,112	1
						Subtotal	**$17,035,139**	
RESIDUAL WASTE MANAGEMENT (including disposal of sediment at Altamont Landfill)								
Secondary containment and storage, loading hazardous waste for shipment into 5,000 gal. bulk tank truck	12.00	EA	0.00	1,055.18	394.82	$1,450.00	$17,400	1
Secondary containment and storage, loading hazardous waste for shipment on disposal truck	18.00	EA	0.00	10.81	1.80	$12.61	$227	1
Subcontracted shipping of hazardous wa transport drums of solid hazardous waste, 80 55 gal. drums	70.00	MI	3.26	0.00	0.00	$3.26	$228	1

TABLE D-7: COST ESTIMATE -- AREA IX/X ALTERNATIVE 2 (CONTINUED)
Feasibility Study Report for Parcel F, Hunters Point Shipyard, San Francisco, California

Alternative 2:	Location Modifiers	
Area IX/X: Removal/Backfill and Off-Site Disposal	Material:	1.152
	Labor:	1.67
	Equipment:	1.076
	Contingency on Direct Costs:	20%
Prepared by: M. Berry - BAI, September 2006	**Options**	
Checked by: S. Delhomme - Tetra Tech, December 2006	RACER Database:	Modified System
	Cost Database Date:	2006

Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Unit Cost	Extended Cost	Source
Subcontracted shipping of hazardous waste, transport bulk solid hazardous waste, 20 C.Y.	840.00	MI	3.26	0.00	0.00	$3.26	$2,738	1
Commercial RCRA landfills, additional landfill disposal costs, waste stream evaluation, 50% rebate on first	2.00	EA	793.09	0.00	0.00	$793.09	$1,586	1
Commercial RCRA landfills, drummed waste disposal, solid, non-hazardous, 55 gal drums	18.00	EA	13.50	0.00	0.00	$13.50	$243	1
						Subtotal	**$22,423**	
DEWATERING PAD								
Grub and stack, 140 H.P. dozer	212.00	CY	0.00	6.75	2.29	$9.04	$1,916	1
Excavating, trench, normal soil, to 2 to 6 deep, excavate by hand, piled only	212.00	BCY	0.00	165.78	0.00	$165.78	$35,145	1
953, 2.0 CY, Track Loader	1,000.00	HR	0.00	119.96	104.04	$224.00	$224,000	1
Backfill Trench, Borrow Material, Delivered & Dumped Only	136.00	CY	10.16	4.46	1.89	$16.51	$2,245	1
18" x 18" Underground French Drain	753.39	LF	6.15	3.81	0.58	$10.54	$7,941	1
Pump, pedestal sump, single stage, 75 GPM, 1-1/2 H.P., 2" discharge	1.00	EA	4,242.65	1,769.93	0.00	$6,012.58	$6,013	1
Storage Tanks, plastic, ground level, horizontal cylinder, 550 gallon	1.00	EA	2,570.88	1,067.48	0.00	$3,638.36	$3,638	1
Storage Tanks, plastic, ground level, horizontal cylinder, 6" NP, 4,000 gallon	1.00	EA	6,685.01	1,673.48	0.00	$8,358.49	$8,358	1
Polymeric Liner Anchor Trench, 3'x1.5'	792.00	LF	0.06	4.45	0.42	$4.93	$3,905	1
Secure burial cell construction, polymeric liner and cover system, polyvinyl chloride (PVC), 40 mil	38,259.00	SF	0.59	0.93	0.04	$1.56	$59,684	1
Waste Pile Cover, 135 Lb Tear,	3,742.00	SY	2.88	0.83	0.00	$3.71	$13,883	1
Sewage connection charge	1.00	EA	1,370.32	0.00	0.00	$1,370.32	$1,370	1
Wastewater Disposal Fee	434.00	KGA	3.06	0.00	0.00	$3.06	$1,328	1
Pump, submersible sump, automatic, 15 GPM, 1-1/2" discharge, 15' head	1.00	EA	1,336.83	286.89	0.00	$1,623.72	$1,624	1
Operator, dewatering pad	800.00	HR	0.00	171.00	0.00	$171.00	$136,800	1
						Subtotal	**$507,851**	
DECONTAMINATION FACILITIES								
Pad Subgrade Preparation	35.56	CY	0.00	12.01	1.96	$ 13.97	$ 497	1
Excavating, trench, medium soil, 4' to 6' deep, 1 C.Y. bucket, gradall	1.78	BCY	0.00	1.73	0.44	$ 2.17	$ 4	1
Compaction, subgrade, 18" wide, 8" lifts, walk behind, vibrating plate	35.56	ECY	0.00	5.28	0.20	$ 5.48	$ 195	1
Dry Roll Gravel, Steel Roller	106.67	SY	0.00	1.55	0.44	$ 1.99	$ 212	1
Gravel, Delivered & Dumped	14.81	CY	36.68	6.64	2.67	$ 45.99	$ 681	1
Gravel (90%) & Sand Base (10%), with Calcium Chloride 3/4 - 1 lb/cy	14.81	CY	29.44	6.68	3.45	$ 39.57	$ 586	1
Asphalt Curb 8" W x 6" H	120.00	LF	2.59	7.63	5.83	$ 16.05	$1,926	1
Prime Coat	88.89	SY	0.53	0.08	0.02	$ 0.63	$ 56	1
Asphalt Wearing Course, 1 Pass (Line Item Includes 5% Waste)	19.33	TON	55.11	16.17	3.73	$ 75.01	$1,450	1
26" x 26", 5' Deep Area Drain with Grate	1.00	EA	1,663.98	4,663.80	71.06	$6,398.84	$6,399	1
5' x 5' x 5' Reinforced Concrete Sump	1.00	EA	2,277.14	7,663.76	83.78	$10,024.68	$10,025	1
12" x 12" CIP Concrete In-Ground Trench Drain with Metal Grate	20.00	LF	66.78	151.37	0.49	$ 218.64	$4,373	1
Storage Tanks, steel, above ground single wall, 1,500 gallon, incl. cradles, coating & fittings, excl. foundation, pumps or piping	1.00	EA	4,776.17	1,173.24	0.00	$5,949.41	$5,949	1
Polymeric Liner Anchor Trench, 3'x15'	144.00	LF	0.06	4.45	0.42	$ 4.93	$ 710	1

TABLE D-7: COST ESTIMATE -- AREA IX/X ALTERNATIVE 2 (CONTINUED)

Feasibility Study Report for Parcel F, Hunters Point Shipyard, San Francisco, California

Alternative 2:	Location Modifiers	
Area IX/X: Removal/Backfill and Off-Site Disposal	**Material:**	*1.152*
	Labor:	*1.67*
	Equipment:	*1.076*
	Contingency on Direct Costs:	*20%*
Prepared by: M. Berry - BAI, September 2006	**Options**	
Checked by: S. Delhomme - Tetra Tech, December 2006	**RACER Database:**	Modified System
	Cost Database Date:	2006

Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Unit Cost	Extended Cost	Source
8 oz/sy Erosion	106.67	SY	1.27	1.57	0.04	$ 2.88	$ 307	*1*
Control/Drainage Filter Fabric (80 mil)								
Secure burial cell construction,	960.00	SF	0.53	0.50	0.02	$ 1.05	$1,008	*1*
polymeric liner and cover system								
rough textured H.D. polyethylene (HDPE), 40 mil								
Spray washers, electric, 1800	1.00	EA	2,988.01	0.00	0.00	$2,988.01	$2,988	*1*
psi, 4.8 GPM, pressure washer, 50' hose								
Decontamination trailers, 2	5.00	MO	4,129.47	0.00	0.00	$4,129.47	$20,647	*1*
showers, 2 wall fans (monthly rental), 8' x 36'								
Operation of Pressure Washer,	200.00	HR	11.73	150.95	0.00	$ 162.68	$32,536	*1*
Including Water, Soap, Electricity, Labor								
DOT steel drums, 55 gal., open, 17C	18.00	EA	145.97	0.00	0.00	$ 145.97	$2,627	*1*
Field Technician	800.00	HR	0.00	171.18	0.00	$ 171.18	$136,944	*1*
High Sump Level Switch for	1.00	EA	386.54	503.57	0.00	$ 890.11	$ 890	*1*
Avoiding Overflow								*1*
(2 1/2", 4") PVC Double-wall, piping/fittin	30.00	LF	38.15	77.03	0.00	$ 115.18	$3,455	
Pump, pedestal sump, single	1.00	EA	4,011.30	1,474.94	0.00	$5,486.24	$5,486	*1*
stage, 25 GPM, 1 H.P., 1-1/2" discharge								*1*
and personnel								
						Subtotal	**$239,952**	
PROFESSIONAL LABOR MANAGEMENT - REMOVAL AREA IX/X								
Project Management Labor Cost	1.00	LS	0.00	1,274,552.1	0.00	$1,274,552.07	$1,274,552	*1*
Planning Documents Labor Cost	1.00	LS	0.00	1,223,570.0	0.00	$1,223,570.00	$1,223,570	*1*
Construction Oversight Labor	1.00	LS	0.00	2,141,247.4	0.00	$2,141,247.39	$2,141,247	*1*
Reporting Labor Cost	1.00	LS	0.00	254,910.41	0.00	$254,910.41	$254,910	*1*
As-Built Drawings Labor Cost	1.00	LS	0.00	254,910.41	0.00	$254,910.41	$254,910	*1*
Public Notice Labor Cost	1.00	LS	0.00	15,294.62	0.00	$15,294.62	$15,295	*1*
Permitting Labor Cost	1.00	LS	0.00	509,820.82	0.00	$509,820.82	$509,821	*1*
						Subtotal	**$5,674,306**	
						SUBTOTAL REMOVAL AREA IX/X	**$29,940,508**	

REMEDIAL DESIGN

Phase Name	Design Approach	Total Capital	%	Design
Excavation - Area IX/X	Ex Situ Removal - Off-site Treatment or Disposal	$24,266,203	8%	$1,941,296
			Subtotal Design	**$1,941,296**

Base Cost	$31,881,805
30-Year O&M	$0
Total Future Cost	$31,881,805

PRESENT VALUE

Description	Total Cost	Year From Start	Calendar Year	Escalation Factor[a]	Discount Factor[b]	Total Present Value Cost
Design	$1,941,296	0	2006	1	1	$1,941,296
Remedial Action Construction	$29,940,508	1	2007	1.021	0.970	$29,650,106
	$40,020,000					$31,591,402

TOTAL PRESENT VALUE- AREA IX/X ALTERNATIVE 2 $31,591,402

Sources:

1 Racer 2005 Database
2 Vendor Quote - Aquadam - Water Structures Unlimited, 12/6/05
3 Altamont Landfill tipping fee, non-hazardous material.
4 Vendor Quote - Dutra Dredging, 12/14/05.
5 Vendor Quote - AquaBlok Limited, 12/13/05.
6 Vendor Quote - TEG Ocean Services, 1/9/06.

[c]**Annual Discount Rate (i) = 3.10%**

Notes:
a. Escalation factors from RACER 2005.
b. Annual discount factor = 1/(1+i)t, where i = 3.10% and t=year.
c. Annual discount rate obtained from OMB Circular No. A-94, 2005.

TABLE D-8: COST ESTIMATE -- AREA IX/X ALTERNATIVE 3
Feasibility Study Report for Parcel F, Hunters Point Shipyard, San Francisco, California

Alternative 3:	**Location Modifiers**
Area IX/X: In-Situ Stabilization and Institutional Controls	**Material:** *1.152* **Labor:** *1.67* **Equipment:** *1.076* **Contingency on Direct Costs:** *20%*
Prepared by: M. Berry - BAI, September 2006 Checked by: S. Delhomme - Tetra Tech, December 2006	**Options** **RACER Database:** Modified System **Cost Database Date:** 2006

Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Unit Cost	Extended Cost	Source
IN SITU STABILIZATION - AREA IX/X								
IN-SITU STABILIZATION (33-acre treatment area)								
22 Ton 4WD Rough Terrain Hydr Crane	2,000.00	HR	0.00	0.00	137.04	$ 137.04	$274,080	1
Equip. Operators, Crane/Shovel	2,000.00	HR	0.00	133.29	0.00	$ 133.29	$266,580	1
Crane Mats	10.00	EACH	3,852.82	0.00	0.00	$3,852.82	$38,528	1
Activated Carbon	1,671,143.00	LB	2.90	0.00	0.00	$ 2.90	$4,846,315	7
Mixing carbon into sediment with Aquamog equipment	1,787,319.00	SF	1.54	0.00	0.00	$ 1.54	$2,752,471	7
						Subtotal	**$8,177,974**	
LONG-TERM MONITORING - IN-SITU STABILIZATION								
Includes annual monitoring for the first five years, and monitoring at five-year intervals for years 5 through 30								
Five-Year Review								
Project Manager	35.00	HR	0.00	232.33	0.00	$ 232.33	$8,132	1
Project Engineer	67.00	HR	0.00	225.30	0.00	$ 225.30	$15,095	1
Project Scientist	33.00	HR	0.00	260.79	0.00	$ 260.79	$8,606	1
Staff Scientist	55.00	HR	0.00	193.29	0.00	$ 193.29	$10,631	1
Draftsman/CADD	24.00	HR	0.00	131.14	0.00	$ 131.14	$3,147	1
						Subtotal	**$45,611**	
Monitoring - Sample Collection								
Analysis, mercury (7041)	30.00	EA	48.17	0.00	0.00	$ 48.17	$1,445	1
Analysis, copper (6010)	30.00	EA	20.88	0.00	0.00	$ 20.88	$ 626	1
Analysis PCBs (8081/8082)	30.00	EA	377.03	0.00	0.00	$ 377.03	$11,311	1
Bathymetry Survey - Area IX-X	1.00	EACH	22,994.62	0.00	0.00	$22,994.62	$22,995	6
Vibracore mob/demob, shallow water drill barge/tender	1.00	EACH	7,136.26	0.00	0.00	$7,136.26	$7,136	6
Vibracore daily rate - Area IX-X	5.00	DAY	6,422.64	0.00	0.00	$6,422.64	$32,113	6
Vibracore consumables	5.00	DAY	634.33	0.00	0.00	$ 634.33	$3,172	6
Benthic analysis	30.00	EACH	396.46	0.00	0.00	$ 396.46	$11,894	1
General Monitoring and Reporting								
Sample collection, vehicle mileage	100.00	MI	0.49	0.00	0.00	$ 0.49	$ 49	1
Project Manager	4.00	HR	0.00	278.80	0.00	$ 278.80	$1,115	1
Project Engineer	30.00	HR	0.00	270.36	0.00	$ 270.36	$8,111	1
Project Scientist	44.00	HR	0.00	312.95	0.00	$ 312.95	$13,770	1
Staff Scientist	81.00	HR	0.00	231.94	0.00	$ 231.94	$18,787	1
Field Technician	2.00	HR	0.00	172.80	0.00	$ 172.80	$ 346	1
Word Processing/Clerical	13.00	HR	0.00	120.37	0.00	$ 120.37	$1,565	1
Draftsman/CADD	9.00	HR	0.00	157.37	0.00	$ 157.37	$1,416	1
						Subtotal	**$135,851**	
						Annual Monitoring for First Four Years	**$543,402**	
						Monitoring Every 5 Years and 5-yr Review Cost for Years 5 through 30	**$1,088,770**	
ADMINISTRATIVE LAND USE CONTROLS (See Alternative 3, Area III for details						**Subtotal**	**$792,699**	
DECONTAMINATION FACILITIES (See Alternative 2, Area IX/X for details						**Subtotal**	**$239,952**	
RESIDUAL WASTE MANAGEMENT - DECON WASTES								
Utilities Hook-up Fee	1.00	EA	4,639.22	0.00	0.00	$4,639.22	$4,639	1
Wastewater Disposal Fee	60.00	KGA	3.36	0.00	0.00	$ 3.36	$ 202	1
Secondary containment and storage, loading hazardous waste for shipment into 5,000 gal. bulk tank truck	12.00	EA	0.00	1,158.99	433.66	$1,592.65	$19,112	1
Subcontracted shipping of hazardous waste, transport bulk sludge/liquid hazardous waste, 5000 gal.	18.00	EA	0.00	11.87	1.97	$ 13.84	$ 249	1
Subcontracted shipping of hazardous wast transport drums of solid hazardous waste, 80 55 gal. drums	60.00	MI	3.26	0.00	0.00	$ 3.26	$ 196	1
Commercial RCRA landfills, additional costs, waste stream evaluation, 50% rebate on first	2.00	EA	871.12	0.00	0.00	$ 871.12	$1,742	1
Commercial RCRA landfills, liquid/sludge, non-fuel, non-hazardous 55 gal drums	18.00	EA	13.50	0.00	0.00	$ 13.50	$ 243	1
						Subtotal	**$26,383**	
PROFESSIONAL LABOR MANAGEMENT - IN SITU STABILIZATION								
Project Management Labor Cost	1.00	LS	0.00	585,097.14	0.00	$585,097.14	$585,097	1
Planning Documents Labor Cost	1.00	LS	0.00	643,606.85	0.00	$643,606.85	$643,607	1
Construction Oversight Labor Cost	1.00	LS	0.00	877,645.74	0.00	$877,645.74	$877,646	1
Reporting Labor Cost	1.00	LS	0.00	97,516.19	0.00	$97,516.19	$97,516	1
As-Built Drawings Labor Cost	1.00	LS	0.00	97,516.19	0.00	$97,516.19	$97,516	1
Public Notice Labor Cost	1.00	LS	0.00	9,751.62	0.00	$9,751.62	$9,752	1
Permitting Labor Cost	1.00	LS	0.00	487,580.98	0.00	$487,580.98	$487,581	1
						Subtotal	**$2,798,715**	
						SUBTOTAL IN-SITU STABILIZATION - AREA IX/X	**$13,667,895**	

TABLE D-8: COST ESTIMATE -- AREA IX/X ALTERNATIVE 3 (CONTINUED)
Feasibility Study Report for Parcel F, Hunters Point Shipyard, San Francisco, California

Alternative 3:	Location Modifiers	
Area IX/X: In-Situ Stabilization and Institutional Controls	Material:	1.152
	Labor:	1.67
	Equipment:	1.076
	Contingency on Direct Costs:	20%
Prepared by: M. Berry - BAI, September 2006	Options	
Checked by: S. Delhomme - Tetra Tech, December 2006	RACER Database:	Modified System
	Cost Database Date:	2006

Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Unit Cost	Extended Cost	Source
DESIGN COSTS								
Phase Name	**Design Approach**			**Total Capital**		**%**	**Design Cost**	
In Situ Stabilization - Area X	In Situ Containment			$8,460,064		12%	$1,015,208	
						Subtotal Design	**$1,015,208**	
						Total Capital Costs	$13,050,931	
						30-Year O&M	$1,632,172	
						Total Future Costs	$14,683,103	

PRESENT VALUE

Description	Total Cost	Year From Start	Calendar Year	Escalation Factor[a]	Discount Factor[b]	Total Present Value Cost
Design	$ 1,015,208	0	2006	1	1	$ 1,015,208
Remedial Action Construction	$ 12,035,723	1	2007	1.021	0.970	$ 11,918,985
Monitoring	$ 135,851	2	2008	1.042	0.941	$ 133,224
Monitoring	$ 135,851	3	2009	1.064	0.912	$ 131,932
Monitoring	$ 135,851	4	2010	1.087	0.885	$ 130,658
Monitoring	$ 135,851	5	2011	1.110	0.858	$ 129,389
Monitoring, 5-Year Review	$ 181,462	6	2012	1.133	0.833	$ 171,154
Monitoring, cap repair, 5-Yr review	$ 181,462	11	2017	1.257	0.715	$ 163,007
Monitoring, 5-Year Review	$ 181,462	16	2022	1.395	0.614	$ 155,262
Monitoring, 5-Year Review	$ 181,462	21	2027	1.547	0.527	$ 147,877
Monitoring, 5-Year Review	$ 181,462	26	2032	1.717	0.452	$ 140,841
Monitoring, 5-Year Review	$ 181,462	31	2037	1.905	0.388	$ 134,144
	$ 14,683,103					$ 14,371,679

TOTAL PRESENT VALUE- ALTERNATIVE 3: $14,371,679

Sources:
1 Racer 2005 Database
2 Vendor Quote - Aquadam - Water Structures Unlimited, 12/6/05
3 Altamont Landfill tipping fee, non-hazardous material.
4 Vendor Quote - Dutra Dredging, 12/14/05.
5 Vendor Quote - AquaBlok Limited, 12/13/05.
6 Vendor Quote - TEG Ocean Services, 1/9/06.
7 Carbon application costs were extrapolated from the 2005 Parcel F pilot test conducted by Stanford University.

[c]Annual Discount Rate (i) = 3.10%

Notes:
a. Escalation factors from RACER 2005.
b. Annual discount factor = 1/(1+i)t, where i = 3.10% and t=year.
c. Annual discount rate obtained from OMB Circular No. A-94, 2005.

TABLE D-9: COST ESTIMATE -- AREA IX/X ALTERNATIVE 4
Feasibility Study Report for Parcel F, Hunters Point Shipyard, San Francisco, California

Alternative 4:			Location Modifiers					
Area IX/X: Monitored Natural Recovery and Institutional Controls					Material:	1.152		
					Labor:	1.67		
					Equipment:	1.076		
					Contingency on Direct Costs:	20%		
Prepared by: M. Berry - BAI, September 2006			Options					
Checked by: S. Delhomme - Tetra Tech, December 2006					RACER Database:	Modified System		
					Cost Database Date:	2006		
Description	**Quantity**	**Unit of Measure**	**Material Unit Cost**	**Labor Unit Cost**	**Equipment Unit Cost**	**Unit Cost**	**Extended Cost**	**Source**
MONITORED NATURAL RECOVERY - AREA IX/X								
ADMINISTRATIVE LAND USE CONTROLS								
Planning Docs								
Project Manager	120.00	HR	0.00	226.48	0.00	$ 226.48	$27,178	1
Project Engineer	300.00	HR	0.00	219.62	0.00	$ 219.62	$65,886	1
Staff Engineer	600.00	HR	0.00	192.19	0.00	$ 192.19	$115,314	1
QA/QC Officer	80.00	HR	0.00	185.23	0.00	$ 185.23	$14,818	1
Word Processing/Clerical	400.00	HR	0.00	97.78	0.00	$ 97.78	$39,112	1
Draftsman/CADD	400.00	HR	0.00	127.83	0.00	$ 127.83	$51,132	1
Attorney, Partner, Real Estate	30.00	HR	0.00	200.00	0.00	$ 200.00	$ 6,000	1
Other Direct Costs	1.00	LS	4,367.26	0.00	0.00	$ 4,367.26	$ 4,367	1
						Subtotal	**$323,807**	
Planning Meetings								
Per Diem (per person)	16.00	DAY	194.00	0.00	0.00	$ 194.00	$ 3,104	1
Project Manager	160.00	HR	0.00	226.48	0.00	$ 226.48	$36,237	1
Project Engineer	128.00	HR	0.00	219.62	0.00	$ 219.62	$28,111	1
Word Processing/Clerical	128.00	HR	0.00	97.78	0.00	$ 97.78	$12,516	1
Draftsman/CADD	64.00	HR	0.00	127.83	0.00	$ 127.83	$ 8,181	1
Other Direct Costs	1.00	LS	906.62	0.00	0.00	$ 906.62	$ 907	1
						Subtotal	**$89,056**	
Implementation								
Overnight Delivery, 8 oz Letter	18.00	EA	22.21	0.00	0.00	$ 22.21	$ 400	1
Project Manager	82.00	HR	0.00	226.48	0.00	$ 226.48	$18,571	1
Project Engineer	140.00	HR	0.00	219.62	0.00	$ 219.62	$30,747	1
Staff Engineer	180.00	HR	0.00	192.19	0.00	$ 192.19	$34,594	1
QA/QC Officer	51.00	HR	0.00	185.23	0.00	$ 185.23	$ 9,447	1
Word Processing/Clerical	140.00	HR	0.00	97.78	0.00	$ 97.78	$13,689	1
Draftsman/CADD	200.00	HR	0.00	127.83	0.00	$ 127.83	$25,566	1
Computer Data Entry	160.00	HR	0.00	87.86	0.00	$ 87.86	$14,058	1
Attorney, Sr Associate, Real Estate	8.00	HR	0.00	175.00	0.00	$ 175.00	$ 1,400	1
Paralegal, Real Estate	8.00	HR	0.00	100.00	0.00	$ 100.00	$ 800	1
Other Direct Costs	1.00	LS	2,034.38	0.00	0.00	$ 2,034.38	$ 2,034	1
Construction Signs	10.00	SF	21.35	0.00	0.00	$ 21.35	$ 214	1
Surveying - 3-man Crew	4.00	DAY	0.00	2,696.95	390.12	$ 3,087.07	$12,348	1
Portable GPS Set with Mapping	1.00	MO	1,161.52	0.00	0.00	$ 1,161.52	$ 1,162	1
Local Fees	2.00	LS	308.96	0.00	0.00	$ 308.96	$ 618	1
						Subtotal	**$165,647**	
Modification/Termination								
Project Manager	40.00	HR	0.00	226.48	0.00	$ 226.48	$ 9,059	
Project Engineer	60.00	HR	0.00	219.62	0.00	$ 219.62	$13,177	1
Staff Engineer	80.00	HR	0.00	192.19	0.00	$ 192.19	$15,375	1
QA/QC Officer	10.00	HR	0.00	185.23	0.00	$ 185.23	$ 1,852	1
Word Processing/Clerical	40.00	HR	0.00	97.78	0.00	$ 97.78	$ 3,911	1
Draftsman/CADD	24.00	HR	0.00	127.83	0.00	$ 127.83	$ 3,068	1
Other Direct Costs	1.00	LS	759.08	0.00	0.00	$ 759.08	$ 759	1
						Subtotal	**$47,202**	
						Subtotal Administrative Land Use Controls	**$625,712**	
LONG-TERM MONITORING - MONITORED NATURAL RECOVERY								
Five-Year Review								
Project Manager	35.00	HR	0.00	232.33	0.00	$ 232.33	$8,132	1
Project Engineer	67.00	HR	0.00	225.30	0.00	$ 225.30	$15,095	1
Project Scientist	33.00	HR	0.00	260.79	0.00	$ 260.79	$8,606	1
Staff Scientist	55.00	HR	0.00	193.29	0.00	$ 193.29	$10,631	1
Draftsman/CADD	24.00	HR	0.00	131.14	0.00	$ 131.14	$3,147	1
						Subtotal	**$45,611**	
Sample Collection								
Analysis, mercury (7041)	30.00	EA	46.93	0.00	0.00	$ 46.93	$ 1,408	1
Analysis, copper (6010)	30.00	EA	20.34	0.00	0.00	$ 20.34	$ 610	1
Analysis PCBs, (8081/8082)	30.00	EA	367.28	0.00	0.00	$ 367.28	$11,018	1
Bathymetry Survey - Area X	1.00	EACH	22,399.93	0.00	0.00	$22,399.93	$22,400	6
Vibracore mob/demob, shallow water drill barge/tender	1.00	EACH	6,951.70	0.00	0.00	$ 6,951.70	$ 6,952	6
Vibracore daily rate - Area X	5.00	DAY	6,256.53	0.00	0.00	$ 6,256.53	$31,283	6
Vibracore consumables	5.00	DAY	617.93	0.00	0.00	$ 617.93	$ 3,090	6
Benthic analysis	30.00	EACH	386.21	0.00	0.00	$ 386.21	$11,586	1

TABLE D-9: COST ESTIMATE -- AREA IX/X ALTERNATIVE 4 (CONTINUED)
Feasibility Study Report for Parcel F, Hunters Point Shipyard, San Francisco, California

Alternative 4:	Location Modifiers	
Area IX/X: Monitored Natural Recovery and Institutional Controls	**Material:**	*1.152*
	Labor:	*1.67*
	Equipment:	*1.076*
	Contingency on Direct Costs:	*20%*
Prepared by: M. Berry - BAI, September 2006	**Options**	
Checked by: S. Delhomme - Tetra Tech, December 2006	**RACER Database:**	Modified System
	Cost Database Date:	2006

Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Unit Cost	Extended Cost	Source
General Monitoring and Reporting								
Sample collection, vehicle mileage	100.00	MI	0.49	0.00	0.00	$ 0.49	$ 49	*1*
Project Manager	4.00	HR	0.00	276.19	0.00	$ 276.19	$ 1,105	*1*
Project Engineer	30.00	HR	0.00	267.83	0.00	$ 267.83	$ 8,035	*1*
Project Scientist	40.00	HR	0.00	310.02	0.00	$ 310.02	$12,401	*1*
Staff Scientist	60.00	HR	0.00	229.78	0.00	$ 229.78	$13,787	*1*
Field Technician	2.00	HR	0.00	171.18	0.00	$ 171.18	$ 342	*1*
Word Processing/Clerical	13.00	HR	0.00	119.25	0.00	$ 119.25	$ 1,550	*1*
Draftsman/CADD	9.00	HR	0.00	155.90	0.00	$ 155.90	$ 1,403	*1*
						Subtotal	**$127,019**	
						Annual Monitoring for First Four Years	**$508,075**	
						Monitoring Every 5 Years and 5-yr Review Cost for Years 5 through 30	**$1,035,778**	
PROFESSIONAL LABOR MANAGEMENT - MONITORED NATURAL RECOVERY								
Project Management Labor Cost	1.00	LS	0.00	29,703.06	0.00	$29,703.06	$29,703	*1*
Planning Documents Labor Cost	1.00	LS	0.00	23,762.45	0.00	$23,762.45	$23,762	*1*
Construction Oversight Labor Cost	1.00	LS	0.00	19,306.99	0.00	$19,306.99	$19,307	*1*
Reporting Labor Cost	1.00	LS	0.00	4,455.46	0.00	$ 4,455.46	$ 4,455	*1*
As-Built Drawings Labor Cost	1.00	LS	0.00	4,455.46	0.00	$ 4,455.46	$ 4,455	*1*
Public Notice Labor Cost	1.00	LS	0.00	1,485.15	0.00	$ 1,485.15	$ 1,485	*1*
Permitting Labor Cost	1.00	LS	0.00	29,703.06	0.00	$29,703.06	$29,703	*1*
						Subtotal	**$112,872**	
						SUBTOTAL MONITORED NATURAL RECOVERY - AREA IX/X	**$2,282,437**	

DESIGN COSTS				
Phase Name	**Design Approach**	**Total Capital**	**%**	**Design Cost**
Monitored Natural Recovery - Area X	Natural Attenuation	$172,630	8%	$13,810
			Subtotal Design	**$13,810**
			Base Cost	$752,394
			30-Year O&M	$1,543,853
			Total Future Cost	$2,296,248

PRESENT VALUE

Description	Total Cost	Year From Start	Calendar Year	Escalation Factor[a]	Discount Factor[b]	Total Present Value Cost
Design	$ 13,810	0	2006	1	1	$ 13,810
Remedial Action Construction	$ 738,584	1	2007	1.021	0.970	$ 731,420
Monitoring	$ 127,019	2	2008	1.042	0.941	$ 124,563
Monitoring	$ 127,019	3	2009	1.064	0.912	$ 123,355
Monitoring	$ 127,019	4	2010	1.087	0.885	$ 122,164
Monitoring	$ 127,019	5	2011	1.110	0.858	$ 120,977
Monitoring, 5-Year Review	$ 172,630	6	2012	1.133	0.833	$ 162,823
Monitoring, cap repair, 5-Yr review	$ 172,630	11	2017	1.257	0.715	$ 155,073
Monitoring, 5-Year Review	$ 172,630	16	2022	1.395	0.614	$ 147,705
Monitoring, 5-Year Review	$ 172,630	21	2027	1.547	0.527	$ 140,679
Monitoring, 5-Year Review	$ 172,630	26	2032	1.717	0.452	$ 133,986
Monitoring, 5-Year Review	$ 172,630	31	2037	1.905	0.388	$ 127,615
	$ 2,296,248					$ 2,104,171

TOTAL PRESENT VALUE - ALTERNATIVE 4: $2,104,171

Sources:
1 Racer 2005 Database
2 Vendor Quote - Aquadam - Water Structures Unlimited, 12/6/05
3 Altamont Landfill tipping fee, non-hazardous material.
4 Vendor Quote - Dutra Dredging, 12/14/05.
5 Vendor Quote - AquaBlok Limited, 12/13/05.
6 Vendor Quote - TEG Ocean Services, 1/9/06.

[c]**Annual Discount Rate (i) = 3.10%**

Notes:
a. Escalation factors from RACER 2005.
b. Annual discount factor = 1/(1+i)t, where i = 3.10% and t=year.
c. Annual discount rate obtained from OMB Circular No. A-94, 2005.

TABLE D-10: COST ESTIMATE -- AREA IX/X ALTERNATIVE 5
Feasibility Study Report for Parcel F, Hunters Point Shipyard, San Francisco, California

Alternative 5:	Location Modifiers	
Area IX/X: Focused Removal/Backfill, Off-Site Disposal, Monitored Natural Recovery, and Institutional Controls	**Material:**	*1.152*
	Labor:	*1.67*
	Equipment:	*1.076*
	Contingency on Direct Costs:	*20%*
Prepared by: M. Berry - BAI, September 2006	**Options**	
Checked by: S. Delhomme - Tetra Tech, December 2006	**RACER Database:**	Modified System
	Cost Database Date:	2006

Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Unit Cost	Extended Cost	Source
MONITORED NATURAL RECOVERY - PARTIAL AREA IX/X								
ADMINISTRATIVE LAND USE CONTROLS								
Planning Docs								
Project Manager	130.00	HR	0.00	226.48	0.00	$ 226.48	$29,442	1
Project Engineer	360.00	HR	0.00	219.62	0.00	$ 219.62	$79,063	1
Staff Engineer	820.00	HR	0.00	192.19	0.00	$ 192.19	$157,596	1
QA/QC Officer	121.00	HR	0.00	185.23	0.00	$ 185.23	$22,413	1
Word Processing/Clerical	520.00	HR	0.00	97.78	0.00	$ 97.78	$50,846	1
Draftsman/CADD	550.00	HR	0.00	127.83	0.00	$ 127.83	$70,307	1
Attorney, Partner, Real Estate	30.00	HR	0.00	200.00	0.00	$ 200.00	$ 6,000	1
Other Direct Costs	1.00	LS	4,367.26	0.00	0.00	$ 4,367.26	$ 4,367	1
						Subtotal	**$420,034**	
Planning Meetings								
Per Diem (per person)	16.00	DAY	194.00	0.00	0.00	$ 194.00	$ 3,104	1
Project Manager	160.00	HR	0.00	226.48	0.00	$ 226.48	$36,237	1
Project Engineer	128.00	HR	0.00	219.62	0.00	$ 219.62	$28,111	1
Word Processing/Clerical	128.00	HR	0.00	97.78	0.00	$ 97.78	$12,516	1
Draftsman/CADD	64.00	HR	0.00	127.83	0.00	$ 127.83	$ 8,181	1
Other Direct Costs	1.00	LS	906.62	0.00	0.00	$ 906.62	$ 907	1
						Subtotal	**$89,056**	
Implementation								
Overnight Delivery, 8 oz Letter	18.00	EA	22.21	0.00	0.00	$ 22.21	$ 400	1
Project Manager	82.00	HR	0.00	226.48	0.00	$ 226.48	$18,571	1
Project Engineer	180.00	HR	0.00	219.62	0.00	$ 219.62	$39,532	1
Staff Engineer	220.00	HR	0.00	192.19	0.00	$ 192.19	$42,282	1
QA/QC Officer	51.00	HR	0.00	185.23	0.00	$ 185.23	$ 9,447	1
Word Processing/Clerical	165.00	HR	0.00	97.78	0.00	$ 97.78	$16,134	1
Draftsman/CADD	370.00	HR	0.00	127.83	0.00	$ 127.83	$47,297	1
Computer Data Entry	200.00	HR	0.00	87.86	0.00	$ 87.86	$17,572	1
Attorney, Senior Associate, Real Estate	8.00	HR	0.00	175.00	0.00	$ 175.00	$ 1,400	1
Paralegal, Real Estate	8.00	HR	0.00	100.00	0.00	$ 100.00	$ 800	1
Other Direct Costs	1.00	LS	2,034.38	0.00	0.00	$ 2,034.38	$ 2,034	1
Construction Signs	96.00	SF	21.35	0.00	0.00	$ 21.35	$ 2,050	1
Surveying - 3-man Crew	4.00	DAY	0.00	2,696.95	390.12	$ 3,087.07	$12,348	1
Portable GPS Set with Mapping	1.00	MO	1,161.52	0.00	0.00	$ 1,161.52	$ 1,162	1
Local Fees	2.00	LS	308.96	0.00	0.00	$ 308.96	$ 618	1
						Subtotal	**$211,646**	
Modification/Termination								
Project Manager	56.00	HR	0.00	226.48	0.00	$ 226.48	$12,683	1
Project Engineer	104.00	HR	0.00	219.62	0.00	$ 219.62	$22,840	1
Staff Engineer	120.00	HR	0.00	192.19	0.00	$ 192.19	$23,063	1
QA/QC Officer	19.00	HR	0.00	185.23	0.00	$ 185.23	$ 3,519	1
Word Processing/Clerical	46.00	HR	0.00	97.78	0.00	$ 97.78	$ 4,498	1
Draftsman/CADD	36.00	HR	0.00	127.83	0.00	$ 127.83	$ 4,602	1
Other Direct Costs	1.00	LS	759.08	0.00	0.00	$ 759.08	$ 759	1
						Subtotal	**$71,964**	
				SUBTOTAL INSTITUTIONAL CONTROLS:			**$792,699**	
LONG-TERM MONITORING - MNR								
Five-Year Review								
Project Manager	35.00	HR	0.00	232.33	0.00	$ 232.33	$8,132	1
Project Engineer	67.00	HR	0.00	225.30	0.00	$ 225.30	$15,095	1
Project Scientist	33.00	HR	0.00	260.79	0.00	$ 260.79	$8,606	1
Staff Scientist	55.00	HR	0.00	193.29	0.00	$ 193.29	$10,631	1
Draftsman/CADD	24.00	HR	0.00	131.14	0.00	$ 131.14	$3,147	1
						Subtotal	**$45,611**	

TABLE D-10: COST ESTIMATE -- AREA IX/X ALTERNATIVE 5 (CONTINUED)
Feasibility Study Report for Parcel F, Hunters Point Shipyard, San Francisco, California

Alternative 5:		Location Modifiers	
Area IX/X:	Focused Removal/Backfill, Off-Site Disposal, Monitored Natural Recovery, and Institutional Controls	Material:	1.152
		Labor:	1.67
		Equipment:	1.076
		Contingency on Direct Costs:	20%
Prepared by:	M. Berry - BAI, September 2006	Options	
Checked by:	S. Delhomme - Tetra Tech, December 2006	RACER Database:	Modified System
		Cost Database Date:	2006

Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Unit Cost	Extended Cost	Source
Sample Collection								
Analysis, mercury (7041)	24.00	EA	46.93	0.00	0.00	$ 46.93	$ 1,126	1
Analysis, copper (6010)	24.00	EA	20.34	0.00	0.00	$ 20.34	$ 488	1
Analysis PCBs, (8081/8082)	24.00	EA	367.28	0.00	0.00	$ 367.28	$ 8,815	1
Bathymetry Survey - Area IX/XX	1.00	EACH	22,399.93	0.00	0.00	$22,399.93	$22,400	6
Vibracore mob/demob, shallow water drill barge/tender	1.00	EACH	6,951.70	0.00	0.00	$ 6,951.70	$ 6,952	6
Vibracore daily rate - Area IX/X	3.00	DAY	6,256.53	0.00	0.00	$ 6,256.53	$18,770	6
Vibracore consumables	3.00	DAY	617.93	0.00	0.00	$ 617.93	$ 1,854	6
Benthic analysis	24.00	EACH	386.21	0.00	0.00	$ 386.21	$ 9,269	1
General Monitoring and Reporting								
Sample collection, vehicle mileage	100.00	MI	0.49	0.00	0.00	$ 0.49	$ 49	1
Project Manager	4.00	HR	0.00	276.19	0.00	$ 276.19	$ 1,105	1
Project Engineer	30.00	HR	0.00	267.83	0.00	$ 267.83	$ 8,035	1
Project Scientist	47.00	HR	0.00	310.02	0.00	$ 310.02	$14,571	1
Staff Scientist	81.00	HR	0.00	229.78	0.00	$ 229.78	$18,612	1
Field Technician	2.00	HR	0.00	171.18	0.00	$ 171.18	$ 342	1
Word Processing/Clerical	13.00	HR	0.00	119.25	0.00	$ 119.25	$ 1,550	1
Draftsman/CADD	9.00	HR	0.00	155.90	0.00	$ 155.90	$ 1,403	1
						Subtotal	**$115,341**	
						Annual Monitoring for First Four Years	**$461,363**	
						Monitoring Every 5 Years and 5-yr Review Cost for Years 5 through 30	**$965,711**	
PROFESSIONAL LABOR MANAGEMENT - MNR								
Project Management Labor Cost	1.00	LS	0.00	29,703.06	0.00	$29,703.06	$29,703	1
Planning Documents Labor Cost	1.00	LS	0.00	23,762.45	0.00	$23,762.45	$23,762	1
Construction Oversight Labor Cost	1.00	LS	0.00	19,306.99	0.00	$19,306.99	$19,307	1
Reporting Labor Cost	1.00	LS	0.00	4,455.46	0.00	$ 4,455.46	$ 4,455	1
As-Built Drawings Labor Cost	1.00	LS	0.00	4,455.46	0.00	$ 4,455.46	$ 4,455	1
Public Notice Labor Cost	1.00	LS	0.00	1,485.15	0.00	$ 1,485.15	$ 1,485	1
Permitting Labor Cost	1.00	LS	0.00	29,703.06	0.00	$29,703.06	$29,703	1
						Subtotal	**$112,872**	
						SUBTOTAL MONITORED NATURAL RECOVERY - AREA IX/X	**$2,332,645**	
FOCUSED REMOVAL - AREA IX/X								
COFFER DAM - SOUTH BASIN								
Construction Labor	240.00	HR	0.00	101.21	0.00	$ 101.21	$24,290	1
Maintenance Labor	80.00	HR	0.00	101.21	0.00	$ 101.21	$ 8,097	1
Crawler-mounted, 2.0 CY, 235 Hydraulic Excavator	48.00	HR	0.00	137.97	206.56	$ 344.53	$16,537	1
4" Diameter Contractor's Trash Pump, 300 GPM	139.00	DAY	87.42	60.30	0.00	$ 147.72	$20,533	1
4", Class 150, PVC Piping	1,000.00	LF	3.12	18.25	0.94	$ 22.31	$22,310	1
AquaDam Rental	2,000.00	LF	0.00	0.00	97.27	$ 97.27	$194,540	2
Mobilization AquaDam	2.00	EACH	8,199.05	0.00	0.00	$ 8,199.05	$16,398	2
Installation AquaDam	6.00	DAY	3,279.62	0.00	0.00	$ 3,279.62	$19,678	2
						Subtotal	**$322,384**	
COFFER DAM - YOSEMITE CREEK								
Construction Labor	40.00	HR	0.00	95.35	0.00	$ 95.35	$ 3,814	1
Crawler-mounted, 2.0 CY, 235 Hydraulic Excavator	8.00	HR	0.00	129.98	194.59	$ 324.57	$ 2,597	1
4" Diameter Contractor's Trash Pump, 300 GPM	60.00	DAY	82.35	56.81	0.00	$ 139.16	$ 8,350	1
4", Class 150, PVC Piping	1,000.00	LF	2.94	17.19	0.88	$ 21.01	$21,010	1
AquaDam Rental	150.00	LF	0.00	0.00	91.64	$ 91.64	$13,746	2
Mobilization AquaDam	1.00	EACH	1,544.82	0.00	0.00	$ 1,544.82	$ 1,545	2
Installation AquaDam	1.00	DAY	3,089.65	0.00	0.00	$ 3,089.65	$ 3,090	2
						Subtotal	**$54,151**	
EXCAVATION AND BACKFILL								
4 CY, Crawler-mounted, Hydraulic Excavator	57,851.00	CY	0.00	2.29	3.47	$ 5.76	$333,222	1
								1
Delivered & Dumped, Backfill	28,888.89	BCY	44.01	1.99	1.48	$ 47.48	$1,371,644	1
Unclassified Fill, 6" Lifts, Off-Site, Includes Delivery, Spreading, and Compaction	72,232.22	CY	10.54	4.56	3.05	$ 18.15	$1,311,015	1
2" Diameter Trash Pump, 75 gpm	80.00	DAY	70.73	29.50	0.00	$ 100.23	$ 8,018	1

TABLE D-10: COST ESTIMATE -- AREA IX/X ALTERNATIVE 5 (CONTINUED)
Feasibility Study Report for Parcel F, Hunters Point Shipyard, San Francisco, California

Alternative 5:	**Location Modifiers**	
Area IX/X: Focused Removal/Backfill, Off-Site Disposal, Monitored Natural Recovery, and Institutional Controls	**Material:**	*1.152*
	Labor:	*1.67*
	Equipment:	*1.076*
	Contingency on Direct Costs:	*20%*
Prepared by: M. Berry - BAI, September 2006	**Options**	
Checked by: S. Delhomme - Tetra Tech, December 2006	**RACER Database:**	Modified System
	Cost Database Date:	2006

Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Unit Cost	Extended Cost	Source
Spray washing, decontaminate heavy equipment,	1.00	EA	0.00	1,072.83	0.00	$ 1,072.83	$ 1,073	*1*
2" Polyethylene, flexible piping, SDR15, 125 psi	100.00	LF	2.18	0.00	0.00	$ 2.18	$ 218	*1*
Crane Mats	10.00	EACH	3,852.82	0.00	0.00	$ 3,852.82	$38,528	*1*
						Subtotal	**$3,063,718**	
CONFIRMATION SAMPLING								
Analysis, mercury (7041)	36.00	EA	46.93	0.00	0.00	$ 46.93	$ 1,689	*1*
Analysis, copper (6010)	36.00	EA	20.34	0.00	0.00	$ 20.34	$ 732	*1*
Analysis, PCBs (8081/8082)	36.00	EA	306.06	0.00	0.00	$ 306.06	$11,018	*1*
Surveying - 2-man Crew	5.00	DAY	0.00	2,288.95	383.39	$2,672.34	$13,362	*1*
Field Technician	16.00	HR	0.00	171.18	0.00	$ 171.18	$ 2,739	*1*
						Subtotal	**$29,540**	
LOAD AND HAUL - SEDIMENT DISPOSAL (35,480 cubic yards disposed at Altamont Landfill)								
Dump Charges	75,206.00	CY	46.34	0.00	0.00	$46.34	$3,485,046	*3*
988, 7.0 CY, Wheel Loader	239.00	HR	0.00	126.64	261.97	$388.61	$92,878	*1*
32 CY, Semi Dump	10,963.00	HR	0.00	99.94	117.30	$217.24	$2,381,602	*1*
							$5,959,526	
RESIDUAL WASTE MANAGEMENT - SEDIMENT AND DECON WASTE DISPOSAL								
Secondary containment and storage, loading hazardous waste for shipment into 5,000 gal. bulk tank truck	12.00	EA	0.00	1,055.18	394.82	$ 1,450.00	$17,400	*1*
Secondary containment and storage, loading hazardous waste for shipment	18.00	EA	0.00	10.81	1.80	$ 12.61	$ 227	*1*
Subcontracted shipping of haz. waste, transport drums of solid hazardous waste, 80 55 gal. drums	17.00	MI	3.26	0.00	0.00	$ 3.26	$ 55	*1*
Subcontracted shipping of hazardous waste, transport bulk sludge/liquid hazardous waste, 5000 gal.	840.00	MI	3.26	0.00	0.00	$ 3.26	$ 2,738	*1*
Commercial RCRA landfills, additional costs, waste stream evaluation, 50% rebate on first	2.00	EA	793.09	0.00	0.00	$ 793.09	$ 1,586	*1*
Commercial RCRA landfills, drummed waste disposal, solid, non-hazardous, 55 gal drums	18.00	EA	13.50	0.00	0.00	$ 13.50	$ 243	*1*
						Subtotal	**$22,250**	
DEWATERING PAD								
Grub and stack, 140 H.P. dozer	212.00	CY	0.00	6.75	2.29	$ 9.04	$ 1,916	*1*
Excavating, trench, normal soil, to 2' - 6' deep, excavate by hand, piled only	212.00	BCY	0.00	165.78	0.00	$ 165.78	$35,145	*1*
953, 2.0 CY, Track Loader	500.00	HR	0.00	119.96	104.04	$ 224.00	$112,000	*1*
Backfill Trench, Borrow Material, Delivered & Dumped Only	136.00	CY	10.16	4.46	1.89	$ 16.51	$ 2,245	*1*
18" x 18" Underground French Drain	753.39	LF	6.15	3.81	0.58	$ 10.54	$ 7,941	*1*
Pump, pedestal sump, single stage, 75 GPM, 1-1/2 H.P., 2" discharge	1.00	EA	4,242.65	1,769.93	0.00	$ 6,012.58	$ 6,013	*1*
Storage Tanks, plastic, ground level, horizontal cylinder, 550 gallons	1.00	EA	2,570.88	1,067.48	0.00	$ 3,638.36	$ 3,638	*1*
Storage Tanks, plastic, ground level, horizontal cylinder, 6" NP conn., 4,000 gal	1.00	EA	6,685.01	1,673.48	0.00	$ 8,358.49	$ 8,358	*1*
Polymeric Liner Anchor Trench, 3'x1.5'	792.00	LF	0.06	4.45	0.42	$ 4.93	$ 3,905	*1*
Secure burial cell construction, polymeric liner and cover system, polyvinyl chloride (PVC), 40 mil	38,259.00	SF	0.59	0.93	0.04	$ 1.56	$59,684	*1*
Waste Pile Cover, 135 Lb Tear,	3,742.00	SY	2.88	0.83	0.00	$ 3.71	$13,883	*1*
Pump, submersible sump, automatic, 15 GPM, 1-1/2" discharge, 15' head	1.00	EA	1,336.83	286.89	0.00	$ 1,623.72	$ 1,624	*1*
Operator, dewatering pad	340.00	HR	0.00	171.00	0.00	$171.00	$58,140	
						Subtotal	**$314,493**	
DECONTAMINATION FACILITIES								
Decon pad for heavy equipment and personnel							$108,130	*1*
						Subtotal	**$108,130**	

TABLE D-10: COST ESTIMATE -- AREA IX/X ALTERNATIVE 5 (CONTINUED)
Feasibility Study Report for Parcel F, Hunters Point Shipyard, San Francisco, California

Alternative 5:		Location Modifiers	
Area IX/X:	Focused Removal/Backfill, Off-Site Disposal, Monitored Natural Recovery, and Institutional Controls	Material:	*1.152*
		Labor:	*1.67*
		Equipment:	*1.076*
		Contingency on Direct Costs:	*20%*
Prepared by:	M. Berry - BAI, September 2006	**Options**	
Checked by:	S. Delhomme - Tetra Tech, December 2006	RACER Database:	Modified System
		Cost Database Date:	2006

Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Unit Cost	Extended Cost	Source
PROFESSIONAL LABOR MANAGEMENT - FOCUSED REMOVAL AREA IX/X								
Project Management Labor Cost	1.00	LS	0.00	664,955.02	0.00	$664,955.02	$664,955	*1*
Planning Documents Labor Cost	1.00	LS	0.00	731,450.49	0.00	$731,450.49	$731,450	*1*
Construction Oversight Labor Cost	1.00	LS	0.00	997,432.5	0.00	$997,432.53	$997,433	*1*
Reporting Labor Cost	1.00	LS	0.00	110,825.83	0.00	$110,825.83	$110,826	*1*
As-Built Drawings Labor Cost	1.00	LS	0.00	110,825.83	0.00	$110,825.83	$110,826	*1*
Public Notice Labor Cost	1.00	LS	0.00	11,082.58	0.00	$11,082.58	$11,083	*1*
Permitting Labor Cost	1.00	LS	0.00	554,129.15	0.00	$554,129.15	$554,129	*1*
						Subtotal	**$3,180,701**	
						SUBTOTAL FOCUSED REMOVAL - AREA X	**$13,054,893**	

DESIGN COSTS

Phase Name	Design Approach	Total Capital	%	Design Cost
Monitored Natural Recovery - Area X	Natural Attenuation	$172,630	8%	$13,810
Focused Removal - Area X	Ex Situ Removal - Off-site	$9,874,192	10%	$987,419
			Subtotal Design	**$1,001,230**

Base Cost	$14,961,694
30-Year O&M	$1,427,074
Total Future Cost	$16,388,767

PRESENT VALUE

Description	Total Cost	Year From Start	Calendar Year	Escalation Factor[a]	Discount Factor[b]	Total Present Value Cost
Design	$ 1,001,230	0	2006	1	1	$ 1,001,230
Remedial Action Construction	$ 13,960,464	1	2007	1.021	0.970	$ 13,825,057
Monitoring	$ 115,341	2	2008	1.042	0.941	$ 113,111
Monitoring	$ 115,341	3	2009	1.064	0.912	$ 112,014
Monitoring	$ 192,647	4	2010	1.087	0.885	$ 185,284
Monitoring	$ 192,647	5	2011	1.110	0.858	$ 183,483
Monitoring, 5-Year Review	$ 238,258	6	2012	1.133	0.833	$ 224,723
Monitoring, cap repair, 5-Yr review	$ 238,258	11	2017	1.257	0.715	$ 214,027
Monitoring, 5-Year Review	$ 238,258	16	2022	1.395	0.614	$ 203,858
Monitoring, 5-Year Review	$ 238,258	21	2027	1.547	0.527	$ 194,161
Monitoring, 5-Year Review	$ 238,258	26	2032	1.717	0.452	$ 184,923
Monitoring, 5-Year Review	$ 238,258	31	2037	1.905	0.388	$ 176,130
	$ 17,007,216					$ 16,618,000

TOTAL PRESENT VALUE - ALTERNATIVE 5: $16,618,000

Sources:
1. Racer 2005 Database
2. Vendor Quote - Aquadam - Water Structures Unlimited, 12/6/05
3. Altamont Landfill tipping fee, non-hazardous material.
4. Vendor Quote - Dutra Dredging, 12/14/05.
5. Vendor Quote - AquaBlok Limited, 12/13/05.
6. Vendor Quote - TEG Ocean Services, 1/9/06.
7. Carbon application costs were extrapolated from the 2005 Parcel F pilot test conducted by Stanford University.

[c]**Annual Discount Rate (i) = 3.10%**

Notes:
a. Escalation factors from RACER 2005.
b. Annual discount factor = 1/(1+i)t, where i = 3.10% and t=year.
c. Annual discount rate obtained from OMB Circular No. A-94, 2005.

TABLE D-11: COST ESTIMATE -- AREA IX/X ALTERNATIVE 5A
Feasibility Study Report for Parcel F, Hunters Point Shipyard, San Francisco, California

Alternative 5A:	Location Modifiers
Area X: Focused Removal/Activated Backfill Off-Site Disposal, Monitored Natural Recovery, and Institutional Controls	Material: 1.152 Labor: 1.67 Equipment: 1.076 Contingency on Direct Costs: 20%
Prepared by: M. Berry - BAI, September 2006 Checked by: S. Delhomme - Tetra Tech, December 2006	Options RACER Database: Modified System Cost Database Date: 2006

Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Unit Cost	Extended Cost	Source
MONITORED NATURAL RECOVERY - PARTIAL AREA IX/X								
ADMINISTRATIVE LAND USE CONTROLS								
Planning Docs								
Project Manager	130.00	HR	0.00	226.48	0.00	$ 226.48	$29,442	1
Project Engineer	360.00	HR	0.00	219.62	0.00	$ 219.62	$79,063	1
Staff Engineer	820.00	HR	0.00	192.19	0.00	$ 192.19	$157,596	1
QA/QC Officer	121.00	HR	0.00	185.23	0.00	$ 185.23	$22,413	1
Word Processing/Clerical	520.00	HR	0.00	97.78	0.00	$ 97.78	$50,846	1
Draftsman/CADD	550.00	HR	0.00	127.83	0.00	$ 127.83	$70,307	1
Attorney, Partner, Real Estate	30.00	HR	0.00	200.00	0.00	$ 200.00	$ 6,000	1
Other Direct Costs	1.00	LS	4,367.26	0.00	0.00	$ 4,367.26	$ 4,367	1
						Subtotal	**$420,034**	
Planning Meetings								
Per Diem (per person)	16.00	DAY	194.00	0.00	0.00	$ 194.00	$ 3,104	1
Project Manager	160.00	HR	0.00	226.48	0.00	$ 226.48	$36,237	1
Project Engineer	128.00	HR	0.00	219.62	0.00	$ 219.62	$28,111	1
Word Processing/Clerical	128.00	HR	0.00	97.78	0.00	$ 97.78	$12,516	1
Draftsman/CADD	64.00	HR	0.00	127.83	0.00	$ 127.83	$ 8,181	1
Other Direct Costs	1.00	LS	906.62	0.00	0.00	$ 906.62	$ 907	1
						Subtotal	**$89,056**	
Implementation								
Overnight Delivery, 8 oz Letter	18.00	EA	22.21	0.00	0.00	$ 22.21	$ 400	1
Project Manager	82.00	HR	0.00	226.48	0.00	$ 226.48	$18,571	1
Project Engineer	180.00	HR	0.00	219.62	0.00	$ 219.62	$39,532	1
Staff Engineer	220.00	HR	0.00	192.19	0.00	$ 192.19	$42,282	1
QA/QC Officer	51.00	HR	0.00	185.23	0.00	$ 185.23	$ 9,447	1
Word Processing/Clerical	165.00	HR	0.00	97.78	0.00	$ 97.78	$16,134	1
Draftsman/CADD	370.00	HR	0.00	127.83	0.00	$ 127.83	$47,297	1
Computer Data Entry	200.00	HR	0.00	87.86	0.00	$ 87.86	$17,572	1
Attorney, Senior Associate, Real Estate	8.00	HR	0.00	175.00	0.00	$ 175.00	$ 1,400	1
Paralegal, Real Estate	8.00	HR	0.00	100.00	0.00	$ 100.00	$ 800	1
Other Direct Costs	1.00	LS	2,034.38	0.00	0.00	$ 2,034.38	$ 2,034	1
Construction Signs	96.00	SF	21.35	0.00	0.00	$ 21.35	$ 2,050	1
Surveying - 3-man Crew	4.00	DAY	0.00	2,696.95	390.12	$ 3,087.07	$12,348	1
Portable GPS Set with Mapping	1.00	MO	1,161.52	0.00	0.00	$ 1,161.52	$ 1,162	1
Local Fees	2.00	LS	308.96	0.00	0.00	$ 308.96	$ 618	1
						Subtotal	**$211,646**	
Modification/Termination								
Project Manager	56.00	HR	0.00	226.48	0.00	$ 226.48	$12,683	1
Project Engineer	104.00	HR	0.00	219.62	0.00	$ 219.62	$22,840	1
Staff Engineer	120.00	HR	0.00	192.19	0.00	$ 192.19	$23,063	1
QA/QC Officer	19.00	HR	0.00	185.23	0.00	$ 185.23	$ 3,519	1
Word Processing/Clerical	46.00	HR	0.00	97.78	0.00	$ 97.78	$ 4,498	1
Draftsman/CADD	36.00	HR	0.00	127.83	0.00	$ 127.83	$ 4,602	1
Other Direct Costs	1.00	LS	759.08	0.00	0.00	$ 759.08	$ 759	1
						Subtotal	**$71,964**	
LONG-TERM MONITORING - MNR								
Five-Year Review								
Project Manager	35.00	HR	0.00	232.33	0.00	$ 232.33	$8,132	1
Project Engineer	67.00	HR	0.00	225.30	0.00	$ 225.30	$15,095	1
Project Scientist	33.00	HR	0.00	260.79	0.00	$ 260.79	$8,606	1
Staff Scientist	55.00	HR	0.00	193.29	0.00	$ 193.29	$10,631	1
Draftsman/CADD	24.00	HR	0.00	131.14	0.00	$ 131.14	$3,147	1
						Subtotal	**$45,611**	
Sample Collection								
Analysis, mercury (7041)	24.00	EA	46.93	0.00	0.00	$ 46.93	$ 1,126	1
Analysis, copper (6010)	24.00	EA	20.34	0.00	0.00	$ 20.34	$ 488	1
Analysis PCBs, (8081/8082)	24.00	EA	367.28	0.00	0.00	$ 367.28	$ 8,815	1
Bathymetry Survey - Area X	1.00	EACH	22,399.93	0.00	0.00	$22,399.93	$22,400	6
Vibracore mob/demob, shallow water drill barge/tender	1.00	EACH	6,951.70	0.00	0.00	$ 6,951.70	$ 6,952	6
Vibracore daily rate - Area X	3.00	DAY	6,256.53	0.00	0.00	$ 6,256.53	$18,770	6
Vibracore consumables	3.00	DAY	617.93	0.00	0.00	$ 617.93	$ 1,854	6
Benthic analysis	24.00	EACH	386.21	0.00	0.00	$ 386.21	$ 9,269	1

TABLE D-11: COST ESTIMATE -- AREA IX/X ALTERNATIVE 5A (CONTINUED)
Feasibility Study Report for Parcel F, Hunters Point Shipyard, San Francisco, California

Alternative 5A:	Location Modifiers
Area X: Focused Removal/Activated Backfill Off-Site Disposal, Monitored Natural Recovery, and Institutional Controls	Material: 1.152 Labor: 1.67 Equipment: 1.076 Contingency on Direct Costs: 20%
Prepared by: M. Berry - BAI, September 2006 Checked by: S. Delhomme - Tetra Tech, December 2006	**Options** RACER Database: Modified System Cost Database Date: 2006

Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Unit Cost	Extended Cost	Source
General Monitoring and Reporting								
Sample collection, vehicle mileage	100.00	MI	0.49	0.00	0.00	$ 0.49	$ 49	1
Project Manager	4.00	HR	0.00	276.19	0.00	$ 276.19	$ 1,105	1
Project Engineer	30.00	HR	0.00	267.83	0.00	$ 267.83	$ 8,035	1
Project Scientist	47.00	HR	0.00	310.02	0.00	$ 310.02	$14,571	1
Staff Scientist	81.00	HR	0.00	229.78	0.00	$ 229.78	$18,612	1
Field Technician	2.00	HR	0.00	171.18	0.00	$ 171.18	$ 342	1
Word Processing/Clerical	13.00	HR	0.00	119.25	0.00	$ 119.25	$ 1,550	1
Draftsman/CADD	9.00	HR	0.00	155.90	0.00	$ 155.90	$ 1,403	1
						Subtotal	**$115,341**	
						Annual Monitoring for First Four Years	**$461,363**	
						Monitoring Every 5 Years and 5-yr Review Cost for Years 5 through 30	**$965,711**	
PROFESSIONAL LABOR MANAGEMENT - MNR								
Project Management Labor Cost	1.00	LS	0.00	29,703.06	0.00	$29,703.06	$29,703	1
Planning Documents Labor Cost	1.00	LS	0.00	23,762.45	0.00	$23,762.45	$23,762	1
Construction Oversight Labor Cost	1.00	LS	0.00	19,306.99	0.00	$19,306.99	$19,307	1
Reporting Labor Cost	1.00	LS	0.00	4,455.46	0.00	$ 4,455.46	$ 4,455	1
As-Built Drawings Labor Cost	1.00	LS	0.00	4,455.46	0.00	$ 4,455.46	$ 4,455	1
Public Notice Labor Cost	1.00	LS	0.00	1,485.15	0.00	$ 1,485.15	$ 1,485	1
Permitting Labor Cost	1.00	LS	0.00	29,703.06	0.00	$29,703.06	$29,703	1
						Subtotal	**$112,872**	
						SUBTOTAL MONITORED NATURAL RECOVERY - AREA X	**$2,332,645**	
FOCUSED REMOVAL - AREA X								
COFFER DAM - SOUTH BASIN								
Construction Labor	240.00	HR	0.00	101.21	0.00	$ 101.21	$24,290	1
Maintenance Labor	80.00	HR	0.00	101.21	0.00	$ 101.21	$ 8,097	1
Crawler-mounted, 2.0 CY, 235 Hydraulic Excavator	48.00	HR	0.00	137.97	206.56	$ 344.53	$16,537	1
4" Diameter Contractor's Trash Pump, 300 GPM	139.00	DAY	87.42	60.30	0.00	$ 147.72	$20,533	1
4", Class 150, PVC Piping	1,000.00	LF	3.12	18.25	0.94	$ 22.31	$22,310	1
AquaDam Rental	2,000.00	LF	0.00	0.00	97.27	$ 97.27	$194,540	2
Mobilization AquaDam	2.00	EACH	8,199.05	0.00	0.00	$ 8,199.05	$16,398	2
Installation AquaDam	6.00	DAY	3,279.62	0.00	0.00	$ 3,279.62	$19,678	2
						Subtotal	**$322,384**	
COFFER DAM - YOSEMITE CREEK								
Construction Labor	40.00	HR	0.00	95.35	0.00	$ 95.35	$ 3,814	1
Crawler-mounted, 2.0 CY, 235 Hydraulic Excavator	8.00	HR	0.00	129.98	194.59	$ 324.57	$ 2,597	1
4" Diameter Contractor's Trash Pump, 300 GPM	60.00	DAY	82.35	56.81	0.00	$ 139.16	$ 8,350	1
4", Class 150, PVC Piping	1,000.00	LF	2.94	17.19	0.88	$ 21.01	$21,010	1
AquaDam Rental	150.00	LF	0.00	0.00	91.64	$ 91.64	$13,746	2
Mobilization AquaDam	1.00	EACH	1,544.82	0.00	0.00	$ 1,544.82	$ 1,545	2
Installation AquaDam	1.00	DAY	3,089.65	0.00	0.00	$ 3,089.65	$ 3,090	2
						Subtotal	**$54,151**	
EXCAVATION AND BACKFILL								
4 CY, Crawler-mounted,	57,851.00	CY	0.00	2.29	3.47	$ 5.76	$333,222	1
Hydraulic Excavator								1
Delivered & Dumped, Backfill	28,888.89	BCY	44.01	1.99	1.48	$ 47.48	$1,371,644	1
Unclassified Fill, 6" Lifts, Off-Site, Includes Delivery, Spreading, and Compaction	72,232.22	CY	10.54	4.56	3.05	$ 18.15	$1,311,015	1
2" Diameter Trash Pump, 75 gpm	80.00	DAY	70.73	29.50	0.00	$ 100.23	$ 8,018	1
Spray washing, decontaminate heavy equipment,	1.00	EA	0.00	1,072.83	0.00	$ 1,072.83	$ 1,073	1
2" Polyethylene, flexible piping, SDR15, 125 psi	100.00	LF	2.18	0.00	0.00	$ 2.18	$ 218	1
Crane Mats	10.00	EACH	3,852.82	0.00	0.00	$ 3,852.82	$38,528	1
						Subtotal	**$3,063,718**	

TABLE D-11: COST ESTIMATE -- AREA IX/X ALTERNATIVE 5A (CONTINUED)
Feasibility Study Report for Parcel F, Hunters Point Shipyard, San Francisco, California

Alternative 5A:	**Location Modifiers**
Area X: Focused Removal/Activated Backfill Off-Site Disposal, Monitored Natural Recovery, and Institutional Controls	**Material:** *1.152* **Labor:** *1.67* **Equipment:** *1.076* **Contingency on Direct Costs:** *20%*
Prepared by: M. Berry - BAI, September 2006 Checked by: S. Delhomme - Tetra Tech, December 2006	**Options** **RACER Database:** Modified System **Cost Database Date:** 2006

Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Unit Cost	Extended Cost	Source
ADD ACTIVATED CARBON TO BACKFILL								
Activated Carbon - Coal Derived	1,967.00	Cy	1,668.36	86.32	47.90	$ 1,802.58	$3,545,675	7
Soil Tilling, D3 Dozer with Tiller Attachm	40.00	HR	0.00	126.64	72.86	$ 199.50	$ 7,980	1
Broadcast carbon using tractor spreade	33.00	ACRE	85.18	20.41	0.00	$ 105.59	$ 3,484	1
Spray washers & decontamination for li	1.00	EA	0.00	362.08	0.00	$ 362.08	$ 362	1
Spray washing, decontaminate med equ	1.00	EA	0.00	724.16	0.00	$ 724.16	$ 724	1
Standby D3 Bulldozer with Tiller	30.00	HR	0.00	0.00	14.98	$ 14.98	$ 449	1
						Subtotal	**$3,558,675**	
CONFIRMATION SAMPLING								
Analysis, mercury (7041)	36.00	EA	46.93	0.00	0.00	$ 46.93	$ 1,689	1
Analysis, copper (6010)	36.00	EA	20.34	0.00	0.00	$ 20.34	$ 732	1
Analysis, PCBs (8081/8082)	36.00	EA	306.06	0.00	0.00	$ 306.06	$11,018	1
Surveying - 2-man Crew	5.00	DAY	0.00	2,288.95	383.39	$2,672.34	$13,362	1
Field Technician	16.00	HR	0.00	171.18	0.00	$ 171.18	$ 2,739	1
						Subtotal	**$29,540**	
LOAD AND HAUL - SEDIMENT DISPOSAL (35,480 cubic yards disposed at Altamont Landfill)								
Dump Charges	75,206.00	CY	46.34	0.00	0.00	$46.34	$3,485,046	3
988, 7.0 CY, Wheel Loader	239.00	HR	0.00	126.64	261.97	$388.61	$92,878	1
32 CY, Semi Dump	10,963.00	HR	0.00	99.94	117.30	$217.24	$2,381,602	1
							$5,959,526	
RESIDUAL WASTE MANAGEMENT - SEDIMENT AND DECON WASTE DISPOSAL								
Secondary containment and storage, loading hazardous waste for shipment into 5,000 gal. bulk tank truck	12.00	EA	0.00	1,055.18	394.82	$ 1,450.00	$17,400	1
Secondary containment and storage, loading hazardous waste for shipment	18.00	EA	0.00	10.81	1.80	$ 12.61	$ 227	1
Subcontracted shipping of haz. waste, transport drums of solid hazardous waste, 80 55 gal. drums	17.00	MI	3.26	0.00	0.00	$ 3.26	$ 55	1
Subcontracted shipping of hazardous waste, transport bulk sludge/liquid hazardous waste, 5000 gal.	840.00	MI	3.26	0.00	0.00	$ 3.26	$ 2,738	1
Commercial RCRA landfills, additional costs, waste stream evaluation, 50% rebate on first	2.00	EA	793.09	0.00	0.00	$ 793.09	$ 1,586	1
Commercial RCRA landfills, drummed waste disposal, solid, non-hazardous, 55 gal drums	18.00	EA	13.50	0.00	0.00	$ 13.50	$ 243	1
						Subtotal	**$22,250**	
DEWATERING PAD								
Grub and stack, 140 H.P. dozer	212.00	CY	0.00	6.75	2.29	$ 9.04	$ 1,916	1
Excavating, trench, normal soil, to 2' - 6' deep, excavate by hand, piled only	212.00	BCY	0.00	165.78	0.00	$ 165.78	$35,145	1
953, 2.0 CY, Track Loader	500.00	HR	0.00	119.96	104.04	$ 224.00	$112,000	1
Backfill Trench, Borrow Material, Delivered & Dumped Only	136.00	CY	10.16	4.46	1.89	$ 16.51	$ 2,245	1
18" x 18" Underground French Drain	753.39	LF	6.15	3.81	0.58	$ 10.54	$ 7,941	1
Pump, pedestal sump, single stage, 75 GPM, 1-1/2 H.P., 2" discharge	1.00	EA	4,242.65	1,769.93	0.00	$ 6,012.58	$ 6,013	1
Storage Tanks, plastic, ground level, horizontal cylinder, 550 gallons	1.00	EA	2,570.88	1,067.48	0.00	$ 3,638.36	$ 3,638	1
Storage Tanks, plastic, ground level, horizontal cylinder, 6" NP conn., 4,000 gal	1.00	EA	6,685.01	1,673.48	0.00	$ 8,358.49	$ 8,358	1
Polymeric Liner Anchor Trench, 3'x1.5'	792.00	LF	0.06	4.45	0.42	$ 4.93	$ 3,905	1
Secure burial cell construction, polymeric liner and cover system, polyvinyl chloride (PVC), 40 mil	38,259.00	SF	0.59	0.93	0.04	$ 1.56	$59,684	1
Waste Pile Cover, 135 Lb Tear,	3,742.00	SY	2.88	0.83	0.00	$ 3.71	$13,883	1
Pump, submersible sump, automatic, 15 GPM, 1-1/2" discharge, 15' head	1.00	EA	1,336.83	286.89	0.00	$ 1,623.72	$ 1,624	1
Operator, dewatering pad	340.00	HR	0.00	171.00	0.00	$171.00	$58,140	
						Subtotal	**$314,493**	

TABLE D-11: COST ESTIMATE -- AREA IX/X ALTERNATIVE 5A (CONTINUED)
Feasibility Study Report for Parcel F, Hunters Point Shipyard, San Francisco, California

Alternative 5A:	**Location Modifiers**
Area X: Focused Removal/Activated Backfill Off-Site Disposal, Monitored Natural Recovery, and Institutional Controls	**Material:** 1.152 **Labor:** 1.67 **Equipment:** 1.076 **Contingency on Direct Costs:** 20%
Prepared by: M. Berry - BAI, September 2006 Checked by: S. Delhomme - Tetra Tech, December 2006	**Options** **RACER Database:** Modified System **Cost Database Date:** 2006

Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Unit Cost	Extended Cost	Source
DECONTAMINATION FACILITIES								
Decon pad for heavy equipment and personnel							$108,130	1
						Subtotal	**$108,130**	
PROFESSIONAL LABOR MANAGEMENT - FOCUSED REMOVAL AREA X								
Project Management Labor Cost	1.00	LS	0.00	913,010.24	0.00	$913,010.24	$913,010	1
Planning Documents Labor Cost	1.00	LS	0.00	1,004,311.24	0.00	$1,004,311.24	$1,004,311	1
Construction Oversight Labor Cost	1.00	LS	0.00	1,369,515.3	0.00	$1,369,515.33	$1,369,515	1
Reporting Labor Cost	1.00	LS	0.00	152,168.38	0.00	$152,168.38	$152,168	1
As-Built Drawings Labor Cost	1.00	LS	0.00	152,168.38	0.00	$152,168.38	$152,168	1
Public Notice Labor Cost	1.00	LS	0.00	15,216.84	0.00	$15,216.84	$15,217	1
Permitting Labor Cost	1.00	LS	0.00	760,841.88	0.00	$760,841.88	$760,842	1
						Subtotal	**$4,367,232**	
						SUBTOTAL FOCUSED REMOVAL - AREA X	**$17,800,099**	

DESIGN COSTS

Phase Name	Design Approach	Total Capital	%	Design Cost
Monitored Natural Recovery - Area X	Natural Attenuation	$172,630	8%	$13,810
Focused Removal - Area X	Ex Situ Removal - Off-site	$13,432,697	10%	$1,343,270
			Subtotal Design	**$1,357,080**

Base Cost	$20,062,750
30-Year O&M	$1,427,074
Total Future Cost	$21,489,824

PRESENT VALUE

Description	Total Cost	Year From Start	Calendar Year	Escalation Factor[a]	Discount Factor[b]	Total Present Value Cost
Design	$ 1,357,080	0	2006	1	1	$ 1,357,080
Remedial Action Construction	$ 18,705,670	1	2007	1.021	0.970	$ 18,524,238
Monitoring	$ 115,341	2	2008	1.042	0.941	$ 113,111
Monitoring	$ 115,341	3	2009	1.064	0.912	$ 112,014
Monitoring	$ 192,647	4	2010	1.087	0.885	$ 185,284
Monitoring	$ 192,647	5	2011	1.110	0.858	$ 183,483
Monitoring, 5-Year Review	$ 238,258	6	2012	1.133	0.833	$ 224,723
Monitoring, cap repair, 5-Yr review	$ 238,258	11	2017	1.257	0.715	$ 214,027
Monitoring, 5-Year Review	$ 238,258	16	2022	1.395	0.614	$ 203,858
Monitoring, 5-Year Review	$ 238,258	21	2027	1.547	0.527	$ 194,161
Monitoring, 5-Year Review	$ 238,258	26	2032	1.717	0.452	$ 184,923
Monitoring, 5-Year Review	$ 238,258	31	2037	1.905	0.388	$ 176,130
	$ 22,108,272					$ 21,673,031

TOTAL PRESENT VALUE - ALTERNATIVE 5a: $21,673,031

Sources:
1 Racer 2005 Database
2 Vendor Quote - Aquadam - Water Structures Unlimited, 12/6/05
3 Altamont Landfill tipping fee, non-hazardous material.
4 Vendor Quote - Dutra Dredging, 12/14/05.
5 Vendor Quote - AquaBlok Limited, 12/13/05.
6 Vendor Quote - TEG Ocean Services, 1/9/06.
7 Carbon application costs were extrapolated from the 2005 Parcel F pilot test conducted by Stanford University.

[c]Annual Discount Rate (i) = 3.10%

Notes:
a. Escalation factors from RACER 2005.
b. Annual discount factor = 1/(1+i)t, where i = 3.10% and t=year.
c. Annual discount rate obtained from OMB Circular No. A-94, 2005.

TABLE D-12: COST ESTIMATE -- AREA IX/X ALTERNATIVE 6
Feasibility Study Report for Parcel F, Hunters Point Shipyard, San Francisco, California

Alternative 6:	**Location Modifiers**
Area IX/X: Focused Shoreline Removal/Backfill, Off-Site Disposal, Monitored Natural Recovery, and Institutional Controls	**Material:** *1.152* **Labor:** *1.67* **Equipment:** *1.076* **Contingency on Direct Costs:** *20%*
Prepared by: M. Berry - BAI, September 2006 Checked by: S. Delhomme - Tetra Tech, December 2006	**Options** **RACER Database:** Modified System **Cost Database Date:** 2006

Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Unit Cost	Extended Cost	Source
MONITORED NATURAL RECOVERY - PARTIAL AREA IX/X								
ADMINISTRATIVE LAND USE CONTROLS								
Planning Docs								
Project Manager	130.00	HR	0.00	226.48	0.00	$ 226.48	$29,442	1
Project Engineer	360.00	HR	0.00	219.62	0.00	$ 219.62	$79,063	1
Staff Engineer	820.00	HR	0.00	192.19	0.00	$ 192.19	$157,596	1
QA/QC Officer	121.00	HR	0.00	185.23	0.00	$ 185.23	$22,413	1
Word Processing/Clerical	520.00	HR	0.00	97.78	0.00	$ 97.78	$50,846	1
Draftsman/CADD	550.00	HR	0.00	127.83	0.00	$ 127.83	$70,307	1
Attorney, Partner, Real Estate	30.00	HR	0.00	200.00	0.00	$ 200.00	$ 6,000	1
Other Direct Costs	1.00	LS	4,367.26	0.00	0.00	$ 4,367.26	$ 4,367	1
						Subtotal	**$420,034**	
Planning Meetings								
Per Diem (per person)	16.00	DAY	194.00	0.00	0.00	$ 194.00	$ 3,104	1
Project Manager	160.00	HR	0.00	226.48	0.00	$ 226.48	$36,237	1
Project Engineer	128.00	HR	0.00	219.62	0.00	$ 219.62	$28,111	1
Word Processing/Clerical	128.00	HR	0.00	97.78	0.00	$ 97.78	$12,516	1
Draftsman/CADD	64.00	HR	0.00	127.83	0.00	$ 127.83	$ 8,181	1
Other Direct Costs	1.00	LS	906.62	0.00	0.00	$ 906.62	$ 907	1
						Subtotal	**$89,056**	
Implementation								
Overnight Delivery, 8 oz Letter	18.00	EA	22.21	0.00	0.00	$ 22.21	$ 400	1
Project Manager	82.00	HR	0.00	226.48	0.00	$ 226.48	$18,571	1
Project Engineer	180.00	HR	0.00	219.62	0.00	$ 219.62	$39,532	1
Staff Engineer	220.00	HR	0.00	192.19	0.00	$ 192.19	$42,282	1
QA/QC Officer	51.00	HR	0.00	185.23	0.00	$ 185.23	$ 9,447	1
Word Processing/Clerical	165.00	HR	0.00	97.78	0.00	$ 97.78	$16,134	1
Draftsman/CADD	370.00	HR	0.00	127.83	0.00	$ 127.83	$47,297	1
Computer Data Entry	200.00	HR	0.00	87.86	0.00	$ 87.86	$17,572	1
Attorney, Senior Associate, Real Estate	8.00	HR	0.00	175.00	0.00	$ 175.00	$ 1,400	1
Paralegal, Real Estate	8.00	HR	0.00	100.00	0.00	$ 100.00	$ 800	1
Other Direct Costs	1.00	LS	2,034.38	0.00	0.00	$ 2,034.38	$ 2,034	1
Construction Signs	96.00	SF	21.35	0.00	0.00	$ 21.35	$ 2,050	1
Surveying - 3-man Crew	4.00	DAY	0.00	2,696.95	390.12	$ 3,087.07	$12,348	1
Portable GPS Set with Mapping	1.00	MO	1,161.52	0.00	0.00	$ 1,161.52	$ 1,162	1
Local Fees	2.00	LS	308.96	0.00	0.00	$ 308.96	$ 618	1
						Subtotal	**$211,646**	
Modification/Termination								
Project Manager	56.00	HR	0.00	226.48	0.00	$ 226.48	$12,683	1
Project Engineer	104.00	HR	0.00	219.62	0.00	$ 219.62	$22,840	1
Staff Engineer	120.00	HR	0.00	192.19	0.00	$ 192.19	$23,063	1
QA/QC Officer	19.00	HR	0.00	185.23	0.00	$ 185.23	$ 3,519	1
Word Processing/Clerical	46.00	HR	0.00	97.78	0.00	$ 97.78	$ 4,498	1
Draftsman/CADD	36.00	HR	0.00	127.83	0.00	$ 127.83	$ 4,602	1
Other Direct Costs	1.00	LS	759.08	0.00	0.00	$ 759.08	$ 759	1
						Subtotal	**$71,964**	
LONG-TERM MONITORING - MNR								
Five-Year Review								
Project Manager	35.00	HR	0.00	232.33	0.00	$ 232.33	$8,132	1
Project Engineer	67.00	HR	0.00	225.30	0.00	$ 225.30	$15,095	1
Project Scientist	33.00	HR	0.00	260.79	0.00	$ 260.79	$8,606	1
Staff Scientist	55.00	HR	0.00	193.29	0.00	$ 193.29	$10,631	1
Draftsman/CADD	24.00	HR	0.00	131.14	0.00	$ 131.14	$3,147	1
						Subtotal	**$45,611**	
Sample Collection								
Analysis, mercury (7041)	24.00	EA	46.93	0.00	0.00	$ 46.93	$ 1,126	1
Analysis, copper (6010)	24.00	EA	20.34	0.00	0.00	$ 20.34	$ 488	1
Analysis PCBs, (8081/8082)	24.00	EA	367.28	0.00	0.00	$ 367.28	$ 8,815	1
Bathymetry Survey - Area IX/X	1.00	EACH	22,399.93	0.00	0.00	$22,399.93	$22,400	6
Vibracore mob/demob, shallow water drill barge/tender	1.00	EACH	6,951.70	0.00	0.00	$ 6,951.70	$ 6,952	6
Vibracore daily rate - Area IX/X	3.00	DAY	6,256.53	0.00	0.00	$ 6,256.53	$18,770	6
Vibracore consumables	3.00	DAY	617.93	0.00	0.00	$ 617.93	$ 1,854	6
Benthic analysis	24.00	EACH	386.21	0.00	0.00	$ 386.21	$ 9,269	1

TABLE D-12: COST ESTIMATE -- AREA IX/X ALTERNATIVE 6 (CONTINUED)
Feasibility Study Report for Parcel F, Hunters Point Shipyard, San Francisco, California

Alternative 6:	Location Modifiers
Area IX/X: Focused Shoreline Removal/Backfill, Off-Site Disposal, Monitored Natural Recovery, and Institutional Controls	**Material:** 1.152 **Labor:** 1.67 **Equipment:** 1.076 **Contingency on Direct Costs:** 20%
Prepared by: M. Berry - BAI, September 2006 Checked by: S. Delhomme - Tetra Tech, December 2006	**Options** **RACER Database:** Modified System **Cost Database Date:** 2006

Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Unit Cost	Extended Cost	Source
General Monitoring and Reporting								
Sample collection, vehicle mileage	100.00	MI	0.49	0.00	0.00	$ 0.49	$ 49	1
Project Manager	4.00	HR	0.00	276.19	0.00	$ 276.19	$ 1,105	1
Project Engineer	30.00	HR	0.00	267.83	0.00	$ 267.83	$ 8,035	1
Project Scientist	47.00	HR	0.00	310.02	0.00	$ 310.02	$14,571	1
Staff Scientist	81.00	HR	0.00	229.78	0.00	$ 229.78	$18,612	1
Field Technician	2.00	HR	0.00	171.18	0.00	$ 171.18	$ 342	1
Word Processing/Clerical	13.00	HR	0.00	119.25	0.00	$ 119.25	$ 1,550	1
Draftsman/CADD	9.00	HR	0.00	155.90	0.00	$ 155.90	$ 1,403	1
						Subtotal	**$115,341**	
						Annual Monitoring for First Four Years	**$461,363**	
						Monitoring Every 5 Years and 5-yr Review Cost for Years 5 through 30	**$965,711**	
PROFESSIONAL LABOR MANAGEMENT - MNR								
Project Management Labor Cost	1.00	LS	0.00	29,703.06	0.00	$29,703.06	$29,703	1
Planning Documents Labor Cost	1.00	LS	0.00	23,762.45	0.00	$23,762.45	$23,762	1
Construction Oversight Labor Cost	1.00	LS	0.00	19,306.99	0.00	$19,306.99	$19,307	1
Reporting Labor Cost	1.00	LS	0.00	4,455.46	0.00	$ 4,455.46	$ 4,455	1
As-Built Drawings Labor Cost	1.00	LS	0.00	4,455.46	0.00	$ 4,455.46	$ 4,455	1
Public Notice Labor Cost	1.00	LS	0.00	1,485.15	0.00	$ 1,485.15	$ 1,485	1
Permitting Labor Cost	1.00	LS	0.00	29,703.06	0.00	$29,703.06	$29,703	1
						Subtotal	**$112,872**	
						SUBTOTAL MONITORED NATURAL RECOVERY - AREA IX/X	**$2,332,645**	
FOCUSED REMOVAL - AREA IX/X								
COFFER DAM - SOUTH BASIN								
Construction Labor	240.00	HR	0.00	101.21	0.00	$ 101.21	$24,290	1
Maintenance Labor	80.00	HR	0.00	101.21	0.00	$ 101.21	$ 8,097	1
Crawler-mounted, 2.0 CY, 235 Hydraulic Excavator	48.00	HR	0.00	137.97	206.56	$ 344.53	$16,537	1
4" Diameter Contractor's Trash Pump, 300 GPM	139.00	DAY	87.42	60.30	0.00	$ 147.72	$20,533	1
4", Class 150, PVC Piping	1,000.00	LF	3.12	18.25	0.94	$ 22.31	$22,310	1
AquaDam Rental	2,000.00	LF	0.00	0.00	97.27	$ 97.27	$194,540	2
Mobilization AquaDam	2.00	EACH	8,199.05	0.00	0.00	$ 8,199.05	$16,398	2
Installation AquaDam	6.00	DAY	3,279.62	0.00	0.00	$ 3,279.62	$19,678	2
						Subtotal	**$322,384**	
COFFER DAM - YOSEMITE CREEK								
Construction Labor	40.00	HR	0.00	95.35	0.00	$ 95.35	$ 3,814	1
Crawler-mounted, 2.0 CY, 235 Hydraulic Excavator	8.00	HR	0.00	129.98	194.59	$ 324.57	$ 2,597	1
4" Diameter Contractor's Trash Pump, 300 GPM	60.00	DAY	82.35	56.81	0.00	$ 139.16	$ 8,350	1
4", Class 150, PVC Piping	1,000.00	LF	2.94	17.19	0.88	$ 21.01	$21,010	1
AquaDam Rental	150.00	LF	0.00	0.00	91.64	$ 91.64	$13,746	2
Mobilization AquaDam	1.00	EACH	1,544.82	0.00	0.00	$ 1,544.82	$ 1,545	2
Installation AquaDam	1.00	DAY	3,089.65	0.00	0.00	$ 3,089.65	$ 3,090	2
						Subtotal	**$54,151**	
EXCAVATION AND BACKFILL								
4 CY, Crawler-mounted,	61,942.00	CY	0.00	2.29	3.47	$ 5.76	$356,786	1
Hydraulic Excavator								1
Delivered & Dumped, Backfill	23,148.15	BCY	44.01	1.99	1.48	$ 47.48	$1,099,074	1
Unclassified Fill, 6" Lifts, Off-Site, Includes Delivery, Spreading, and Compaction	75,241.48	CY	10.54	4.56	3.05	$ 18.15	$1,365,633	1
2" Diameter Trash Pump, 75 gpm	80.00	DAY	70.73	29.50	0.00	$ 100.23	$ 8,018	1
Spray washing, decontaminate heavy equipment,	1.00	EA	0.00	1,072.83	0.00	$ 1,072.83	$ 1,073	1
2" Polyethylene, flexible piping, SDR15, 125 psi	100.00	LF	2.18	0.00	0.00	$ 2.18	$ 218	1
Crane Mats	10.00	EACH	3,852.82	0.00	0.00	$ 3,852.82	$38,528	1
						Subtotal	**$2,869,330**	

TABLE D-12: COST ESTIMATE -- AREA IX/X ALTERNATIVE 6 (CONTINUED)
Feasibility Study Report for Parcel F, Hunters Point Shipyard, San Francisco, California

Alternative 6:		Location Modifiers	
		Material:	1.152
Area IX/X:	Focused Shoreline Removal/Backfill, Off-Site Disposal, Monitored Natural Recovery, and Institutional Controls	Labor:	1.67
		Equipment:	1.076
		Contingency on Direct Costs:	20%
Prepared by:	M. Berry - BAI, September 2006	Options	
Checked by:	S. Delhomme - Tetra Tech, December 2006	RACER Database:	Modified System
		Cost Database Date:	2006

Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Unit Cost	Extended Cost	Source
CONFIRMATION SAMPLING								
Analysis, mercury (7041)	36.00	EA	46.93	0.00	0.00	$ 46.93	$ 1,689	1
Analysis, copper (6010)	36.00	EA	20.34	0.00	0.00	$ 20.34	$ 732	1
Analysis, PCBs (8081/8082)	36.00	EA	306.06	0.00	0.00	$ 306.06	$11,018	1
Surveying - 2-man Crew	5.00	DAY	0.00	2,288.95	383.39	$2,672.34	$13,362	1
Field Technician	16.00	HR	0.00	171.18	0.00	$ 171.18	$ 2,739	1
						Subtotal	**$29,540**	
LOAD AND HAUL - SEDIMENT DISPOSAL (35,480 cubic yards disposed at Altamont Landfill)								
Dump Charges	80,634.00	CY	46.34	0.00	0.00	$46.34	$3,736,580	3
988, 7.0 CY, Wheel Loader	257.00	HR	0.00	126.64	261.97	$388.61	$99,873	1
32 CY, Semi Dump	11,754.00	HR	0.00	99.94	117.30	$217.24	$2,553,439	1
							$6,389,891	
RESIDUAL WASTE MANAGEMENT - SEDIMENT AND DECON WASTE DISPOSAL								
Secondary containment and storage, loading hazardous waste for shipment into 5,000 gal. bulk tank truck	12.00	EA	0.00	1,055.18	394.82	$ 1,450.00	$17,400	1
Secondary containment and storage, loading hazardous waste for shipment	18.00	EA	0.00	10.81	1.80	$ 12.61	$ 227	1
Subcontracted shipping of haz. waste, transport drums of solid hazardous waste, 80 55 gal. drums	17.00	MI	3.26	0.00	0.00	$ 3.26	$ 55	1
Subcontracted shipping of hazardous waste, transport bulk sludge/liquid hazardous waste, 5000 gal.	840.00	MI	3.26	0.00	0.00	$ 3.26	$ 2,738	1
Commercial RCRA landfills, additional costs, waste stream evaluation, 50% rebate on first	2.00	EA	793.09	0.00	0.00	$ 793.09	$ 1,586	1
Commercial RCRA landfills, drummed waste disposal, solid, non-hazardous, 55 gal drums	18.00	EA	13.50	0.00	0.00	$ 13.50	$ 243	1
						Subtotal	**$22,250**	
DEWATERING PAD								
Grub and stack, 140 H.P. dozer	212.00	CY	0.00	6.75	2.29	$ 9.04	$ 1,916	1
Excavating, trench, normal soil, to 2' - 6' deep, excavate by hand, piled only	212.00	BCY	0.00	165.78	0.00	$ 165.78	$35,145	1
953, 2.0 CY, Track Loader	500.00	HR	0.00	119.96	104.04	$ 224.00	$112,000	1
Backfill Trench, Borrow Material, Delivered & Dumped Only	136.00	CY	10.16	4.46	1.89	$ 16.51	$ 2,245	1
18" x 18" Underground French Drain	753.39	LF	6.15	3.81	0.58	$ 10.54	$ 7,941	1
Pump, pedestal sump, single stage, 75 GPM, 1-1/2 H.P., 2" discharge	1.00	EA	4,242.65	1,769.93	0.00	$ 6,012.58	$ 6,013	1
Storage Tanks, plastic, ground level, horizontal cylinder, 550 gallons	1.00	EA	2,570.88	1,067.48	0.00	$ 3,638.36	$ 3,638	1
Storage Tanks, plastic, ground level, horizontal cylinder, 6" NP conn., 4,000 gal	1.00	EA	6,685.01	1,673.48	0.00	$ 8,358.49	$ 8,358	1
Polymeric Liner Anchor Trench, 3'x1.5'	792.00	LF	0.06	4.45	0.42	$ 4.93	$ 3,905	1
Secure burial cell construction, polymeric liner and cover system, polyvinyl chloride (PVC), 40 mil	38,259.00	SF	0.59	0.93	0.04	$ 1.56	$59,684	1
Waste Pile Cover, 135 Lb Tear,	3,742.00	SY	2.88	0.83	0.00	$ 3.71	$13,883	1
Pump, submersible sump, automatic, 15 GPM, 1-1/2" discharge, 15' head	1.00	EA	1,336.83	286.89	0.00	$ 1,623.72	$ 1,624	1
Operator, dewatering pad	340.00	HR	0.00	171.00	0.00	$171.00	$58,140	
						Subtotal	**$314,493**	
DECONTAMINATION FACILITIES								
Decon pad for heavy equipment and personnel							$108,130	1
						Subtotal	**$108,130**	
PROFESSIONAL LABOR MANAGEMENT - FOCUSED REMOVAL AREA IX/X								
Project Management Labor Cost	1.00	LS	0.00	680,302.63	0.00	$680,302.63	$680,303	1
Planning Documents Labor Cost	1.00	LS	0.00	748,332.86	0.00	$748,332.86	$748,333	1
Construction Oversight Labor Cost	1.00	LS	0.00	1,020,453.9	0.00	$1,020,453.93	$1,020,454	1
Reporting Labor Cost	1.00	LS	0.00	113,383.77	0.00	$113,383.77	$113,384	1
As-Built Drawings Labor Cost	1.00	LS	0.00	113,383.77	0.00	$113,383.77	$113,384	1
Public Notice Labor Cost	1.00	LS	0.00	11,338.38	0.00	$11,338.38	$11,338	1
Permitting Labor Cost	1.00	LS	0.00	566,918.81	0.00	$566,918.81	$566,919	1
						Subtotal	**$3,254,114**	
						SUBTOTAL FOCUSED REMOVAL - AREA IX/X	**$13,364,283**	

TABLE D-12: COST ESTIMATE -- AREA IX/X ALTERNATIVE 6 (CONTINUED)
Feasibility Study Report for Parcel F, Hunters Point Shipyard, San Francisco, California

Alternative 6:	**Location Modifiers**
Area IX/X: Focused Shoreline Removal/Backfill, Off-Site Disposal, Monitored Natural Recovery, and Institutional Controls	**Material:** *1.152* **Labor:** *1.67* **Equipment:** *1.076* **Contingency on Direct Costs:** *20%*
Prepared by: M. Berry - BAI, September 2006 Checked by: S. Delhomme - Tetra Tech, December 2006	**Options** **RACER Database:** Modified System **Cost Database Date:** 2006

Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Unit Cost	Extended Cost	Source
DESIGN COSTS								

Phase Name	Design Approach	Total Capital	%	Design Cost
Monitored Natural Recovery - Area IX/X	Natural Attenuation	$172,630	8%	$13,810
Focused Removal - Area IX/X	Ex Situ Removal - Off-site	$10,110,009	10%	$1,011,001
			Subtotal Design	**$1,024,811**
			Base Cost	$15,294,665
			30-Year O&M	$1,427,074
			Total Future Cost	$16,721,739

PRESENT VALUE

Description	Total Cost	Year From Start	Calendar Year	Escalation Factor[a]	Discount Factor[b]	Total Present Value Cost
Design	$ 1,024,811	0	2006	1	1	$ 1,024,811
Remedial Action Construction	$ 14,269,854	1	2007	1.021	0.970	$ 14,131,446
Monitoring	$ 115,341	2	2008	1.042	0.941	$ 113,111
Monitoring	$ 115,341	3	2009	1.064	0.912	$ 112,014
Monitoring	$ 192,647	4	2010	1.087	0.885	$ 185,284
Monitoring	$ 192,647	5	2011	1.110	0.858	$ 183,483
Monitoring, 5-Year Review	$ 238,258	6	2012	1.133	0.833	$ 224,723
Monitoring, cap repair, 5-Yr review	$ 238,258	11	2017	1.257	0.715	$ 214,027
Monitoring, 5-Year Review	$ 238,258	16	2022	1.395	0.614	$ 203,858
Monitoring, 5-Year Review	$ 238,258	21	2027	1.547	0.527	$ 194,161
Monitoring, 5-Year Review	$ 238,258	26	2032	1.717	0.452	$ 184,923
Monitoring, 5-Year Review	$ 238,258	31	2037	1.905	0.388	$ 176,130
	$ 17,340,187					$ 16,947,971

TOTAL PRESENT VALUE - ALTERNATIVE 6: $16,947,971

Sources:
1 Racer 2005 Database
2 Vendor Quote - Aquadam - Water Structures Unlimited, 12/6/05
3 Altamont Landfill tipping fee, non-hazardous material.
4 Vendor Quote - Dutra Dredging, 12/14/05.
5 Vendor Quote - AquaBlok Limited, 12/13/05.
6 Vendor Quote - TEG Ocean Services, 1/9/06.
7 Carbon application costs were extrapolated from the 2005 Parcel F pilot test conducted by Stanford University.

[c]**Annual Discount Rate (i) = 3.10%**

Notes:
a. Escalation factors from RACER 2005.
b. Annual discount factor = 1/(1+i)t, where i = 3.10% and t=year.
c. Annual discount rate obtained from OMB Circular No. A-94, 2005.

TABLE D-13: COST ESTIMATE -- AREA IX/X ALTERNATIVE 6A (CONTINUED)
Feasibility Study Report for Parcel F, Hunters Point Shipyard, San Francisco, California

Alternative 6A:		Location Modifiers	
Area IX/X:	Focused Shoreline Removal/Activated Backfill Off-Site Disposal, Monitored Natural Recovery, and Institutional Controls	Material:	1.152
		Labor:	1.67
		Equipment:	1.076
		Contingency on Direct Costs:	20%
Prepared by:	M. Berry - BAI, September 2006	Options	
Checked by:	S. Delhomme - Tetra Tech, December 2006	RACER Database:	Modified System
		Cost Database Date:	2006

Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Unit Cost	Extended Cost	Source
MONITORED NATURAL RECOVERY - PARTIAL AREA IX/X								
ADMINISTRATIVE LAND USE CONTROLS								
Planning Docs								
Project Manager	130.00	HR	0.00	226.48	0.00	$ 226.48	$29,442	1
Project Engineer	360.00	HR	0.00	219.62	0.00	$ 219.62	$79,063	1
Staff Engineer	820.00	HR	0.00	192.19	0.00	$ 192.19	$157,596	1
QA/QC Officer	121.00	HR	0.00	185.23	0.00	$ 185.23	$22,413	1
Word Processing/Clerical	520.00	HR	0.00	97.78	0.00	$ 97.78	$50,846	1
Draftsman/CADD	550.00	HR	0.00	127.83	0.00	$ 127.83	$70,307	1
Attorney, Partner, Real Estate	30.00	HR	0.00	200.00	0.00	$ 200.00	$ 6,000	1
Other Direct Costs	1.00	LS	4,367.26	0.00	0.00	$ 4,367.26	$ 4,367	1
						Subtotal	**$420,034**	
Planning Meetings								
Per Diem (per person)	16.00	DAY	194.00	0.00	0.00	$ 194.00	$ 3,104	1
Project Manager	160.00	HR	0.00	226.48	0.00	$ 226.48	$36,237	1
Project Engineer	128.00	HR	0.00	219.62	0.00	$ 219.62	$28,111	1
Word Processing/Clerical	128.00	HR	0.00	97.78	0.00	$ 97.78	$12,516	1
Draftsman/CADD	64.00	HR	0.00	127.83	0.00	$ 127.83	$ 8,181	1
Other Direct Costs	1.00	LS	906.62	0.00	0.00	$ 906.62	$ 907	1
						Subtotal	**$89,056**	
Implementation								
Overnight Delivery, 8 oz Letter	18.00	EA	22.21	0.00	0.00	$ 22.21	$ 400	1
Project Manager	82.00	HR	0.00	226.48	0.00	$ 226.48	$18,571	1
Project Engineer	180.00	HR	0.00	219.62	0.00	$ 219.62	$39,532	1
Staff Engineer	220.00	HR	0.00	192.19	0.00	$ 192.19	$42,282	1
QA/QC Officer	51.00	HR	0.00	185.23	0.00	$ 185.23	$ 9,447	1
Word Processing/Clerical	165.00	HR	0.00	97.78	0.00	$ 97.78	$16,134	1
Draftsman/CADD	370.00	HR	0.00	127.83	0.00	$ 127.83	$47,297	1
Computer Data Entry	200.00	HR	0.00	87.86	0.00	$ 87.86	$17,572	1
Attorney, Senior Associate, Real Estate	8.00	HR	0.00	175.00	0.00	$ 175.00	$ 1,400	1
Paralegal, Real Estate	8.00	HR	0.00	100.00	0.00	$ 100.00	$ 800	1
Other Direct Costs	1.00	LS	2,034.38	0.00	0.00	$ 2,034.38	$ 2,034	1
Construction Signs	96.00	SF	21.35	0.00	0.00	$ 21.35	$ 2,050	1
Surveying - 3-man Crew	4.00	DAY	0.00	2,696.95	390.12	$ 3,087.07	$12,348	1
Portable GPS Set with Mapping	1.00	MO	1,161.52	0.00	0.00	$ 1,161.52	$ 1,162	1
Local Fees	2.00	LS	308.96	0.00	0.00	$ 308.96	$ 618	1
						Subtotal	**$211,646**	
Modification/Termination								
Project Manager	56.00	HR	0.00	226.48	0.00	$ 226.48	$12,683	1
Project Engineer	104.00	HR	0.00	219.62	0.00	$ 219.62	$22,840	1
Staff Engineer	120.00	HR	0.00	192.19	0.00	$ 192.19	$23,063	1
QA/QC Officer	19.00	HR	0.00	185.23	0.00	$ 185.23	$ 3,519	1
Word Processing/Clerical	46.00	HR	0.00	97.78	0.00	$ 97.78	$ 4,498	1
Draftsman/CADD	36.00	HR	0.00	127.83	0.00	$ 127.83	$ 4,602	1
Other Direct Costs	1.00	LS	759.08	0.00	0.00	$ 759.08	$ 759	1
						Subtotal	**$71,964**	
LONG-TERM MONITORING - MNR								
Five-Year Review								
Project Manager	35.00	HR	0.00	232.33	0.00	$ 232.33	$8,132	1
Project Engineer	67.00	HR	0.00	225.30	0.00	$ 225.30	$15,095	1
Project Scientist	33.00	HR	0.00	260.79	0.00	$ 260.79	$8,606	1
Staff Scientist	55.00	HR	0.00	193.29	0.00	$ 193.29	$10,631	1
Draftsman/CADD	24.00	HR	0.00	131.14	0.00	$ 131.14	$3,147	1
						Subtotal	**$45,611**	

TABLE D-13: COST ESTIMATE -- AREA IX/X ALTERNATIVE 6A (CONTINUED)
Feasibility Study Report for Parcel F, Hunters Point Shipyard, San Francisco, California

Alternative 6A:	Location Modifiers	
Area IX/X: Focused Shoreline Removal/Activated Backfill Off-Site Disposal, Monitored Natural Recovery, and Institutional Controls	**Material:**	*1.152*
	Labor:	*1.67*
	Equipment:	*1.076*
	Contingency on Direct Costs:	*20%*
Prepared by: M. Berry - BAI, September 2006	**Options**	
Checked by: S. Delhomme - Tetra Tech, December 2006	**RACER Database:**	Modified System
	Cost Database Date:	2006

Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Unit Cost	Extended Cost	Source
Sample Collection								
Analysis, mercury (7041)	24.00	EA	46.93	0.00	0.00	$ 46.93	$ 1,126	1
Analysis, copper (6010)	24.00	EA	20.34	0.00	0.00	$ 20.34	$ 488	1
Analysis PCBs, (8081/8082)	24.00	EA	367.28	0.00	0.00	$ 367.28	$ 8,815	1
Bathymetry Survey - Area IX/X	1.00	EACH	22,399.93	0.00	0.00	$22,399.93	$22,400	6
Vibracore mob/demob, shallow water drill barge/tender	1.00	EACH	6,951.70	0.00	0.00	$ 6,951.70	$ 6,952	6
Vibracore daily rate - Area IX/X	3.00	DAY	6,256.53	0.00	0.00	$ 6,256.53	$18,770	6
Vibracore consumables	3.00	DAY	617.93	0.00	0.00	$ 617.93	$ 1,854	6
Benthic analysis	24.00	EACH	386.21	0.00	0.00	$ 386.21	$ 9,269	1
General Monitoring and Reporting								
Sample collection, vehicle mileage	100.00	MI	0.49	0.00	0.00	$ 0.49	$ 49	1
Project Manager	4.00	HR	0.00	276.19	0.00	$ 276.19	$ 1,105	1
Project Engineer	30.00	HR	0.00	267.83	0.00	$ 267.83	$ 8,035	1
Project Scientist	47.00	HR	0.00	310.02	0.00	$ 310.02	$14,571	1
Staff Scientist	81.00	HR	0.00	229.78	0.00	$ 229.78	$18,612	1
Field Technician	2.00	HR	0.00	171.18	0.00	$ 171.18	$ 342	1
Word Processing/Clerical	13.00	HR	0.00	119.25	0.00	$ 119.25	$ 1,550	1
Draftsman/CADD	9.00	HR	0.00	155.90	0.00	$ 155.90	$ 1,403	1
						Subtotal	**$115,341**	
						Annual Monitoring for First Four Years	**$461,363**	
						Monitoring Every 5 Years and 5-yr Review Cost for Years 5 through 30	**$965,711**	
PROFESSIONAL LABOR MANAGEMENT - MNR								
Project Management Labor Cost	1.00	LS	0.00	29,703.06	0.00	$29,703.06	$29,703	1
Planning Documents Labor Cost	1.00	LS	0.00	23,762.45	0.00	$23,762.45	$23,762	1
Construction Oversight Labor Cost	1.00	LS	0.00	19,306.99	0.00	$19,306.99	$19,307	1
Reporting Labor Cost	1.00	LS	0.00	4,455.46	0.00	$ 4,455.46	$ 4,455	1
As-Built Drawings Labor Cost	1.00	LS	0.00	4,455.46	0.00	$ 4,455.46	$ 4,455	1
Public Notice Labor Cost	1.00	LS	0.00	1,485.15	0.00	$ 1,485.15	$ 1,485	1
Permitting Labor Cost	1.00	LS	0.00	29,703.06	0.00	$29,703.06	$29,703	1
						Subtotal	**$112,872**	
						SUBTOTAL MONITORED NATURAL RECOVERY - AREA IX/X	**$2,332,645**	
FOCUSED REMOVAL - AREA IX/X								
COFFER DAM - SOUTH BASIN								
Construction Labor	240.00	HR	0.00	101.21	0.00	$ 101.21	$24,290	1
Maintenance Labor	80.00	HR	0.00	101.21	0.00	$ 101.21	$ 8,097	1
Crawler-mounted, 2.0 CY, 235 Hydraulic Excavator	48.00	HR	0.00	137.97	206.56	$ 344.53	$16,537	1
4" Diameter Contractor's Trash Pump, 300 GPM	139.00	DAY	87.42	60.30	0.00	$ 147.72	$20,533	1
4", Class 150, PVC Piping	1,000.00	LF	3.12	18.25	0.94	$ 22.31	$22,310	1
AquaDam Rental	2,000.00	LF	0.00	0.00	97.27	$ 97.27	$194,540	2
Mobilization AquaDam	2.00	EACH	8,199.05	0.00	0.00	$ 8,199.05	$16,398	2
Installation AquaDam	6.00	DAY	3,279.62	0.00	0.00	$ 3,279.62	$19,678	2
						Subtotal	**$322,384**	
COFFER DAM - YOSEMITE CREEK								
Construction Labor	40.00	HR	0.00	95.35	0.00	$ 95.35	$ 3,814	1
Crawler-mounted, 2.0 CY, 235 Hydraulic Excavator	8.00	HR	0.00	129.98	194.59	$ 324.57	$ 2,597	1
4" Diameter Contractor's Trash Pump, 300 GPM	60.00	DAY	82.35	56.81	0.00	$ 139.16	$ 8,350	1
4", Class 150, PVC Piping	1,000.00	LF	2.94	17.19	0.88	$ 21.01	$21,010	1
AquaDam Rental	150.00	LF	0.00	0.00	91.64	$ 91.64	$13,746	2
Mobilization AquaDam	1.00	EACH	1,544.82	0.00	0.00	$ 1,544.82	$ 1,545	2
Installation AquaDam	1.00	DAY	3,089.65	0.00	0.00	$ 3,089.65	$ 3,090	2
						Subtotal	**$54,151**	

TABLE D-13: COST ESTIMATE -- AREA IX/X ALTERNATIVE 6A (CONTINUED)
Feasibility Study Report for Parcel F, Hunters Point Shipyard, San Francisco, California

Alternative 6A:	**Location Modifiers**	
	Material:	*1.152*
Area IX/X: Focused Shoreline Removal/Activated Backfill	**Labor:**	*1.67*
Off-Site Disposal, Monitored Natural	**Equipment:**	*1.076*
Recovery, and Institutional Controls	**Contingency on Direct Costs:**	*20%*
Prepared by: M. Berry - BAI, September 2006	**Options**	
Checked by: S. Delhomme - Tetra Tech, December 2006	**RACER Database:**	Modified System
	Cost Database Date:	2006

Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Unit Cost	Extended Cost	Source
EXCAVATION AND BACKFILL								
4 CY, Crawler-mounted,	61,942.00	CY	0.00	2.29	3.47	$ 5.76	$356,786	*1*
Hydraulic Excavator								*1*
Delivered & Dumped, Backfill	23,148.15	BCY	44.01	1.99	1.48	$ 47.48	$1,099,074	*1*
Unclassified Fill, 6" Lifts,	75,241.48	CY	10.54	4.56	3.05	$ 18.15	$1,365,633	*1*
Off-Site, Includes Delivery, Spreading, and Compaction								
2" Diameter Trash Pump, 75 gpm	80.00	DAY	70.73	29.50	0.00	$ 100.23	$ 8,018	*1*
Spray washing, decontaminate	1.00	EA	0.00	1,072.83	0.00	$ 1,072.83	$ 1,073	*1*
heavy equipment,								
2" Polyethylene, flexible piping,	100.00	LF	2.18	0.00	0.00	$ 2.18	$ 218	*1*
SDR15, 125 psi								
Crane Mats	10.00	EACH	3,852.82	0.00	0.00	$ 3,852.82	$38,528	*1*
						Subtotal	**$2,869,330**	
ADD ACTIVATED CARBON TO BACKFILL								
Activated Carbon - Coal Derived	2,106.00	Cy	1,668.36	86.32	47.90	$ 1,802.58	$3,796,233	*7*
Soil Tilling, D3 Dozer with Tiller Attachm	60.00	HR	0.00	126.64	72.86	$ 199.50	$11,970	*1*
Broadcast carbon using tractor spreade	33.00	ACRE	85.18	20.41	0.00	$ 105.59	$ 3,484	*1*
Spray washers & decontamination for li	1.00	EA	0.00	362.08	0.00	$ 362.08	$ 362	*1*
Spray washing, decontaminate med eq	1.00	EA	0.00	724.16	0.00	$ 724.16	$ 724	*1*
Standby D3 Bulldozer with Tiller	40.00	HR	0.00	0.00	14.98	$ 14.98	$ 599	*1*
						Subtotal	**$3,813,373**	
CONFIRMATION SAMPLING								
Analysis, mercury (7041)	36.00	EA	46.93	0.00	0.00	$ 46.93	$ 1,689	*1*
Analysis, copper (6010)	36.00	EA	20.34	0.00	0.00	$ 20.34	$ 732	*1*
Analysis, PCBs (8081/8082)	36.00	EA	306.06	0.00	0.00	$ 306.06	$11,018	*1*
Surveying - 2-man Crew	5.00	DAY	0.00	2,288.95	383.39	$2,672.34	$13,362	*1*
Field Technician	16.00	HR	0.00	171.18	0.00	$ 171.18	$ 2,739	*1*
						Subtotal	**$29,540**	
LOAD AND HAUL - SEDIMENT DISPOSAL (35,480 cubic yards disposed at Altamont Landfill)								
Dump Charges	80,634.00	CY	46.34	0.00	0.00	$46.34	$3,736,580	*3*
988, 7.0 CY, Wheel Loader	257.00	HR	0.00	126.64	261.97	$388.61	$99,873	*1*
32 CY, Semi Dump	11,754.00	HR	0.00	99.94	117.30	$217.24	$2,553,439	*1*
							$6,389,891	
RESIDUAL WASTE MANAGEMENT - SEDIMENT AND DECON WASTE DISPOSAL								
Secondary containment and storage,	12.00	EA	0.00	1,055.18	394.82	$ 1,450.00	$17,400	*1*
loading hazardous waste for shipment								
into 5,000 gal. bulk tank truck								
Secondary containment and storage,	18.00	EA	0.00	10.81	1.80	$ 12.61	$ 227	*1*
loading hazardous waste for shipment								
Subcontracted shipping of haz. waste,	17.00	MI	3.26	0.00	0.00	$ 3.26	$ 55	*1*
transport drums of solid hazardous waste, 80 55 gal. drums								
Subcontracted shipping of	840.00	MI	3.26	0.00	0.00	$ 3.26	$ 2,738	*1*
hazardous waste, transport bulk								
sludge/liquid hazardous waste, 5000 gal.								
Commercial RCRA landfills, additional	2.00	EA	793.09	0.00	0.00	$ 793.09	$ 1,586	*1*
costs, waste stream evaluation, 50% rebate on first								
Commercial RCRA landfills,	18.00	EA	13.50	0.00	0.00	$ 13.50	$ 243	*1*
drummed waste disposal, solid,								
non-hazardous, 55 gal drums								
						Subtotal	**$22,250**	
DEWATERING PAD								
Grub and stack, 140 H.P. dozer	212.00	CY	0.00	6.75	2.29	$ 9.04	$ 1,916	*1*
Excavating, trench, normal soil,	212.00	BCY	0.00	165.78	0.00	$ 165.78	$35,145	*1*
to 2' - 6' deep, excavate by hand, piled only								
953, 2.0 CY, Track Loader	500.00	HR	0.00	119.96	104.04	$ 224.00	$112,000	*1*
Backfill Trench, Borrow Material,	136.00	CY	10.16	4.46	1.89	$ 16.51	$ 2,245	*1*
Delivered & Dumped Only								
18" x 18" Underground French Drain	753.39	LF	6.15	3.81	0.58	$ 10.54	$ 7,941	*1*
Pump, pedestal sump, single	1.00	EA	4,242.65	1,769.93	0.00	$ 6,012.58	$ 6,013	*1*
stage, 75 GPM, 1-1/2 H.P., 2" discharge								
Storage Tanks, plastic, ground	1.00	EA	2,570.88	1,067.48	0.00	$ 3,638.36	$ 3,638	*1*
level, horizontal cylinder, 550 gallons								

TABLE D-13: COST ESTIMATE -- AREA IX/X ALTERNATIVE 6A (CONTINUED)
Feasibility Study Report for Parcel F, Hunters Point Shipyard, San Francisco, California

Alternative 6A:	Location Modifiers	
	Material:	1.152
Area IX/X: Focused Shoreline Removal/Activated Backfill Off-Site Disposal, Monitored Natural Recovery, and Institutional Controls	Labor:	1.67
	Equipment:	1.076
	Contingency on Direct Costs:	20%
Prepared by: M. Berry - BAI, September 2006	Options	
Checked by: S. Delhomme - Tetra Tech, December 2006	RACER Database:	Modified System
	Cost Database Date:	2006

Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Unit Cost	Extended Cost	Source
Storage Tanks, plastic, ground level, horizontal cylinder, 6" NP conn., 4,000 gal	1.00	EA	6,685.01	1,673.48	0.00	$ 8,358.49	$ 8,358	1
Polymeric Liner Anchor Trench, 3'x1.5'	792.00	LF	0.06	4.45	0.42	$ 4.93	$ 3,905	1
Secure burial cell construction, polymeric liner and cover system, polyvinyl chloride (PVC), 40 mil	38,259.00	SF	0.59	0.93	0.04	$ 1.56	$59,684	1
Waste Pile Cover, 135 Lb Tear,	3,742.00	SY	2.88	0.83	0.00	$ 3.71	$13,883	1
Pump, submersible sump, automatic, 15 GPM, 1-1/2" discharge, 15' head	1.00	EA	1,336.83	286.89	0.00	$ 1,623.72	$ 1,624	1
Operator, dewatering pad	340.00	HR	0.00	171.00	0.00	$171.00	$58,140	
						Subtotal	**$314,493**	
DECONTAMINATION FACILITIES								
Decon pad for heavy equipment and personnel							$108,130	1
						Subtotal	**$108,130**	
PROFESSIONAL LABOR MANAGEMENT - FOCUSED REMOVAL AREA IX/X								
Project Management Labor Cost	1.00	LS	0.00	946,086.60	0.00	$946,086.60	$946,087	1
Planning Documents Labor Cost	1.00	LS	0.00	1,040,695.28	0.00	$1,040,695.28	$1,040,695	1
Construction Oversight Labor Cost	1.00	LS	0.00	1,419,129.9	0.00	$1,419,129.90	$1,419,130	1
Reporting Labor Cost	1.00	LS	0.00	157,681.10	0.00	$157,681.10	$157,681	1
As-Built Drawings Labor Cost	1.00	LS	0.00	157,681.10	0.00	$157,681.10	$157,681	1
Public Notice Labor Cost	1.00	LS	0.00	15,768.11	0.00	$15,768.11	$15,768	1
Permitting Labor Cost	1.00	LS	0.00	788,405.50	0.00	$788,405.50	$788,406	1
						Subtotal	**$4,525,448**	
						SUBTOTAL FOCUSED REMOVAL - AREA IX/X	**$18,448,990**	

DESIGN COSTS

Phase Name	Design Approach	Total Capital	%	Design Cost
Monitored Natural Recovery - Area IX/X	Natural Attenuation	$172,630	8%	$13,810
Focused Removal - Area IX/X	Ex Situ Removal - Off-site	$13,923,376	10%	$1,392,338
			Subtotal Design	**$1,406,148**

Base Cost	$20,760,709
30-Year O&M	$1,427,074
Total Future Cost	$22,187,782

PRESENT VALUE

Description	Total Cost	Year From Start	Calendar Year	Escalation Factor[a]	Discount Factor[b]	Total Present Value Cost
Design	$ 1,406,148	0	2006	1	1	$ 1,406,148
Remedial Action Construction	$ 19,354,561	1	2007	1.021	0.970	$ 19,166,835
Monitoring	$ 115,341	2	2008	1.042	0.941	$ 113,111
Monitoring	$ 115,341	3	2009	1.064	0.912	$ 112,014
Monitoring	$ 192,647	4	2010	1.087	0.885	$ 185,284
Monitoring	$ 192,647	5	2011	1.110	0.858	$ 183,483
Monitoring, 5-Year Review	$ 238,258	6	2012	1.133	0.833	$ 224,723
Monitoring, cap repair, 5-Yr review	$ 238,258	11	2017	1.257	0.715	$ 214,027
Monitoring, 5-Year Review	$ 238,258	16	2022	1.395	0.614	$ 203,858
Monitoring, 5-Year Review	$ 238,258	21	2027	1.547	0.527	$ 194,161
Monitoring, 5-Year Review	$ 238,258	26	2032	1.717	0.452	$ 184,923
Monitoring, 5-Year Review	$ 238,258	31	2037	1.905	0.388	$ 176,130
	$ 22,806,231					$ 22,364,696

TOTAL PRESENT VALUE - ALTERNATIVE 6a: $22,364,696

Sources:
1 Racer 2005 Database
2 Vendor Quote - Aquadam - Water Structures Unlimited, 12/6/05
3 Altamont Landfill tipping fee, non-hazardous material.
4 Vendor Quote - Dutra Dredging, 12/14/05.
5 Vendor Quote - AquaBlok Limited, 12/13/05.
6 Vendor Quote - TEG Ocean Services, 1/9/06.
7 Carbon application costs were extrapolated from the 2005 Parcel F pilot test conducted by Stanford University.

[c]Annual Discount Rate (i) = 3.10%

Notes:
a. Escalation factors from RACER 2005.
b. Annual discount factor = 1/(1+i)t, where i = 3.10% and t=year.
c. Annual discount rate obtained from OMB Circular No. A-94, 2005.

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ATTACHMENT 3
RESPONSIVENESS SUMMARY

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Responsiveness Summary
Parcel F, Hunters Point Naval Shipyard, San Francisco, California

Table of Contents

Responsiveness Summary
Parcel F, Hunters Point Naval Shipyard, San Francisco, California

Acronyms and Abbreviations

ARAR	applicable or relevant and appropriate requirement
BBL	Battelle, Blasland, Bouck & Lee, Inc.
BCDC	San Francisco Bay Conservation and Development Commission
BCT	Base Realignment and Closure Cleanup Team
BRAC	Base Realignment and Closure
CBG	Committee to Bridge the Gap
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
COC	chemical of concern
CSM	conceptual site model
DTSC	California Department of Toxic Substances Control
EIR	Environmental Impact Report
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
ER-M	effects range - median
FEMA	Federal Emergency Management Agency
FS	Feasibility Study
HPNS	Hunters Point Naval Shipyard
IBNA	India Basin Neighborhood Association
IC	Institutional control
µg/kg	micrograms per kilogram
mg/kg	milligrams per kilogram
MNR	monitored natural recovery
Navy	United States Department of the Navy
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NEPA	National Environmental Policy Act
NOAA	National Oceanic and Atmospheric Administration
OEHHA	Office of Environmental Health Hazard Assessment
OPC	California Ocean Protection Council
PAL	project action level
PCB	polychlorinated biphenyl
PRG	preliminary remediation goal

Responsiveness Summary
Parcel F, Hunters Point Naval Shipyard, San Francisco, California

RAO	remedial action objective
ROC	radionuclides of concern
ROD	Record of Decision
§	Section
SLERA	screening level ecological risk assessment
U.S.	United States
Water Board	San Francisco Bay Regional Water Quality Control Board
YSCPG	Yosemite Slough Cooperating Parties Group

Responsiveness Summary
Parcel F, Hunters Point Naval Shipyard, San Francisco, California

Index to Responsiveness Summary

Comments received during the public comment period are organized alphabetically as follows – on the electronic version, the names are hyperlinked:

Responsiveness Summary
Parcel F, Hunters Point Naval Shipyard, San Francisco, California

1. GENERAL RESPONSES

The United States Department of Navy (Navy) has prepared the following General Responses on the following topics to support the Responsiveness Summary for the Public Comments on the following topics:

1. Truck Route for Off-Site Disposal, Air and Dust Monitoring;
2. Yosemite Slough Remedial Action and Coordination;
3. Radiological Analytical Data for Hunters Point Naval Shipyard (HPNS) Parcel F; and
4. List of HPNS Parcel F and General References.

....

General Response 1. Truck Route for Off-Site Disposal, Air and Dust Monitoring

The proposed remedy for HPNS Parcel F does involve excavation of contaminated sediment from Areas III, IX, and X for off-site disposal to a landfill. Any material removed using land-based equipment will be managed to minimize the potential for the release of contamination during transport and handling.

All means of transporting contaminated material will be designed and managed to minimize dust generation and address air quality concerns in accordance with the HPNS base-wide dust control plan. A project specific dust control plan will be prepared prior to the removal actions at Parcel F and will need to be approved by the Base Realignment and Closure [BRAC] Cleanup Team (BCT) and will include the following:

1. **Approved Truck Route** – ***Exhibit 1*** shows the current approved truck route from HPNS for contaminated material that will need to be transported on land. The truck route will be evaluated prior to the construction phases with input from the public along with the BCT.

2. **Air Monitoring** – The Navy conducts daily monitoring for air quality, both upwind and downwind during construction activities. On-site air monitoring equipment will monitor all construction activities. The air monitoring data is submitted to the Bay Area Air Quality Management District (BAAQMD) and the Department of Toxic Substances Control (DTSC).

3. **Dust Control Measures** – The following dust control measures are currently in place for all construction activities and will be included for the proposed construction activities at HPNS Parcel F:

- Misting systems are used to wet down work areas and roads;
- Stockpiles of soil are coated with a biodegradable polymer to minimize windblown dust;
- 15-mile per hour (mph) speed limit is enforced base-wide and 5 mph speed limit is enforced for active work areas;
- All truck beds containing soil (even clean soil) are required to be covered;
- Raised strips (or rumble strips) are placed at the exits of the construction areas to vibrate truck tires and loosen soil caught in the treads. In addition, a tire wash station also helps remove excess dirt and dust form truck tires;
- Street sweeping; and
- Construction operations are shutdown if conditions become too windy.

4. **Portal Monitoring for Truck Screening** – Trucks entering and leaving HPNS pass through a portal monitor which screens for radiation. If any elevated radiation is detected, the monitor sounds an alarm and further evaluation of the truck load is conducted.

Responsiveness Summary
Parcel F, Hunters Point Naval Shipyard, San Francisco, California

General Response 2 - Yosemite Slough Site Remedial Action and Coordination

The Navy acknowledges that the remedy for Area X and the cleanup planned for the Yosemite Slough site must both be effective and protective and implemented in a manner that minimizes the potential for recontamination. The cleanup action selected by the Environmental Protection Agency (EPA) for Yosemite Slough includes dredging, capping, enhanced monitored natural recovery (MNR), and is compatible with the proposed cleanup at Parcel F which includes removal, backfill, *in situ* treatment, and MNR. The Navy understands that the planned remedial activities for Area X and the Yosemite Slough site should be compatible with respect to timing and constructability to ensure that the cleanups are complimentary and to minimize any potential for recontamination of either area.

The cleanup goals developed for the Yosemite Slough site were developed in part based on the cleanup goals developed for HPNS as noted in the Final Engineering Evaluation/Cost Analysis for Yosemite Slough (Ecology and Environment, 2013) and Action Memorandum for the Yosemite Slough Site (USEPA, 2014).

Yosemite Slough was identified as a potential source of contamination to Parcel F in Figure 3 of the Proposed Plan based on detections of polychlorinated biphenyls (PCBs) in Yosemite Slough and tidal exchange between Yosemite Slough and the South Basin.

The Feasibility Study (FS) Data Gaps Investigation Report (Barajas et al., 2007) identified Yosemite Slough and the Parcel E-2 landfill as the two apparent major sources of PCBs to the South Basin. The report also concluded that the presence of elevated PCB concentrations in surface sediments in Yosemite Slough suggested that there may be ongoing sources to the Yosemite Slough. The Validation Study Report (Battelle et al., 2005) concluded that given the weak tidal circulation in the South Basin, significant upstream transport of contaminated sediments from the Parcel E shoreline adjacent to the Parcel E-2 landfill into Yosemite Slough is unlikely. However, additional sediment data will be collected prior to implementation of the remedy to ensure that the remedial actions are conducted to meet the Remedial Action Objectives (RAOs) in both areas.

General Response 3 – Radiological Data Concerns for HPNS Parcel F

A detailed investigation of radionuclides was conducted at Parcel F. The results are presented in the Addendum to the FS Report for Parcel F (KCH, 2017). Three phases of investigation focused on radionuclides were conducted between 2009 and 2013 (see Table 1 in General Response 4). The investigations included a Phase 1 screening investigation (2009) and a Phase 2a data gaps investigation (2011) as presented in Battelle and Sea Engineering (2013), and a Phase 2b data gaps investigation (ITSI Gilbane and SAIC, 2013). The investigations were used to support the 2017 FS Addendum (KCH, 2017). The investigations included 247 Parcel F sediment cores which generated more than 1,058 sediment samples for laboratory analysis, 800 of which were analyzed for radionuclides. The resulting data was used to assess radiological risks to recreational users at HPNS. Radiological risks were estimated as 4×10^{-6} for exposure to the intertidal sediments and 6×10^{-8} for exposure to subtidal sediments. These risks are within or below the EPA acceptable risk range of 10^{-6} to 10^{-4}.

Regarding background, it is known that background levels of radionuclides occur naturally. The radionuclide investigation collected 18 reference area cores for radionuclide analysis and determined that the Parcel F median radionuclide sediment concentrations were equal to or less than the median background concentrations for all six radionuclides of concern.

Based on an evaluation of radionuclide risk at Parcel F and evaluation with respect to background, it was determined that remediation of radionuclides in sediment is not required at the HPNS Parcel F.

Regarding the general concern about radiological data collected by Tetra Tech, please see the latest Navy updates on the HPNS BRAC site:

https://www.bracpmo.navy.mil/brac_bases/california/former_shipyard_hunters_point/RadiologicalCleanup.html

Responsiveness Summary
Parcel F, Hunters Point Naval Shipyard, San Francisco, California

General Response 4 - List of HPNS Parcel F and General References used in the Responsiveness Summary

Table 1 lists references for HPNS Parcel F References are available in the following repositories:

City of San Francisco Main Library Science, Technical, & Government Document Room
100 Larkin Street
San Francisco, CA 94102
(415) 557-4400

United States Navy Hunters Point Naval Shipyard Site Trailer
690 Hudson Ave
San Francisco, CA 94124
Superfund Records Center

Mail Stop SFD-7C
75 Hawthorne Street, Room 3110
San Francisco, CA 94105
(415) 947-8717

The Parcel F administrative record file is located at:

Naval Facilities Engineering Command Southwest
2965 Mole Road, Building 3519
San Diego, CA 92136

Command Records Manager, Diane Silva, can be reached at (619) 556-1280

In addition, the Navy and Department of Toxic Substances Control (DTSC) have electronic versions of the documents posted for public review at the following web sites:

1) Navy Web site:

   https://www.navfac.navy.mil/products_and_services/ev/products_and_services/env_restoration/administrative_records.html?fromDate=DD-MON-YYYY&toDate=DD-MON-YYYY&p_instln_id=HUNTERS_POINT_NS&basic=&title=&sites=&author=&keywords=

2) DTSC web site:

   https://www.envirostor.dtsc.ca.gov/public/profile_report?global_id=38440007

Responsiveness Summary
Parcel F, Hunters Point Naval Shipyard, San Francisco, California

Table 1- List of HPNS Parcel F References

Year	Author	Reference Title	Description
1991	Aqua Terra Technologies	Environmental Sampling and Analysis Plan	Characterization of chemicals in sediment, water chemistry, and toxicity.
1991	United States Environmental Protection Agency (USEPA).	Applicable or relevant and appropriate requirements (ARARs) Q's and A's: General Policy, RCRA, CWA, SDWA, Post-ROD information, and Contingent Waivers. OSWER Publication 9234.2-01/FS-A.	Guidance on ARARs general policy.
1994	PRC Environmental Management, Inc. (PRC)	Phase IA Ecological Risk Assessment	Qualitative analysis of existing site data, biotic surface areas, and offshore areas.
1996	PRC	Phase IB Ecological Risk Assessment, Hunters Point Shipyard, San Francisco, California. Volume I, Part 1: Nature and Extent of Contamination, and Part 2: Risk Characterization to Aquatic Receptors. Draft.	Characterization of Phase 1 data gaps and completion of a screening levels risk assessment. Included collection of sediment core samples.
1998	Tetra Tech and Levine-Fricke-Recon	Parcel F Feasibility Study Draft Report	Delineation of preliminary remediation footprints based on screening criteria. Identified Areas I, III, VIII, IX, and X as areas with the highest potential ecological risk.
2004	Germano & Associates, Inc.	Sediment Profile Imaging Report: Benthic Macrofauna Activity	Sediment profile image study determined that the depth of the biologically active Zone in marine sediments averages about 10 centimeters and rarely exceeds 30 centimeters.
2005	Battelle, Blasland, Bouck & Lee, Inc. (BBL) and Neptune and Company	Final Hunters Point Shipyard Parcel F, Validation Study Report	Sediment characterization focused on evaluation of chemical distribution within each focus area. Determined that the primary chemicals posing ecological risk were copper and mercury in Area III and PCBs in Area X. Also determined that PCBs posed potentially unacceptable risks to human health in Areas IX and X.

Responsiveness Summary
Parcel F, Hunters Point Naval Shipyard, San Francisco, California

Year	Author	Reference Title	Description
2006	URS Corporation	Draft Environmental Impact Report for the Trans Bay Cable Project. Available Online at: <http://www.ci.pittsburg.ca.us/pittsburg/pdf/tbc/>.	Marine mammals observed using the bay waters around HPNS include the California sea lion (*Zalophus californianus*) and harbor seal (*Phoca vitulina*). Harbor seals, which are the only marine mammals that are permanent residents in the bay, use rocks or sand flats as resting areas (haul-out sites).
2007	SulTech	Parcels E and E-2 Shoreline Characterization Technical Memorandum	A shoreline investigation was conducted to evaluate contaminant migration to Parcel F from Parcels E and E-2. The investigation also included a screening level ecological risk assessment (SLERA). The shoreline investigation and SLERA determined that source control measures were warranted along the shoreline at Parcels E and E-2 and that remedial alternatives should be evaluated to address the potential risk to invertebrates, birds, and mammals.
2007	Barajas and Associates, Battelle, Neptune & Company, and Sea Engineering, Inc. [Barajas et al., 2007]	Technical Memorandum, Hunters Point Shipyard Parcel F, Feasibility Study Data Gaps Investigation	Further delineated and refined the extent of chemical release, evaluated toxicity, and assessed human and ecological risk.
2008	Barajas and Associates	Parcel F Feasibility Study	Proposed RAOs, and evaluated cleanup alternatives and costs for Parcel F sediment contamination.
2013	Battelle and Sea Engineering	Battelle and Sea Engineering, Inc. 2013. Technical Memorandum for Radiological Data Gap Investigation Phase 2a at Parcel F	Phase 1 nature and extent of radionuclides at HPNS Parcel F.
2013	ITSI Gilbane and SAIC	Final Technical Memorandum for Radiological Data Gap Investigation Phase 2b at Parcel	Phase 2b Data Gaps Radiological investigation in Parcel F Sediment.
2017	ECC-Insight, LLC and CDM Smith	Final Technical Memorandum, Optimized Remedial Alternative for Parcel F	Presents the technology assignment framework used to assess the applicability as well as the development of an optimized alternative for HPNS Parcel F.
2017	KCH	Final Addendum to the Feasibility Study Report for Parcel F	Characterization of radionuclides in sediment. The investigations included a Phase 1 screening investigation (2009), a

Responsiveness Summary
Parcel F, Hunters Point Naval Shipyard, San Francisco, California

Year	Author	Reference Title	Description
			Phase 2a data gaps investigation (2011), and a Phase 2b data gaps investigation.
2018	KCH	Final Demonstration of Activated Carbon Amendments to Reduce PCB Bioavailability.	Results of activated carbon pilot study at HPNS Parcel F.

Responsiveness Summary
Parcel F, Hunters Point Naval Shipyard, San Francisco, California

Table 2 – List of General References

Year	Author	Reference Title	Description
1988	Jacobs, L., R. Barrick, and T. Ginn.	SedCam Model	Used to evaluate reductions in sediment concentrations through remediation.
1991	United States Environmental Protection Agency (USEPA).	ARARs Q's and A's: General Policy, RCRA, CWA, SDWA, Post-ROD information, and Contingent Waivers. OSWER Publication 9234.2-01/FS-A.	Guidance on ARARs general policy.
2009	Magar, V., B. Chadwick, T. Bridges, P. Fuschsman, J. Condor, T. Dekker, J. Steevens, K. Gustavson, and M. Mills	Technical Guide. Monitored Natural Recovery at Contaminated Sediment Sites. ESTCP Project ER-0622.	Technical guidance for evaluating and implementing monitored natural recovery (MNR) at contaminated sediment sites.
2013	Ecology and Environment	Final Engineering Evaluation/Cost Analysis for Yosemite Slough	Non-time-critical removal action was selected.
2013	USEPA	ProUCL users guide	Statistical software for environmental applications.
2014	USEPA	Action Memorandum for the Yosemite Slough Site	Non-time-critical removal action was selected.
2015	USEPA	Climate Change Adaptation Technical Fact Sheet: Contaminated Sediment Remedies	

Responsiveness Summary
Parcel F, Hunters Point Naval Shipyard, San Francisco, California

Written Comment by Anonymous 1 received during the Public Meeting on April 11, 2018.		**Response**
COMMENTS		
1.	Area III – Cap should extend along the start of material recovery area, plus regular testing of area that is more than 30 ft. Collect regular samples of all sites. Communication with the City and Lennar about plans.	The Validation Study concluded that Area III poses a potential risk to birds feeding on benthic invertebrates and fishes. The surf scoter, which forages in water depths less than 30 feet was selected as the representative species in evaluating ecological risk at Area III. Therefore, the footprint of the planned cap will be designed to prevent exposure of the surf scoter to site contaminants. The Navy intends to conduct baseline monitoring prior to remedy implementation to characterize pre-remedy conditions and to aid in the design of the remedy prior to construction. The cap and dredging footprints in Area III may be revised based on baseline monitoring results. Details regarding sampling to be conducted to assess baseline conditions and performance of the remedy will be developed as part of the remedial action work plan, prior to remedy implementation. The Navy will communicate regularly with the City and Lennar about the progress of the cleanup and any sampling results. The City is part of the Base Realignment and Closure (BRAC) Cleanup Team (BCT) and frequent communication, including monthly face to face meetings, are conducted to discuss progress of the remedial actions conducted at HPNS.

Verbal Comment by Anonymous 2, recorded by Court Reporter during Public Meeting, April 11, 2018.		**Response**
COMMENTS		
1.	The proposed plan should include a figure that shows all the sampling locations conducted within the bay, so that we can see the true extent of sampling that the Navy conducted.	The Record of Decision (ROD) [**Figures 2** and **3**] and this Responsiveness Summary (***Exhibits 2*****, 3, and 4**) depict sediment sampling locations for Parcel F sediments.

Responsiveness Summary
Parcel F, Hunters Point Naval Shipyard, San Francisco, California

<table>
<tr><th colspan="2">Written comments by Liane Bauer received on May 7, 2018, via email.</th><th>Response</th></tr>
<tr><td colspan="3">COMMENTS</td></tr>
<tr><td>1.</td><td>NOT A CLEANUP PLAN BUT A RISK REDUCTION PLAN
The proposed plan does not say it will remove the contamination, it says it will “protect the public and environment by reducing the risk of exposure to contaminated sediment” (pg. 1, italics added). This means the exposure will still be there and further means that the land will never actually be “cleaned up.” This is not a “cleanup” plan, as the proposed plan consistently labels these actions, but one that marginally reduces risk of exposure, leaving substantial risk. Call it what it is so as not to confuse the public about the actual goals of the plan, please.</td><td>The Comprehensive Environmental Response Compensation, and Liability Act (CERCLA) requires all remedies to be protective of human health and the environment. The United States (U.S.) EPA defines CERCLA as follows: https://www.epa.gov/superfund-cleanup-process.
CERCLA does not require removal of all material that poses unacceptable risks to human health or the environment. CERCLA allows for management of material in place (i.e., in situ) to reduce the risk to human health and the environment to protective levels. The proposed remedy is a combination of removal and other treatment options, evaluated in accordance with nine evaluation criteria.
https://semspub.epa.gov/work/HQ/174406.pdf
The two most important criteria are:
1. Overall protection of human health and the environment, and
2. Compliance with ARARs.
Five primary balancing criteria are:
1. Long-term effectiveness and permanence,
2. Reduction of toxicity, mobility, or volume through treatment,
3. Short-term effectiveness, and
4. Implementability.
The two modifying criteria are:
1. State acceptance, and
2. Community acceptance.
The proposed remedy contains excavation and off-site disposal to a landfill as part of the cleanup. A summary of the remedies for each area are:
For Area III, contaminated sediments exceeding the Remedial Action Objective (RAO) 1 remedial goals (RGs) in the nearshore area too shallow to be capped will be removed to a depth of two feet followed by backfilling with clean sediment to pre-removal elevations. Beyond the nearshore area, contaminated sediments in water depths less than 30 feet will be capped. An estimated 68,670 square feet of contaminated sediment will be capped with approximately 2 feet of material.
For Areas IX and X, intertidal sediments that exceed RAO 1 RGs will be removed to a depth of approximately 1 foot (final depth to be determined during the Remedial Design). An estimated 39,000 cubic yards of sediment is expected to be removed. For the subtidal areas, the remedy will depend on the</td></tr>
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Responsiveness Summary
Parcel F, Hunters Point Naval Shipyard, San Francisco, California

Written comments by Liane Bauer received on May 7, 2018, via email.		**Response**
		concentrations identified in sediment and consists of a combination of removal and backfill, *in situ* treatment and MNR. Long-term performance and remedial goal monitoring will be performed in the appropriate remediation zones of Areas III, IX, and X. These monitoring results will be presented in Five Year Review reports that assess the ongoing protectiveness of the remedy and to ensure that the remedy is performing as intended and remains protective over time.
2.	**HOW DID THE OTHER AGENCIES REVIEW THIS PLAN FOR CONCURRENCE? WHAT WERE THE STANDARDS OF REVIEW?** - The EPA, the CDTSC (California DTSC), the SFRWQCB (the water board) all reviewed the document and "concur with the Navy's preferred clean up alternatives" (pg. 1). What was the process of review by these agencies? Did they simply rubberstamp the plans or did each agency honestly consider the alternatives and the potential impacts? The concurrence process should be disclosed to the public to affirm the integrity and honesty of that process. And since those same agencies reviewed and concurred with the prior Hunters Point work that has now been demonstrated to be falsified and incapable of protecting public health, there should be a discussion as to the steps made by each agency to correct the factors that led to their prior failures in oversight. - Discussions with regulatory agencies regarding acceptance need to be disclosed to the public to affirm honesty and integrity of discussions and review. The Proposed Plan states that "State acceptance will be evaluated through on-going discussion with State of California regulatory agencies" (pg. 11). These discussions should be disclosed to the public and interested parties to affirm the integrity and honesty of evaluations of the proposed plans.	State of California concurrence with the selected remedy has been evaluated through on-going discussions with State of California regulatory agencies. These agencies provided comments and concurrence on the documents identified in Table 1 (General Response 4) including the Parcel F FS (Barajas and Associates, 2008) which provides the basis for the selected remedy. All CERCLA documents are reviewed and commented on by the BCT, and comments are addressed and resolved prior to the document becoming final. The BCT includes the U.S. EPA Region IX, California DTSC and affiliated agencies (e.g. Fish and Wildlife), and the San Francisco Regional Water Quality Control Board (SFRWQCB or Water Board). Concurrence on the selected remedy for the Hunters Point Naval Shipyard Site are part of the administrative record for the site and, as such, are available for public review. The BCT has reviewed and concurred with the Proposed Plan.
3.	**WHY IS CLEANUP ONLY HAPPENING IN THREE AREAS?** - The proposed plan says that "active clean up" will be limited to three areas, Area III, Area IX, and Area X, (pg. 1) because those areas are "the only parcel F areas that pose unacceptable risk to human health or the environment" (pg. 1, italics added). However, the proposed plan says that Parcel F is made up of 11 subareas. (pg. 4.) The proposed plan says the chemical concentrations in other areas "do not pose unacceptable risk to human health or to the	Numerous investigations of Parcel F sediments took place between 1991 and 2015 (see General Response 4, Table 1). The results of these investigations are presented in numerous reports and documented in the administrative record. As described in the ROD, Areas III, IX and X are the only areas that were found to pose an unacceptable risk to human health or the environment. See additional detail in Liane Bauer Response #4.

Responsiveness Summary
Parcel F, Hunters Point Naval Shipyard, San Francisco, California

Written comments by Liane Bauer received on May 7, 2018, via email.		**Response**
	environment" (pg. 4). So I ask, what are these levels and what risk, if any, do they pose to human health and the environment? It is unreasonable to expect people to support or oppose a proposed plan that is being put forward purely on your assertion that it is acceptable, with no evidence supporting, particularly with the current scandal facing the shipyard. This should be stated clearly in the Final Proposed Plan.	
4.	**PROPOSED PLAN RELIES ON (TECHNOLOGICALLY) OUTDATED DATA** - The proposed plan is relying on site inspection data from the "1991 Environmental Sampling and Analysis Plan" and from the "1994 Phase 1A and 1996 Phase 1B Ecological Risk Assessments" (pg. 3) which means the Navy is relying on contamination data from over 20 years ago. Not only does contamination migrate, but newer and improved technology can and should be used to retest the area and see whether contamination levels are the same or worse in all areas of Hunters Point. Why is the Navy relying on such old data? Furthermore, who conducted the site inspection and is that inspection data accurate? I ask because we all know that the Navy has a track record of hiring companies who are willing to return false or fabricated data regarding contamination levels. I am referring to Tetra Tech. Furthermore, the Navy's inadequate oversight contributed to the Tetra Tech matter and undermines the credibility of all such measurements.	The majority of the data used to assess risk to human health and the environment and to evaluate remedial action alternatives in the Parcel F FS were collected in 2003. These data are presented in the 2005 Validation Study Report (Battelle et al., 2005) and the 2007 FS Data Gaps Investigation Report (Barajas et al., 2007). Supplemental sediment data were collected between 2011 and 2015 and are presented in the 2017 FS Addendum (KCH, 2017). The Navy plans on collecting additional data prior to implementing the remedy to refine the areas that will require cleanup under the selected Remedy. In addition, the Navy will perform long-term performance and remedial goal monitoring within the appropriate remediation zones to verify the protectiveness of the remedy following implementation. The results of this monitoring will be presented in Five-Year Review reports, also available in the public administrative record.
5.	**WHY WERE RISK TO OTHER GROUPS BESIDES ADULTS NOT ASSESSED?** - The Proposed Plan says that "the Navy calculated the potential cancer and noncancer risk to adults from eating fish and shellfish and direct contact with sediment during shellfish collection" (pg. 7) which means the proposed plan is explicitly stating that it only assessed risk to adults and not to children who may come in direct contact with the shores, perhaps assisting a parent with fish and shellfish collection. It's ridiculous and irresponsible to assume children are unaffected by shellfish contamination. If you truly want to protect the community you need to take the child consumption pathway and all other consumption pathways into consideration.	Risks to children associated with the direct contact of sediment and fish consumption were evaluated in the Validation Study Report (Battelle et al., 2005). As presented in Table 9-7 of the Validation Study Report (Battelle et al., 2005), risks to children associated with direct contact were within EPA's acceptable risk range and the noncancer hazard index was below one.

Responsiveness Summary
Parcel F, Hunters Point Naval Shipyard, San Francisco, California

6.	**NOT ENOUGH PATHWAYS OF EXPOSURE WERE CONSIDERED** - The Proposed Plan lists only a few examples of how individuals may be exposed to contaminated sediment. These examples include "individuals consuming shellfish and sportfish" and "individuals incidentally exposed to sediment during harvesting and cleaning of shellfish" (pg. 6). However, there are a multitude of ways for humans to be exposed to these contaminated sediments, especially on a shoreline. Why are other methods of exposure not listed, considered, or studied? The same goes for the decision to only study the "surf scoter (bird)" as a "representative ecological receptor that forages within Area III and Areas IX/X for food" (pg. 6). Why was only the Scoter selected and why weren't other species also studied and considered? The Proposed Plan says the "surf scoter, feeding on organisms, such as clams, snails, worms, or insects [...] was chosen as a representative species due to its feeding pattern and presence at the site" (pg. 7). However other species do feed and dwell in that same area with similar feeding patterns, so these species should also be considered for a comprehensive and complete understanding of effects. Please include all this information in the Proposed Plan as this is necessary to know when considering the cumulative and comprehensive effects of contaminated sediment on the local environment and to future human uses of the area.	The Parcel F human health evaluation focused on the potential human health impact from exposure to offshore sediment in HPNS study Areas I, III, VIII, IX, and X. Based on available information regarding the likely future land uses at HPNS, it was determined that potential exposures to humans could occur as the result of consumption of aquatic species such as fish and shellfish, and direct contact with sediment during shellfish collection. These exposure scenarios are consistent with the development of risk estimates based on an estimate of the reasonable maximum exposure (RME) expected to occur under both current and future land-use conditions. The reasonable maximum exposure is defined in EPA guidance as the highest exposure that is reasonably expected to occur at a site. The Parcel F ecological risk evaluation presented in the 2005 Validation Study Report (Battelle et al., 2005) considered three lines of evidence – sediment chemistry, sediment toxicity and bioaccumulation, and ecological risks were evaluated based on a weight of evidence approach that considered each line of evidence. The evaluation concluded that sediment toxicity was within acceptable levels throughout Parcel F. Uptake of chemicals from sediment to benthic invertebrates was evaluated to support risk estimates to birds, such as the surf scoter, that primarily feed on mollusks. The surf scoter, a diving duck, was selected as a representative receptor for the following reasons: • The surf scoter is present in large numbers from late fall through winter at Parcel F. • The surf scoter is a benthic-feeding bird that forages primarily on mollusks. As such, it is exposed directly to contaminated sediment. Additionally, because scoters feed primarily on bivalves, food-chain modeling using clam tissue could be used in the exposure models. • The surf scoter can feed in the intertidal zone during high tide and forages in the subtidal to depths in excess of 20 feet. Therefore, it can represent species potentially exposed to both intertidal and subtidal habitats. Many other species are only appropriate for one habitat or the other. • There is a substantial body of relevant literature for surf scoters. For example, trace metal and organochlorine analyses of surf scoter tissue and prey items have been reported from British Columbia to San Francisco Bay and form a good data set for evaluation of risk. Concentrations of chemicals in clam tissue samples exposed under standard laboratory protocols to sediments from Parcel F were used to evaluate the risk to birds such as the surf scoter that feed on clams in the field. The results of this evaluation determined that surf scoters in Areas III, IX, and X may be at risk from ingested doses of copper, lead, mercury, and PCBs in sediment. Because

Responsiveness Summary
Parcel F, Hunters Point Naval Shipyard, San Francisco, California

Written comments by Liane Bauer received on May 7, 2018, via email.		**Response**
		the surf scoter is assumed to be present at the site 50 percent of the time, and because the surf scoter is assumed to exclusively consume shellfish that are in direct contact with Parcel F sediments, the Navy has determined that remediation of sediments containing PCBs, copper, and mercury to concentrations that protect the surf scoter will be protective of other wildlife that consume fish and shellfish at the site.
7.	**WEAK STANDARD OF CLEAN UP, LIMITING RISK IS NOT CLEANING UP** - The Proposed Plan begins with a weak cleanup objective when it states that the Remedial Action Objective 2 (RAO2) will "limit or reduce the potential risk to human health from eating shellfish from Parcel F" (pg. 8). This objective is weak because it accepts that a "limit" to potential risk is enough clean up and does not explicitly require any measures to actually reduce or lower potential risk. This would mean that the Navy only has to limit the future risk and exposure, keeping actual contamination as is, rather than beginning with an objective that would require physically lowering the risk. The objective is problematic because the Proposed Plan clearly states that "for the fish consumption exposure pathway, it [the Hazard Index] exceeds 1 for total PCBs, which indicates that adverse noncancer human health effects are possible" (pg. 7) and "in the ecological risk assessment, the Navy concluded that contaminated sediment in Parcel F poses a potential threat to wildlife" (pg. 7). Because of these effects and potential risks on human health and wildlife, the Navy should not simply "limit" potential risk but should be compelled to take effective measures to markedly reduce the risk by removing contamination. In short, a stricter objective than "limiting" the risk of exposure should be set. - The same comment is true for RAO 3 which is summarized on page 8 of the Proposed Plan. An objective of "limiting" and not specifically markedly "reducing" or eliminating risk is too weak considering the effects and potential risks to human health and wildlife.	As noted in the response to Bauer Comment #1, all remedies are implemented under CERCLA. Consistent with EPA guidance, RAOs are medium specific goals for protecting human health and the environment and specify the chemical of concern, the exposure route and receptor, and an acceptable cleanup level. The cleanup goals for the selected remedy are expected to be protective of human health and the environment based on the results of the human health and ecological risk assessments. The goal of the selected remedy is to achieve the acceptable cleanup levels through a combination of removal, containment, treatment and MNR. The Navy has determined that these actions represent "effective measures to markedly reduce risk" and include a substantial sediment removal component. The Navy has also determined that other sediment remediation technologies such as containment, treatment, and MNR will be effective at reducing risk to protective concentrations. Full removal was evaluated in the FS but was not selected based on short-term effectiveness, implementability, and cost.

Responsiveness Summary
Parcel F, Hunters Point Naval Shipyard, San Francisco, California

Written comments by Liane Bauer received on May 7, 2018, via email.		**Response**
8.	**NEED TO ADDRESS WATERS DEEPER THAN 30 FEET OR PROOF THAT RISKS IN WATERS DEEPER THAN 30 FEET IS IMPOSSIBLE** - The Proposed Plan states that "contaminated sediments in deeper water exceeding RAO 1 PRGs would not be addressed due to the lack of exposure by the surf scoter, which does not forage in water depths greater than 30 ft" (pg.13). However, no information is provided about other bird and fish species' foraging patterns nor was there evidence provided to support the claim that since Scoter's would not be exposed, nothing in the area needs to be addressed. The Final Proposed Plan should consider all species when deciding on appropriate safe levels for humans and all other species present at Hunters Point. There must be appropriate justification for excluding contaminated sediments in waters deeper than 30 feet from cleanup.	Please see response to Bauer #6. Please see the Validation Study Report (Battelle et al., 2005) for additional information regarding how representative species were selected for risk evaluation.
9.	**PROPOSED PLAN IS NOT COMPLETE, MORE INFORMATION IS NEEDED AND MUST BE PUBLISHED BEFORE ANY AGENCY OR INDIVIDUAL CAN DECIDE WHICH ALTERNATIVE SHOULD BE USED** - In describing the preferred alternative for Area III, the Proposed Plan states that "the selection and specifications of capping material will be finalized during design of the clean up remedy" (pg. 13). The proposed plan makes various similar statements ("incorporation of additional sustainability elements will be considered during the design of the clean up remedy" pg. 14; "re-use opportunities of removed sediments will be considered during remedial design" pg. 14) which imply that not all aspects of the proposed plans and preferred alternatives have been considered and studied. How then, can this proposed plan be a sufficient or complete guide for deciding which alternative will be used? The proposed plan is incomplete and will need to include further data regarding each alternative since each alternative has not been fully studied or understood before any decisions on alternatives is made.	The Parcel F FS (Barajas and Associates, 2008) evaluated capping and sediment removal followed by off-site disposal for the purpose of selecting a remedy for the HPNS Site. However, the Parcel F FS (Barajas and Associates, 2008) did not include detailed information on the type of capping material. This level of specificity is appropriate for an FS level evaluation and is consistent with EPA guidance. As noted in the Proposed Plan, the selection of the capping material will be determined during remedial design based on site specific information. The cap will be designed to prevent exposure through the cap, prevent contaminant migration upward through the cap, and resist erosion such that protectiveness is maintained over time. However, details of the engineering implementation will be outlined in the remedial design. In addition, the waste management plan and re-use opportunities will be included in the remedial design.

Responsiveness Summary
Parcel F, Hunters Point Naval Shipyard, San Francisco, California

Written comments by Liane Bauer received on May 7, 2018, via email.		**Response**
10.	**INSTITUTIONAL CONTROL EFFECTIVENESS IS NEVER MENTIONED IN PROPOSED PLAN** - The Proposed Plan discusses the use of Institutional Controls (ICs) which would "consist of legal and administrative documents and processes to limit exposure of a future landowner(s) or user(s) to hazardous substances remaining on the property" (pg. 14). The plan mentions the following IC's as being under consideration for use at HPNS: "fish consumption advisories and commercial fishing bans to limit the potential for human exposure through fish consumption", "land and waterway use restriction", "restricted uses, including limitations on water use such as anchoring, swimming, or clamming" (pg. 14). The plan further states that "clamming restrictions would be implemented by posting warning signs and through physical barrier to restrict access" (pg. 14). While these measures may deter some people from being exposed to contamination, it is likely others will not be deterred. Therefore, there should be information regarding how effective these ICs will be to all groups of people. Furthermore, whose responsibility will it be if someone is incidentally exposed to contamination? Will it be theirs for missing a sign, or the Navy's for not cleaning up enough and for not establishing sufficient deterrence mechanisms? Finally, warning signs, physical barriers, and the like will all create aesthetic impacts on the landscape. How does the Navy intend to address the impacts of restricted use and warning/prohibited signs related to that?	The objectives of the Institutional Controls (ICs) associated with the selected remedy are to prevent exposure to contaminants until protective levels are achieved and to maintain the integrity of the engineered components of the remedy. As noted in the response to Caine Comment #2, fish consumption advisories are non-enforceable advisories that provide recommendations on the type and how many fish should be eaten and are typically issued by state health agencies (e.g., the California Office of Environmental Health Hazard Assessment [OEHHA]). A fish consumption advisory is currently in place for the San Francisco Bay water body based on PCBs: https://oehha.ca.gov/advisories/san-francisco-bay Natural physical barriers such as marsh vegetation will be considered as a component of the fish consumption advisory program. See Response to Maria Caine Comment #2 and Jill Fox Comment #2. The Navy will work with the local community and public health agencies to develop and implement appropriate community outreach programs. Details will be included in the land use control remedial design plan.

Responsiveness Summary
Parcel F, Hunters Point Naval Shipyard, San Francisco, California

Written comments by Amy D. Brownell, P.E., SFPDH, received on May 4, 2018.		**Response**
GENERAL COMMENTS		
1.	In consideration of the issue of polychlorinated biphenyls (PCBs) in Yosemite Slough and a proposal by different parties (2013 Final Engineering Evaluation/Cost Analysis [EECA] and 2014 Action Memorandum) on how to remediate the Yosemite Slough site please address the following: a. Given proximity, does the Navy's proposed remedy for Parcel F differ from the proposed remedy for Yosemite Slough? And if the cleanup approaches do differ, do the two remedies provide an equal level of protectiveness? b. Please describe how the Navy's proposed remedy for Parcel F considers proposed cleanup at Yosemite Slough. Please discuss the general remedy compatibility. Please also discuss the potential for both remedies to impact contiguous areas, for example due to sediment disturbance during cleanup. Specifically, please explain how the Navy's cleanup will assure that PCB-contaminated sediments from Parcel F don't migrate to the slough and affect that cleanup and vice versa. If potential for contaminant migration is identified, please also identify possible mitigation measures that may be implemented during remediation.	Please see General Response No. 2. a. The remedial goals selected for sediment at the Yosemite Slough Site require remediation of PCBs above 1,240 micrograms per kilogram (µg/kg) and lead above 436 mg/kg (Ecology and Environment, 2013; USEPA, 2014). Since the Parcel F sediment cleanup will also remediate PCBs and lead above these values, the remedies provide a similar level of protectiveness. b. The cleanup action selected by EPA for the Yosemite Slough includes dredging, capping, enhanced MNR, and is expected to be compatible with the proposed cleanup at Parcel F of HPNS which includes removal, backfill, *in situ* treatment, and MNR. In planning and implementing its remedy for Parcel F, the Navy will endeavor to ensure that the Yosemite Slough cleanup action and the Navy's actions pose no conflicts from a timing and constructability perspective and that the actions taken minimize any potential for recontamination of either area.
SPECIFIC COMMENTS		
1.	**Table 3, PRG Summary for Parcel F Surface Sediment, Page 8, Footnote:** The footnote states "Lead is collocated with PCBs in sediment, so achieving the cleanup goals for PCBs is expected to address any risks associated with lead." As noted in the response to Question 3 by CDFW, a single exceedance of the NOAA's Effects Range-Median (ER-M) for lead was observed in Area III and none were observed in Areas IX/X. The near absence of concentrations exceeding the ER-M is a more convincing argument for negligible lead-related risk following remedy implementation than concomitant removal and treatment of lead and PCBs. Please consider revising the statement if a similar explanation is planned to be included in the Record of Decision (ROD).	The National Oceanic and Atmospheric Administration (NOAA) Effects Range-Median (ER-M) concentration for lead is 218 milligrams per kilogram (mg/kg). Lead was detected in surface sediments at a single location within Area III above this threshold (275 mg/kg in sample PA-47) (Battelle et al., 2005). This detection is outside the remedial footprint of Area III because it is located in water with depths greater than 30 feet. Lead was detected at two locations within Area X above the ER-M threshold (364 mg/kg at TZSA03 and 663 mg/kg at SB-01) (Battelle et al., 2005; PRC, 1996). These detections are within the removal footprint for Area X. The ROD will clarify this point.

Responsiveness Summary
Parcel F, Hunters Point Naval Shipyard, San Francisco, California

Written comments by Amy D. Brownell, P.E., SFPDH, received on May 4, 2018.		**Response**
2.	**Table 4, Area III Cleanup Alternatives, Alternative 4 and 4A, Page 9:** The document states alternatives 4 and 4A "would not limit exposure to the benthic community and fish in water depths greater than 30 feet". Related to Comment 1, please explain in the ROD how RAO 3 ("Limit or reduce the potential biomagnification of total PCBs at higher trophic levels in the food chain to reduce the potential risk to human health from eating sport fish") is satisfied in consideration of potential exposure in water depths greater than 30 feet.	Alternative 4/4A will reduce PCB concentrations within Area III from 314 micrograms per kilogram (µg/kg) to 52.4 µg/kg as measured on an area weighted average basis. This concentration is below the estimated nearshore San Francisco Bay PCB ambient sediment concentration of 200 µg/kg. Since PCBs will be reduced to at or below the estimated nearshore ambient sediment concentration levels for San Francisco Bay, the potential for biomagnification cannot be reduced further. In addition, all sediments outside the Alternative 4/4A remedial footprint are below the RAO 1 remedial goal (RG) of 1,240 µg/kg with the exception of sample PA-150 which was found to contain PCBs at a concentration of 2,395 µg/kg at a depth of 45 to 60 centimeters (cm). However, shallow sediment PCB concentrations collected between 0 and 45 cm were found to contain PCBs between 91 and 147 µg/kg which are below the established PCB cleanup level.
3.	**Figure 9, Technology Assignment Decision Matrix Areas IX and X, Page 16:** The decision node in the bottom right corner of the figure, "PCBs range 1,240 to 200 µg/kg", is reached by a PCB concentration exceeding the "RAO 1 Not-to-Exceed PRG" of 1,240 µg/kg at the first decision node; therefore, the concentration cannot be less than 1,240 µg/kg. If Figure 9 or an equivalent figure is planned to be included in the ROD, please delete the decision node in the bottom right corner of the figure.	The decision node in question refers to sediments that contain PCBs above 200 µg/kg but below the not-to-exceed RG of 1,240 µg/kg. Sediments within this range will be remediated through MNR. To clarify, sediment with PCB concentrations exceeding 12,400 µg/kg will be remediated through removal; sediment with PCB concentrations between 1,240 and 12,400 µg/kg will be remediated through *in situ* treatment; sediment with PCB concentrations between 200 and 1,240 µg/kg will be remediated through MNR; and sediment with PCBs below 200 µg/kg will not require remediation. The "Description of Selected Remedy, Areas IX and X" section of the ROD clearly presents this information.

Responsiveness Summary
Parcel F, Hunters Point Naval Shipyard, San Francisco, California

Verbal Comment by Brian Butler, recorded by the Court Reporter during the Public Meeting on April 11, 2018.		Response
COMMENTS		
1.	I do want to give you some additional information. I am a community organizer and policy advocate for Green Action for Health and Environmental Justice. So I think before I get into the technical comments that I have around the proposed plan, I definitely want to take a moment just to formally comment on the Navy's continued quality of – the quality of the Navy's community engagements. It's very much lacking. It is very much narrow, and unfortunately, after many attempts to inform the Navy on how to improve its community engagement for this specific community, because I believe that this specific community has very unique characteristics, and the type of community engagement should be relevant to that. And, again, at the repeated attempts to inform the Navy about its community engagement, in the many ways that it's lacking I continued to get nowhere. I continued to see the Navy same brand of community engagement. I think there's a couple of issues that I have about the Navy in light of the Tetra Tech falsification, I believe that the Navy continues to evaluate and its data analysis that has borne out of Tetra Tech fraud. I wonder if the data, the sampling data, that this plan is based on has been evaluated as rigorously as the current techniques for data analysis, if that makes sense. One of the questions that I have is in terms of the extent of sampling that was done to inform this plan, how was that boundary, if you will, established? Were there contaminants beyond the current boundary of the proposed plan? Was there contamination beyond the boundary of the proposed plan? And if the proposed plan is based on data taken in 1990 or the 1990s or the early 2000s, does it account for the amount of flux in sediment migration that is inherent to the bay front. I also didn't understand why area Roman numeral I was not part of the proposed plan remediation. I read in the proposed plan that the active cleanup is to areas III, IX and X. In the past, I've heard that because a certain area or parcel didn't have industrial or	The Navy has conducted and continues to conduct numerous events to provide the community information about investigation and cleanup activities a HPNS. For example, the Navy has made and continues to make presentations at local community group meetings, conducts guided bus tours and published community outreach newsletters. Please see Community Outreach activities on the Navy web site: https://www.bracpmo.navy.mil/brac_bases/california/former_shipyard_hunters_point.html Regarding concerns about data quality and falsification, please see General Response 3. The remedial footprint presented in the Proposed Plan for Parcel F sediments was based on the results of the human health and ecological risk assessments and sediment data collected between the early 1990's and 2015. The data distribution and areas evaluated were based on an evaluation of the relative size of the impacted area around HPNS. Uncertainty in the data was incorporated into the development of treatment areas by using very conservative assumptions in developing the polygons representing different impact areas. The Proposed Plan is intended to provide the framework for implementing the remedy and presents the criteria used to define treatment and will be further developed in the remedial design. Based on the remedial strategy presented in the Proposed Plan, additional characterization will be performed prior to implementing the Parcel F remedy to ensure that accurate and current data are used to refine the treatment zones and ensure that RAOs are achieved and risk to human health and the environment is mitigated. In addition, performance monitoring will be performed after the remedial actions are implemented to confirm the effectiveness of the cleanup. Regarding Area I (India Basin Area), surface and subsurface sediment was collected and evaluated in the human health and ecological risk assessments. The results of this evaluation determined that risk to human health and the environment were within the risk management range and thus, remedial action is not warranted (please see Battelle et al., 2005).

Responsiveness Summary
Parcel F, Hunters Point Naval Shipyard, San Francisco, California

Verbal Comment by Brian Butler, recorded by the Court Reporter during the Public Meeting on April 11, 2018.		**Response**
	commercial activity, it was assumed that there was no contamination. It is also important in light of all the falsification and fraud that we are thorough and comprehensive when determining the true extent of contamination at this site. And I think I'll stop and submit some more written comments.	

Written Comment by Maria Caine, received on May 7, 2018, via e-mail.		**Response**
COMMENTS		
1.	I have many concerns about the Navy's recently released Proposed Plan for Parcel F. My concerns, for the most part, stem from the Plan's lack of actual data supporting the justification of your choice of preferred alternative but extend to my concern about the complete lack of legitimacy and transparency your proposed plan offers. First and foremost, there is a severe lack of information in the Proposed Plan itself. There was little to no information about the radionuclides present at Parcel F, with just a paragraph or two describing an intention to properly dispose of "the potential remains [of] radioluminescent items" that might be encountered during dredging (page 4). The small section describes radiological levels in sediment to be "at or below background" which in itself is impossible. Background is the lowest level of contamination a site can get to—it is the concentration radionuclides (or chemicals) were at before the contamination that is being cleaned took place. If samples at Parcel F are showing reading levels of contamination below background, there is either a) a problem with the samples or b) a problem with the background level being used. Additionally, I find it difficult to believe that there were no signs of contamination when the Navy acknowledged in the radiological addendum to the Feasibility Study that there were four independent, potential sources of radiological contamination at Parcel F (page ES-2). No radiological cleanup is proposed whatsoever.	A detailed investigation of radionuclides was conducted at Parcel F. The results are presented in the Addendum to the FS Report for Parcel F (KCH, 2017). Three phases of investigation focused on radionuclides were conducted between 2009 and 2013. Please see General Response 3.
2.	The Navy contemplates potential institutional controls (ICs) to theoretically reduce opportunities for human to come into contact	ICs at HPNS Parcel F, will focus on limitations on uses that may disturb cleanup. The Navy will consider natural physical barriers that are more

Responsiveness Summary
Parcel F, Hunters Point Naval Shipyard, San Francisco, California

Written Comment by Maria Caine, received on May 7, 2018, via e-mail.		**Response**
	with the sediment, fish, clams, or other potentially harmful sources of contamination at Parcel F. Some ICs at Parcel F (mentioned as possible but not committed to) include an advisory against fish consumption, commercial fishing bans, land and waterway use restrictions within Areas III and IX/X only, and restricted and limitations for water such as anchoring, swimming, or clamming. The clamming restrictions, if adopted, would be implemented by posting warning signs and through physical barriers to restrict access. However, given that fish travel all across the bay, will the IC's, if adopted, tell people that they shouldn't do these activities, or will they also explain why they shouldn't do certain activities? If the Navy plans to leave the contamination behind, will they be open with the community about how dangerous the fish they may consume truly are? Institutional Controls seem like a reasonable idea at face value, but they come with many issues, one of the biggest being the need for an institution to still be around to enforce these covenants in the years to come. I have little faith in the Navy, EPA, or DTSC's ability to be this enforcer given the track record at Hunters Point for miscommunication. Additionally, the Navy has not, as of yet, settled on the specifics of institutional controls, or even whether to impose any at all. Everything listed in the Proposed Plan is merely "under consideration" and subject to change. According to page 3-6 of the Feasibility Study, "Land use restrictions will be applied to the property and included in findings of suitability to transfer, findings of suitability for early transfer, 'Covenant(s) to Restrict Use of Property' between the Navy and DTSC, and any Quitclaim Deed(s) conveying real property containing Parcel F at HPS." So the Navy is proposing a plan and asking for the approval of community members, when an essential part of the supposed remedy has not yet been finalized.	compatible with future site use to restrict access for the protection of human health. Natural physical barriers such as marsh vegetation also act as a non-armored shoreline protection method, and is in alignment with San Francisco Bay Conservation and Development Commission (BCDC) comment No. 2. The Parcel F ROD will reflect this consideration to be consistent with the local reuse plan. Please also see response to written Comment #3 received from Michael Hamman regarding ICs. Fish consumption advisories are non-enforceable advisories that provide recommendations on the type and how many fish should be eaten and are typically issued by state health agencies (e.g., the California OEHHA). A fish consumption advisory is currently in place for the San Francisco Bay water body based on PCBs (https://oehha.ca.gov/advisories/san-francisco-bay). Fish consumption advisories are usually combined with ongoing public outreach and education plans to increase their effectiveness.
3.	Along with ICs, the Proposed Plan also briefly describes a combination of removal actions for some contamination, and for others, no removal but instead caps, in-situ treatment, and/or "monitored natural recovery" which are hardly explained or justified. The in-situ treatment using activated carbon was only given a brief mention in regard to a "pilot study." The small blue box that describes the treatment is extremely misleading, and to get any real information about this alternative I had to do further research into your feasibility study, which is not referenced in the	MNR relies on natural recovery processes such as chemical transformation, reduction in chemical of concern mobility and bioavailability, physical isolation (or burial), and dispersion (Magar et al., 2009) to reduce risks to human health and the environment. MNR can be an effective remedial technology in depositional environments such as Area IX/X and the effectiveness of MNR increases when combined with active sediment remediation and source control measures as is the case at Parcel F. Natural recovery processes at HPNS Parcel F primarily involves natural sedimentation that would create a cleaner layer of surface sediment, by

Responsiveness Summary
Parcel F, Hunters Point Naval Shipyard, San Francisco, California

Written Comment by Maria Caine, received on May 7, 2018, via e-mail.		**Response**
	Proposed Plan as necessary background information. My research led me to conclude that it is dishonest of the Navy to present activated carbon as a valid proposal for cleanup. First of all, activated carbon does not clean up PCBs; if it works, which is questionable, it merely reduces (but doesn't by any means eliminate) the uptake of PCBs by clams; the PCBs remain. The study on activated carbon that is being referenced is not in fact, a guaranteed successful cleanup alternative as the Navy purports in the Proposed Plan, but something very speculative. The 2008 Feasibility Study notes that, "the effectiveness of in-situ bioremediation in addressing contaminated sediment at Parcel F is uncertain." (page 3-16). Additionally, the carbon study is referenced as though it is an ongoing experiment at the site. The feasibility study asserts that: [T]he primary objective of the demonstration project taking place at Parcel F is to evaluate an innovative treatment for in-situ stabilization of PCBs in sediment under field conditions found at Area X (South Basin). Additional objectives are to evaluate if activated carbon treatment reduces PCB bioaccumulation in field tests and evaluate if no significant sediment resuspension and PCB release occurs as a result of the large-scale mixing technologies used to blend the carbon into the sediment. The technology involves mixing activated carbon into the contaminated sediment." This language suggests that the study was, at the time of inclusion in the FS, far from a demonstrated success the way the Proposed Plan makes it appear. In fact, quite the opposite, the carbon study and feasibility studies both seem to support evidence that activated carbon in the environment would not help reduce the levels of PCBs as much as the Navy suggests. Results of the study were inconclusive as to the long term effectiveness of the carbon. Why does the Proposed Plan preferred alternative include a strategy that is not yet proven? It is inappropriate of the Navy to propose this cleanup alternative under the false pretense of effectiveness so the preferred alternative should be reevaluated and reconsidered.	burying more contaminated sediments over time. MNR will be applied to areas outside the removal and *in situ* treatment areas associated with Area IX/X. MNR is not applicable to Area III. *In situ* treatment using carbon-based amendments such as activated carbon is also an effective remedial technology for treating sediments containing PCBs and organic chemicals. The Navy acknowledges that *in situ* treatment using carbon-based amendments does not destroy or eliminate PCBs, but rather reduces the toxicity and bioaccumulation potential of PCBs by reducing the bioavailability of PCBs. Many studies demonstrating the effectiveness of *in situ* treatment using carbon-based amendments have been performed since the 2008 FS was completed including two pilot scale treatability studies conducted at Parcel F. The first Parcel F treatability study was conducted between 2005 and 2008 to field test the mixing of activated carbon with Parcel F sediment (Cho and others. 2009). The second Parcel F treatability study evaluated the effectiveness of two commercially available treatment products – AquaGate +PAC and Sedimite were tested and performance evaluated over a 26-month period (KCH, 2018). The results show substantial reductions in the bioavailable fraction of PCBs measured in sediment porewater of the treatment areas. For example, the 26-month monitoring event conducted in July and August 2017 showed that surficial pore water PCB concentrations were reduced by 89 percent in the AquaGate plot and by 91 percent in the Sedimite plot when compared to the baseline condition. These site-specific treatability testing results were considered in developing the remedial strategy described in the Proposed Plan, and specifically in developing the criteria used to define where *in situ* carbon treatment could provide substantive benefit within Areas IX/X toward achieving compliance with remedy RAOs and RGs. Based on these results, *in situ* treatment will be used to reduce porewater concentrations by approximately 90% in moderately contaminated areas. Based on this recent site- specific information, the Navy has determined that *in situ* treatment is an effective treatment for PCB contaminated sediments within Areas IX and X of Parcel F. The *in situ* treatment will bind to the PCBs in sediment, making them unavailable for uptake by benthic organisms and subsequent biomagnification up the food chain. Therefore, the bioavailability of PCBs resulting from Navy activity will be significantly reduced, resulting in human and ecological risk reduction, until MNR results in achievement of the RAO 3 RG. South Basin is a net depositional

Responsiveness Summary
Parcel F, Hunters Point Naval Shipyard, San Francisco, California

Written Comment by Maria Caine, received on May 7, 2018, via e-mail.		Response
		environment, and sediment from the greater San Francisco Bay will overlay the *in situ* treatment remediation zone over time. Therefore, RAOs and RGs will be achieved through a multi-technology strategy that collectively reduces uncertainties in remedial performance of one technology and ensures RAOs and RGs are achieved. Performance monitoring will be conducted immediately following remedy implementation to ensure that *in situ* treatment materials have been placed to design specifications. Long-term remedial goal monitoring will be performed within the MNR remediation zone to monitor progress toward achieving the RAO 3, 200 µg/kg total PCB RG on an area-weighted average basis. The results of this monitoring will be presented in a series of 5-year review reports.
4.	I am also very concerned about how the Navy decided to study effects on the ecological communities of Hunters Point. First of all, your Feasibility Study seemed to focus entirely on the Surf Scoter and clam consumption when studying the effect of contamination on ecological receptors, despite the variety of wildlife who live at the shipyard. Completely ignoring other species makes no sense, especially given the Navy's admittance that the shallow bay habitat of Parcel F is a feeding area for dozens of species of fish, crabs, and shrimp which support a diversity of birds including the double-crested cormorant and several duck species that feed on benthic invertebrates such as mollusks and crustaceans. Marine mammals including the California sea lion and harbor seal have also been observed using the bay waters around HPNS." Given the diversity of the wildlife at HPNS, why was the surf scoter chosen as a representative at the expense of other ecological receptors? The negative effects of chemical and radiological contamination at Parcel F must be evaluated for all potential receptors in order to create a cleanup plan that is truly protective of human health and the environment.	The Navy acknowledges that a variety of wildlife are present at Parcel F. The surf scoter was selected as a representative ecological receptor based on its feeding behavior and potential for exposure to contaminants of concern. As was noted in the Parcel F FS (Barajas and Associates, 2008), the surf scoter is present at the site during much of the year and consumes fish and shellfish at the site. Because the surf scoter is assumed to be present at the site 50 percent of the time and because the surf scoter is assumed to exclusively consume shellfish that are in direct contact with Parcel F sediments, the Navy has determined that remediation of sediments containing PCBs, copper, and mercury to concentrations that protect the surf scoter will be protective of other wildlife that consume fish and shellfish at the site. Also, please see Response to Bauer #6. In addition, the RGs for the surf scoter exposed to PCBs were compared with the RGs developed for the double-crested cormorant (Parcel F FS – Barajas and Associates, 2008), which feeds predominantly on fish rather than clams. The RG developed for surf scoters was lower than for the cormorant; thus, levels protective of the surf scoter would also be protective of the cormorant, and thus it was considered protective of both feeding guilds.
5.	Regarding the human health impact, the Navy has done a poor job evaluating all of the potential sources of contamination. In the Feasibility Study, the Navy admits to not evaluating the risk exposure for consumption of contaminated shellfish in regard to children because "children are not likely to consume shellfish," (Parcel F FS, 1-25). Having been a child who quite enjoyed shellfish and knowing that there are many others who do too, I	The results of the human health risk assessment are presented in the Validation Study Report (Battelle et al., 2005). The human health risk evaluation determined that risks are within the EPA acceptable risk range of 10^{-4} to 10^{-6}. Consumption of fish collected from Parcel F was the only human health exposure pathway that was found to pose a non-cancer hazard. Risks to children associated with shellfish consumption were not evaluated due to the low probability that children would consume shellfish collected

Responsiveness Summary
Parcel F, Hunters Point Naval Shipyard, San Francisco, California

Written Comment by Maria Caine, received on May 7, 2018, via e-mail.		**Response**
	worry that leaving out this exposure pathway is grossly misrepresenting the effect of contamination on the community, especially considering children are some of the most sensitive receptors. I find this doubly concerning when paired with the knowledge that the Navy has only proposed cleaning up to a risk level 10^{-4} (or 1 in 10,000). A consistent problem I have encountered in regard to Hunters Point is the assertion that anywhere within the risk range of 1 in 10,000 to 1 in 1,000,000 is OK under CERCLA. This is the assumption the Navy is working under for the Proposed Plan. In reality, under Superfund law, one is to aim for a one in a million risk, and only fall back from that if there are overriding reasons demonstrated, and never over one in ten thousand risk. The latter, upper end of what is ever acceptable is not a de facto acceptable level for cleanup; one is to aim for the lower end of that range, and the Navy should be. The Risk Range is supposed to act in part as a protective buffer in the case that we discover chemicals or radionuclides are more dangerous than previously known (something that has almost always been the case). The Navy is supposed to be cleaning up to a standard of 1 in 1,000,000 and only falling into lower magnitudes as time makes the standards more restrictive or if it is impossible to meet that standard. Aiming for a risk higher than that is unethical and not protective of human health hand the environment. It is the Navy's responsibility to clean up the site so that the most at risk individual is safe from contamination. Please evaluate all possibilities, even if assumed unlikely, and do not rely on outrageous assumptions to reduce the amount of cleanup that must be done.	from Parcel F. Although consumption of shellfish by children was not evaluated, risks to children associated with the direct contact of sediment and fish consumption were evaluated in the Validation Study Report (Battelle et al., 2005). As presented in Table 9-7 of the Validation Study Report (Battelle et al., 2005), risks to children associated with direct contact were within EPA's acceptable risk range and the noncancer hazard index was below one. Risk to children associated with fish consumption were estimated based on ingestion rates using a total fish consumption rate for children under the age of six of 11.4 grams per day (g/day) and a recreational fish intake of 5.6 g/day. Risks to children were determined to be only slightly higher than those calculated for adult-only exposures. Based on the evaluation of risks to children associated with direct contact sediment and fish consumption, the Navy has determined that the selected remedy will be protective of both adults and children.
6.	While the Navy does address the human and ecological health impacts of digesting clams that contain PCBs, I did not come across information in your reports about how you will protect the benthic community itself. There was a mention, on page 1-28 of the Parcel F Feasibility Study that "In Area III, copper and mercury were identified as the primary risk drivers; PCBs are of greatest concern in Areas IX and X. These chemicals also exceeded concentrations considered safe for benthic invertebrates directly exposed to sediment." However, despite the acknowledgement that these levels are unsafe, the plan is simply to leave the contamination in in place and either, do nothing (deceptively referred to as "Monitored Natural Recovery"), mix	Although a remedial action objective was not developed specifically for protection of the benthic community, the Parcel F FS considered risks to the benthic community. Based on the results of this evaluation as described below, the Navy has determined that the selected remedy is protective of the benthic community. For copper, the proposed cleanup level of 271 milligrams per kilogram (mg/kg) is similar to the ER-M value of 270 mg/kg for protection of the benthic community. For mercury, the proposed cleanup level of 1.87 mg/kg is above the ER-M value (0.71 mg/kg) for protection of the benthic community. However, mercury contamination is limited within Area III and samples with mercury

Responsiveness Summary
Parcel F, Hunters Point Naval Shipyard, San Francisco, California

Written Comment by Maria Caine, received on May 7, 2018, via e-mail.		Response
	activated carbon into the soil, or cap shallow areas which could be exposed to humans.	at concentrations that exceed the ER-M value were clustered near the tip of the pier. In addition, the sample with the highest concentration of mercury measured during the Validation Study (Battelle et al., 2005), demonstrated no toxicity either to amphipods (survival was 89 percent) or to sea urchin larvae (normal development was 97 percent). For lead, a numeric RG was not developed. However, site data were evaluated against the ER-M value of 218 mg/kg. With the exception of one surface sediment sample with a lead concentration of 275 mg/kg within Area III, all sediments with lead concentrations above 218 mg/kg will be addressed by the selected remedy through removal or capping. For PCBs, the proposed RAO 3 cleanup level of 200 µg/kg is comparable to the total PCB ER-M value of 180 µg/kg. Thus, the proposed cleanup is expected to be protective of the benthic community for PCBs.
7.	Caps, however, are another strong point of concern for me. How will the benthic community be affected by these hard caps being placed over their habitat? Section 1.3 of the activated carbon study points out that, "only the upper 6 inches of surface sediments are considered biologically active," while the feasibility study defines caps as covers that "generally include sand or clay mineral-based material, potentially consisting of multiple layers, and are usually 1 to 3 feet thick," (3-13). I worry that hard caps made of clay or even softer caps of a thickness that great will destroy the native marine ecosystem. It is also troublesome that the Navy only intends to have these caps monitored for 30 years. Additionally, their own modeling predicts PCBs will leak back out over the 30-year time frame. If they predict PCB's will leak during the 30 years, how can we know that more will not leak out as the caps get older? It does not seem like we can be sure that the caps will stay safe and secure and that people living near the water at Parcel B will be safe. It is the responsibility of the Navy to protect the entire ecosystem from the contamination it left behind at Parcel F, not just the Surf Scoter and adult humans.	The sediment cap proposed in Area III will be designed to both resist erosion, severe storm events, and to maintain benthic community habitat. Actions to protect the benthic community may include the use of natural materials to armor the cap (e.g., rounded gravel or cobbles) or the use of a habitat layer on the surface of the cap. The FS only evaluated 30 years of monitoring for costing purposes since costs greater than 30 years out have a minimal effect on the overall cost of a remedy. After the remedy is implemented, performance monitoring will be conducted to verify that the remedy is performing as intended. Immediately following construction, data will be collected to ensure that capping materials have been placed to design specifications. Physical inspections (e.g., for erosion) of the cap will be conducted annually in years 1 through 5 post-construction, and then at 5-year intervals during the five-year review process thereafter. Under CERCLA, a review of the remedy is required every 5 years. The purpose of a Five-Year Review is to determine whether the selected remedy at a site continues to be protective of human health and the environment. Performance monitoring results will be presented in the Five-Year Review reports.
8.	The Navy asserts that cleanup was also focused on PCBs because they had the highest concentration of all chemicals present at parcel F, but I saw no studies on how mercury, lead, or copper would affect the community. Where is this information? The Navy admits that they discovered "polychlorinated biphenyl	Sediments collected from Parcel F were characterized for PCBs and metals. The results of the risk assessment concluded that PCBs, copper, lead and mercury were contaminants of concern for Parcel F. Within Area III, PCBs, copper and mercury were detected in surface sediments (less than 2 feet deep) above RGs and there was a single detection

Responsiveness Summary
Parcel F, Hunters Point Naval Shipyard, San Francisco, California

Written Comment by Maria Caine, received on May 7, 2018, via e-mail.		**Response**
	(PCB), copper, lead, and mercury contamination of sediment in certain areas of Parcel F," (Parcel F Proposed Plan, 2018), but then disregards these because PCB's were found in the highest concentrations where other chemicals were also present. If the proposed plan were dredging, I suppose this argument would hold some merit, as all contamination would be removed along with PCBs. However, the majority of "remediation" in the proposed alternative is to leave the contamination in place, something I find very concerning given the different chemicals at the site. The proposed in-situ remediation using activated carbon is only described as having an affect (and not a very positive one) on the levels of PCB contamination. If this treatment is chosen, what will happen to the mercury, copper, and potential radionuclides in the sediment? Furthermore, regarding lead, the Navy's feasibility study stated that "lead was identified as a potential but unquantifiable contributor to risk because of the uncertainty associated with both the bioavailability and toxicity of lead. However, no further effort to quantify risk posed by lead is warranted because the highest lead concentrations are found in the same areas as high concentrations of other metals or PCBs." (Parcel F FS, 1-28). I find this extremely concerning. Lead is a highly toxic chemical known to cause serious health problems in children and pregnant women, yet the effect the lead in this ecosystem could have is not even being studied.	of lead above the ER-M of 218 mg/kg. The selected remedy for Area III either removes or caps sediment with PCBs, copper and mercury contamination above the RAO 1 cleanup levels and lead contamination above 218 mg/kg in water less than 30 feet deep. This will result in a remedy that is protective of human health and the environment. Within Areas IX and X, PCBs, copper and mercury were detected in surface sediments (less than 2 feet deep) above RGs and there were two detections of lead above the ER-M of 218 mg/kg. The highest concentrations of chemicals of concern were detected in intertidal sediments which will be remediated through removal and off-site disposal followed by placement of clean backfill material. This includes all sediment with lead above the ER-M of 218 mg/kg and copper and mercury above the RAO 1 RGs. *In situ* treatment using carbon-based amendments will be limited to subtidal sediments with PCB concentrations between 1,240 and 12,400 µg/kg. Subtidal sediments with PCBs above 12,400 µg/kg will also be remediated through removal and off-site disposal followed by placement of clean backfill. The SedCam Model (Jacobs, L., R. Barrick, and T. Ginn. 1988) was used to evaluate reductions in sediment concentrations through MNR following active remediation within Areas IX and X. The modeling results demonstrated that MNR will achieve the PCB RAO 3 RG of 200 µg/kg within 5 years for Area IX and within 8 years for Area X. The modeling results are presented in the Final Technical Memorandum, Optimized Remedial Alternative for Parcel F (ECC-Insight, LLC and CDM Smith, 2017). Please refer to the response to General Response 3.
9.	In general, I found the entire Proposed Plan to be very concerning. I mentioned it briefly before, but it makes very little sense to me that someone would choose an alternative before having the details of said alternative worked out, but according to the quote on page 13 of the Navy's proposed plan which states, "the selection and specifications of capping material will be finalized during design of the cleanup remedy," that's exactly what you intend to do. How can you settle on a plan before knowing what the plan would truly entail? Further, how can the public comment on your plan if you have not included the exact details of the plan in the "Proposed Plan for Offshore Sediment Clean Up." It feels more to me, like the plan itself is poorly produced piece of propaganda used to encourage community support for Navy selected alternatives that don't have a sound scientific background	The evaluation presented in the FS and the Proposed Plan were performed consistent with EPA CERCLA guidance and for comparing remedial alternatives and selecting a preferred remedy. More information on the CERCLA process may be found at: https://www.epa.gov/superfund-cleanup-process It is not practicable to conduct detailed design level evaluations on all remedial alternatives. Rather this level of analysis is only appropriate for the selected remedy. Additional data collection and analyses will be conducted to design and construct the cleanup. As noted above, the remedy addresses copper, lead and mercury in addition to PCBs. Based on the results of the many studies performed at Parcel F, the Navy has determined that the selected remedy is protective of human health and the environment and complies with the requirements of CERCLA.

Responsiveness Summary
Parcel F, Hunters Point Naval Shipyard, San Francisco, California

Written Comment by Maria Caine, received on May 7, 2018, via e-mail.		**Response**
	for effectiveness. You ask the public to comment on this proposed plan, while providing almost no information about what the plan entails or how it affects humans and the environment. Some of this information could be found in the Feasibility Study, but this is not explained in the Proposed Plan, nor is anything clearly cited or referenced for transparency. The Navy must provide verified sources and information to back their claims that the preferred alternatives are truly the most protective option for human health and the environment. If this cannot be provided for the final Proposed Plan, the proposed plan and preferred alternatives must be reworked until we have a solution that will keep the community safe. Given the Tetra Tech scandal which has shaken public confidence in the Navy and the other governmental entities that were supposed to be thoroughly overseeing the Hunters Point cleanup, the Parcel F Plan is deeply troubling. Rather than committing to cleaning up the contamination, it proposes leaving most of it. It essentially ignores all the radionuclide contamination possible and ignores all but the PCBs, and for those, it proposes to leave in place most of that contamination. I urge you to withdraw the Plan and start from scratch, with a top to bottom reform to get the whole Hunters Point process into a position where public confidence can be earned and high levels of protection of public health and the environment assured.	

Responsiveness Summary
Parcel F, Hunters Point Naval Shipyard, San Francisco, California

Written Comments sent by CBG received on May 7, 2018 via email.		Response
GENERAL COMMENTS		
1.	**Background:** The Navy's Proposal to Walk Away from Most Cleanup Obligations for Parcel F in the Context of the Current Hunters Point Crisis The Hunters Point Naval Shipyard is one of the nation's most contaminated sites. Decades of poor environmental practices resulted in extensive pollution with radioactive materials and toxic chemicals. Navy ships that had been exposed to high levels of nuclear fallout by being placed near hydrogen bomb explosions in the Pacific were brought back to Hunters Point for "decontamination." Because radioactivity cannot be neutralized by such mechanical means, decontamination in practice meant moving the contamination from the ships to Hunters Point, contaminating soil, groundwater, and offshore sediments. Additional pollution was caused by years of experimentation with radioactive materials at the Naval Radiological Defense Laboratory based also at Hunters Point. In addition to releases of radionuclides such as plutonium-239, cesium-137, strontium-90, and radium-226, among many others, a wide array of very toxic chemicals were also released, including polychlorinated biphenyls (PCBs) and heavy metals. Unfortunately, the poor environmental practices by the Navy that led to the contamination in the first place have now been repeated during the last couple of decades in what was supposed to be the cleanup of the damage that had been done to Hunters Point. The most visible of these problems has been the extraordinary set of revelations that the Navy's contractor at the site, Tetra Tech, engaged in significant fabrication or falsification of sampling results. The Navy itself now estimates nearly half of the measurements are suspect and will need to be done again. The US EPA, in its independent review of those findings with the state Department of Toxic Substances Control (DTSC) and Department of Public Health (DPH), has concluded that only 10% of measurements at one parcel and 3% at another are free of falsification. In other words, for two parcels making up 40% of Hunters Point, the first parcels reviewed by EPA, 90-97% of the readings are suspect and need to be done again. The Navy itself has stated, in filings with the court that issued the first convictions in the scandal, that the fabrication of results by	The selected remedy for Parcel F at the HPNS Site relies on a combination of remedial technologies including removal and off-site disposal, capping, *in situ* treatment, and MNR. These measures will result in a remedy that protects human health and the environment and demonstrates the Navy's commitment to the cleanup of the HPNS Site. Please see General Response 3.

Responsiveness Summary
Parcel F, Hunters Point Naval Shipyard, San Francisco, California

Written Comments sent by CBG received on May 7, 2018 via email.		**Response**
	Tetra Tech has caused other agencies to lose confidence in the Navy and set back the cleanup by a decade. The loss of confidence among the public is, of course, even greater. And indeed, the oversight failures by the Navy and the regulatory agencies that allowed this environmental fraud to go on for so long goes far beyond just the actions of Tetra Tech. Fundamental questions are being asked as to whether the Navy sent signals, implicitly or otherwise, perceived by Tetra Tech as wanting reports that low-balled the amount of contamination, as a way of reducing the amount of cleanup mandated and thus saving considerable money, albeit at the expense of increased risk to the health of the public. Additionally, serious questions arise out of the failure of EPA, DTSC, DPH and other agencies to have fulfilled their oversight functions and caught these extraordinary failures years ago. Given the current crisis, one would think that this is the last moment the Navy would propose walking away from most of its cleanup obligations for a Hunters Point parcel. Yet that is, as discussed below, precisely what the Navy has now done with regards Parcel F.	
2.	**The Parcel F Proposal: Undertake No Cleanup of Radionuclide or Chemical Contamination in Parcel F, with the Exception of Removal of a Fraction of the PCB Contamination** Parcel B consists of the areas immediately offshore contaminated Hunters Point land. These offshore areas were potentially contaminated by numerous means: discharges of toxic and radioactive materials via sewer pipes and storm drains, sandblasting and other steps to get contamination off the berthed ships, runoff from contamination on Hunters Point land, “underwater experimentation, and accidental radioactive waste disposal activities from Navy ships.” Despite the controversy swirling about the unreliable radiation measurements throughout Hunters Point and the use of non-protective cleanup standards, the Navy has now proposed to take no action whatsoever to cleanup any radioactivity in Parcel F And despite acknowledgment of contamination by copper, lead and mercury, the Navy proposes to take no specific action remove any of them. The Plan thus ignores all other contaminants and only directly addresses PCBs. However, most of the preferred alternative	Please see General Response 3. The selected remedy for Parcel F at HPNS, relies on a combination of remedial technologies including removal and off-site disposal, capping, *in situ* treatment and MNR. These measures will result in a remedy that protects human health and the environment. However, remediation is only required in areas that were determined to pose unacceptable risk to human health or the environment. Based on the results of the risk assessment, only Areas III, IX and X were determined to pose unacceptable risk to human health or the environment. Although the selected remedy leaves some contamination in place, the sediment with the highest contaminant concentrations will be removed and transported for off-site disposal (land fill). *In situ* treatment using carbon-based amendments will only be applied in areas where treatment has been demonstrated to be able to achieve the RAOs for the site. Similarly, capping will only be performed in areas where it can be shown that contamination can be effectively contained.

Responsiveness Summary
Parcel F, Hunters Point Naval Shipyard, San Francisco, California

Written Comments sent by CBG received on May 7, 2018 via email.		Response
	identified involves leaving most of the PCB contaminated sediments, taking no action to remove or otherwise clean up the PCBs. Instead, for much of the PCB contamination, it is proposed to either put a thin layer of sand or similar substance on top. Other PCB contamination would have some activated carbon placed on it, in the extremely theoretical hope that the uptake of PCBs by benthic organisms like clams would be slowed. And for much of the PCB contamination, the Navy proposes not even doing that, but instead just leaving it in place, a process euphemistically called Monitored Natural Recovery (MNR). There is no pretense that MNR involves the PCBs disappearing (PCBs are extremely persistent in the environment). Instead, the premise is that over time particulates in the water will settle on the contaminated sediment. By this illusion, talking only about the thin sediment layer that will fall onto the contaminated layer and calling the thin new layer "clean" while ignoring the toxic stuff just below it, the Navy makes the remarkable claim that in about 5 years, doing nothing, those PCB areas will be below background. Obviously if this were so, there would be no PCB contamination in Parcel F to begin with, because many multiples of 5 years have passed since the bulk of the contamination got there. And to make matters even worse, the Parcel F Plan proposes that no cleanup action whatsoever be taken for eight of the eleven areas within Parcel F. This is not a cleanup plan. It is, for most of the areas and almost all the contaminants, a no-cleanup plan.	
3.	**The Refusal to Undertake Any Cleanup of Radionuclides is Inappropriate** It has now been recognized that the great majority of radionuclide samples taken to date at Hunters Point—for all practical purposes, essentially all of them—are suspect and need to be done again, with far tighter controls. Additionally, there are significant questions about the propriety of the cleanup standards employed. It is difficult to comprehend, therefore, why the Navy is proposing to do no radioactive cleanup in Parcel F. Indeed, some of the Parcel F work was done by Tetra Tech (in a former iteration) and its Contractor. But the underlying problems that the Tetra Tech situation revealed raise fundamental questions about the Navy oversight generally.	Please see General Response 3. Remedial actions in accordance with CERCLA are conducted to produce site conditions that do not present an unacceptable risk to human health and the environment. Because risk associated with radionuclides is within or below the EPA acceptable risk range of 10^{-6} to 10^{-4}, cleanup of radionuclides at Parcel F at HPNS is not required.

Responsiveness Summary
Parcel F, Hunters Point Naval Shipyard, San Francisco, California

Written Comments sent by CBG received on May 7, 2018 via email.		Response
	The minimal analyses upon which the Navy is relying for its decision to do no radioactive cleanup in Parcel F are questionable and do not support such a decision. For example, the Parcel F Plan asserts that all measurements were at or below background. (p4) It is, of course, not possible to be below background. But even so, the documents upon which the Navy relies for this assertion do not demonstrate this. They purport to show that the radionuclide levels in Parcel F may be above background, but below the Project Action Limits (PALs) that the Navy has proposed, above background. PALs are levels below which the Navy says no cleanup need occur, that the risk is "acceptable." Furthermore, those PALs, in themselves, are extremely suspect. Table 4-3 of the Final Feasibility Study Addendum shows, for example, the PAL for strontium-90 is about 50 times background. For plutonium 239/240, the PAL is nearly 4000 times background. None of this is disclosed in the Parcel F Plan. The public would be deeply dismayed to learn that the Navy is proposing no cleanup of plutonium, for example, until its concentration is thousands of times higher than background. The claims that there is no radionuclide contamination above background is belied also by the actual data in the underlying reports. The same table mentioned above shows plutonium levels 44 times background, and strontium-90 at 26 times background. The subtidal median values for cesium-137 and plutonium-239/240 exceeded the median background values. p. 4-4, ibid. And the measurements for radium in the initial sampling exceeded not just background but background plus the hugely non-protective PAL for multiple samples. The data suggest radionuclide contamination in Parcel F, despite implications to the contrary in the Plan. The cleanup standards proposed are inflated and non-protective. And the measurements, their interpretation, and standards are under a cloud of credibility. It is difficult to assert that there is massive PCB contamination and no radioactive contamination. How could the PCBs get there and not radioactivity? And given the sandblasting and other radioactive decontamination of the ships berthed there, and the radioactive contamination on land that must have migrated through stormwater runoff, airborne deposition, and release through sewer lines, it simply isn't credible to assert no	

Responsiveness Summary
Parcel F, Hunters Point Naval Shipyard, San Francisco, California

Written Comments sent by CBG received on May 7, 2018 via email.		Response
	radioactive contamination in Parcel F. The decision to do no cleanup for radioactivity cannot be defended.	
4.	**The Proposed Approach to PCB Contamination is Inadequate, Leaving Most of it Not Cleaned Up** The Parcel F Plan proposes to take no action for contamination in Parcel F at levels up to 1240 µg/kg, more than six times the asserted background level. By contrast, DTSC's Risk Based Screening Levels (RBSLs) for individual PCBs are in the 10-4 µg/kg range, ten million times lower (more protective). For PCBs up to 1240 µg/kg, the Plan proposes to just let them sit there, under the euphemism of Monitored Natural Recovery. As indicated above, the PCBs, which are very persistent in the environment, don't cease to exist under this scenario. One just leaves them there under this proposal. For PCBs from 1240 to 12,400 µg/kg, the Plan also proposes to not clean them up. Instead, one might put a layer of sand and rocks on them, or something similar. Again, the PCBs remain, not cleaned up. Additionally, it is proposed for other areas to add some activated carbon, not to get rid of the PCBs (which it can't), but to hopefully make it harder for benthic organisms to take up as much of the PCBs. This is based on a pilot study that is badly misrepresented in the Plan. The actual study, which had only gone 14 months by the time it was released, produced extremely modest reductions in uptake of PCBs. The Plan implies 90 or 95% reductions, but these aren't in the clams that were being studied and which is what matters. "Laboratory testing showed an approximate 50 percent reduction in clam tissue concentrations during the 8-month monitoring event and an approximate 30 percent reduction during the 14-month monitoring event." That is not much of a reduction, and it was going down over time, raising serious questions about whether there would be any long-term effect at all. And what small effect was seen over a short time was admitted to be "uncertain because only a single baseline composite clam tissue sample was available for comparison due to high mortality of the white sand clams." Nowhere does the Plan indicate whether what is contemplated is a single application of activated carbon, or dumping new loads	Cleanup levels for total PCBs were determined based on the results of the human health and ecological risk assessments. The not-to-exceed cleanup level of 1,240 µg/kg is based on protection of the surf scoter. This cleanup level is conservative since it will ensure that not a single surf scoter will be exposed to concentrations that exceed this risk-based threshold. Risk-based PCB concentrations for the protection of human health are below background levels. However, as noted in EPA's policy on background, the CERCLA program, generally, does not clean up to concentrations below natural or anthropogenic background levels. As noted in the Proposed Plan, the estimated nearshore San Francisco Bay PCB ambient sediment concentration is 200 µg/kg. This concentration will be met on an area-wide average within each area of Parcel F. Cleaning up all sediments with PCB concentrations that exceed 1,240 µg/kg to achieve an area weighted concentration of 200 µg/kg represents a protective and implementable remedy for Parcel F sediments. Regarding the application of *in situ* treatment using activated carbon amendments, the Navy expects this to be a one-time application. The concentration of carbon amendment and placement of material will be determined during remedial design and will be based on the results of the Hunters Point pilot study. Following placement, natural mixing through bioturbation and physical mixing will distribute the treatment material through the biologically active portion of the sediment bed where exposure to the benthic community takes place. The *in situ* treatment will bind to the PCBs in sediment, making them unavailable for uptake by benthic organisms and subsequent biomagnification up the food chain. Therefore, the bioavailability of PCBs resulting from Navy activity will be significantly reduced, resulting in human and ecological risk reduction, until MNR results in achievement of the RAO 3 RG. South Basin is a net depositional environment, and sediment from the greater San Francisco Bay will overlay the *in situ* treatment remediation zone over time. The results of the pilot study demonstrated that application of the treatment material resulted in a 90% reduction in pore water concentrations relative to baseline. Due to lack of baseline clam tissue data, it is not possible to develop robust estimates in the reduction of *in situ* clam tissue. However, pore water data has been shown to be a reliable indicator of the bioavailable fraction and the effectiveness of *in situ* treatment.

Responsiveness Summary
Parcel F, Hunters Point Naval Shipyard, San Francisco, California

Written Comments sent by CBG received on May 7, 2018 via email.		Response
	every couple of years, and if the latter, for how long they plan to keep doing that, and what the effect on the environment would be. One notes that the study found substantial injury to the clams from the initial application of carbon, so in one's effort to help them one would appear to be hurting them. Although there was recovery after a while, it is not clear what repeated applications of carbon would do. And if it isn't reapplied routinely, over long periods of time, no evidence is provided as to any lasting benefit in terms of PCB uptake. But none of this really matters, as the effect purported, a 1/3 reduction in uptake at 14 months, is quite marginal, even if true.	After the remedy is implemented, performance monitoring will be conducted to verify that the remedy is performing as intended. Immediately following construction, data will be collected to ensure that the *in situ* treatment materials have been placed to design specifications. Long-term remedial goal monitoring will be conducted in the MNR remediation zone to monitor progress toward achieving the RAO 3 200 µg/kg total PCB RG on an area-weighted average basis. Under CERCLA, a review of the remedy is required every 5 years. The purpose of a Five-Year Review is to determine whether the selected remedy at a site is protective of human health and the environment. Performance and long-term remedial goal monitoring results will be presented in a Five-Year Review report.
5.	**No Cleanup of Any Other Contaminant, and Not Even a Cleanup Level for Lead is Identified** As indicated above, the only cleanup proposed is for PCBs, and only for a small fraction of the sediment contaminated with PCBs. No cleanup at all is proposed for radionuclides. No cleanup whatsoever is proposed for 8 of the 11 Areas in Parcel F. And for the other contaminants – including the mercury, copper, and lead admitted to contaminate Parcel F—no cleanup is proposed for them. If they happen to be in an spot where PCBs are to be removed, they will of course be carried along in the removed sediment. But if they are in places where PCBs aren't, or where PCBs exist but are to be merely covered with sand or activated carbon and just left alone for MNR, nothing will be done to remove those other contaminants. There is no showing attempted that activated carbon, even if it has a marginal effect on PCBs, would be of any use for mercury or copper, for example. Lead is treated in a very curious additional way. No cleanup level, PAL, is even put forward for it. This is said to be because of "uncertainties." If there are uncertainties, that argues for strict standards, not no standard at all.	Numerous investigations of Parcel F sediments took place between 1991 and 2015 (see Table 1 of General Response 4). The results of these investigations are presented in numerous reports and documented in the administrative record. Areas III, IX and X are the only areas that were found to pose an unacceptable risk to human health or the environment (Barajas and Associates, 2008). The risk assessment determined that only four chemicals pose unacceptable risk to human health or the environment – copper, lead, mercury, and PCBs. These four chemicals were identified as chemicals of concern (COCs) to be addressed by the cleanup of Parcel F at the HPNS Site. As noted in the ROD, a numeric cleanup level was not developed for lead because of the uncertainty associated with both the bioavailability and toxicity of lead. However, the distribution of lead concentrations follows the distribution of PCBs. As a result, achieving the remediation goals for PCBs through removal and MNR is expected to also reduce any risks associated with lead. Regarding mercury and copper, the selected remedy for Area III is based primarily on the presence of copper and mercury above their cleanup levels. Post-construction performance monitoring will be performed to verify that the remedy is performing as intended. Immediately following construction, data will be collected to ensure that capping and backfill materials have been placed to design specifications. Physical inspections (e.g., for erosion) of the backfill and cap remediation zones will be conducted annually in years 1 through 5 post-construction, and then at 5-year intervals during the five-year review process thereafter. Regarding radionuclides, please see General Response 3.

Responsiveness Summary
Parcel F, Hunters Point Naval Shipyard, San Francisco, California

Written Comments sent by CBG received on May 7, 2018 via email.		Response
6.	**Admitted Risk Levels Are Very High; True Risks Are Likely Even Higher** The Parcel F Plan grossly understates potential cancer risks from the contamination and non-cancer hazards. But even so, the admitted risks are huge. Table 1 estimates cancer risks from eating fish, from PCBs alone, as 9 x 10^{-5}. That is 90 times the main risk goal for Superfund, 1 x 10^{-6} (one in a million). It is exceedingly close to the upper limit EPA will permit under unusual circumstances, 10^{-4}. Indeed, the figure is so close to 1 x 10^{-6} that it raises questions whether assumptions were tweaked to get in just under the very uppermost limit. But as pointed out, it is nonetheless anyway 90 times higher than what should be the risk goal. And note that it doesn't include the risk from any other contaminant (e.g., lead, mercury, radionuclides); under Superfund rules one is supposed to sum the risks from all the contaminants. Furthermore, it appears that this estimate is the "incremental" risk, i.e., the risk not of the full level of the contaminant but rather that level minus background. Under Superfund rules, one is supposed to consider the full measurement and the full risk. The Hazard Index admitted to for just the fish consumption pathway and just the PCBs is 8—eight times the level that is considered acceptable. Again, one should sum all the contaminants and not subtract out background. But even these very high admitted risks, found in the Parcel F Plan, understate the true risks admitted to in the underlying documents. The Final Addendum to the Feasibility Study for Parcel F states, "Combined cancer risks were calculated in this FS addendum to estimate the overall potential human health risk associated with recreational user exposure to both ROCs and chemicals in sediment at Parcel F. The combined risk for the recreational user is 4x10^{-4} for both the intertidal and subtidal CSM exposure scenarios. The combined risk for the intertidal and subtidal CSM exposure scenarios exceeds 10-4, the upper end of the USEPA range of 10^{-4} to 10^{-6} for management of cancer risks." ES-4, emphasis added The document goes on to estimate cancer risks from radionuclides alone as 2 x 10-5, twenty times the normal risk goal of 1 x 10-6. (Even when just estimating the radionuclide risk without background—and that isn't how one is supposed to make the estimate—the risk if four times the 10^{-6} goal.) It must be reiterated	The Navy acknowledges that chemicals present in Parcel F sediments present a risk to human health and the environment. As noted in the comment, the risk to human health associated with consuming fish containing PCBs from Parcel F is 9 x 10^{-5}. This risk estimate also provides part of the basis for taking actions to cleanup Parcel F sediments to the estimated nearshore San Francisco Bay PCB ambient sediment concentration of 200 µg/kg (RAO 3). In addition, RAO 3 is comparable to the total PCB ER-M value of 180 µg/kg. Thus, the proposed cleanup is expected to be protective of the benthic community for PCBs. The risk estimates and noncancer hazard indices presented in the ROD represent the "full risk" associated with PCBs detected in fish tissue collected from Parcel F and considers contamination that may have originated from the HPNS Site as well as other sources of PCB contamination within San Francisco Bay. Please also refer to response to Haakon Williams Comment #5.

Responsiveness Summary
Parcel F, Hunters Point Naval Shipyard, San Francisco, California

Written Comments sent by CBG received on May 7, 2018 via email.		Response
	that the Navy misstates the EPA "acceptable risk range" as being anywhere in the range of 1 x 10^{-4} to 1 x 10^{-6}. Under Superfund law, one is to aim for 1 x 10^{-6}. If one has strong reasons why one can't meet that level, one can request to fall back, the minimum amount necessary, but never over 10^{-4}. 10^{-4} is not a de facto acceptable level; just the opposite. 10^{-6} or below is de facto considered acceptable. The methods used by the Navy and its contractors understate risk in numerous ways. But even so, their own estimate of risk far exceeds the primary risk goal one is supposed to aim at.	
	Conclusion The Navy, its contractors and its regulators, are under a cloud, facing a significant loss of confidence in the wake of the Tetra Tech scandal. The current proposal for Parcel F, rather than being a cleanup plan, is in fact a proposal to not clean up most of Parcel F's contamination. Given the current situation, the Parcel F Plan should be withdrawn. Substantial and deep reform needs to occur, and then thorough and reliable new measurements conducted, defensible cleanup standards established in a transparent fashion, and a completely redrawn proposal put forward, one that involves true cleanup and real protection of public health and the environment.	The selected remedy was selected based on a balancing of the remedy selection factors and meets the protectiveness standard established under CERCLA. The Selected remedy also meets other CERCLA requirements including the requirement to use treatment to the extent practicable and the requirement that all remedies must be cost effective. The Navy has also met its public outreach and public review and comment responsibilities under CERCLA and has considered all comments received in the selection of the final remedy.

Responsiveness Summary
Parcel F, Hunters Point Naval Shipyard, San Francisco, California

Written comments by Naomi Feger received May 7, 2018 via email.		**Response**
GENERAL COMMENTS		
1.	Please accept these comments on the Navy's Proposed Plan for Offshore Sediment Cleanup at Parcel F submitted on behalf of the San Francisco Bay Water Board. Given the efforts in the region to address the water quality impairment in the San Francisco Bay due to PCBs and ongoing implementation of the PCBs TMDL, we feel it is important to make these comments on the Navy's Proposed Plan. I have four main comments to submit regarding the proposed preferred alternative for Areas IX and X, and Area I, India Basin:	See response to the four specific comments below.
SPECIFIC COMMENTS		
1.	The Proposed Plan refers to a background level of 200 µg/kg as representative of background total PCBs for nearshore sediments within San Francisco Bay. Background is identified as having the same meaning as man-made levels, consisting of natural and human-made substances present in the environment as a result of human activities, but not related to activities at Hunters Point and the Plan states that under CERCLA, cleanup levels are not set a concentrations below natural or man-made background levels. We take issue with referring to PCBs at 200 µg/kg as representative of background. I have attached a letter I sent to the Navy in 2003 which describes the 200 µg/kg - originally proposed as an active remedial cleanup goal for the site - and explains what our understanding was for that concentration level at that time. It is represented the upper end of nearshore ambient and the letter made it clear that sites with sediment concentrations greater than 200 µg/Kg were considered to be anomalies in the Bay. It was not considered background, i.e., natural or not due to Hunters Point activities then, nor is it considered so today. Since then, we have collected more data in the margins of the Bay through the San Francisco Bay Regional Monitoring Program. The report on the Central Bay can be found at https://urldefense.proofpoint.com/v2/url?u=http-3A__www.sfei.org_documents_characterization-2Dsediment-2Dcontamination-2Dcentral-2Dbay-2Dmargin-2Dareas-2D0&d=DwIFAg&c=NpiPIT1KNSO0vXgGk6ogJQ&r=a9dxgyfMBOPKctpJx5tAV4xB3f9r12X7qEeYmBeM_mc&m=EKuZWE	The Navy will refer to the 200 µg/kg PCB remediation goal, or RAO 3 RG, in the ROD as follows: “the estimated nearshore San Francisco Bay PCB ambient sediment concentration.” This is the language used in the 2008 FS, in response to the 2003 letter from the Water Board proposing the value as an active remedial cleanup goal for the site.

Responsiveness Summary
Parcel F, Hunters Point Naval Shipyard, San Francisco, California

Written comments by Naomi Feger received May 7, 2018 via email.		Response
	mFJn6rxQthHof3RqZh5HPMOIiKoZGqroam6UQ&s=EFqEIrNHGuAuRs-8E9wxrMttl6GW__o35aWmQcgeW98&e= <https://urldefense.proofpoint.com/v2/url?u=http-3A__www.sfei.org_documents_characterization-2Dsediment-2Dcontamination-2Dcentral-2Dbay-2Dmargin-2Dareas-2D0&d=DwIFAg&c=NpiPIT1KNSO0vXgGk6ogJQ&r=a9dxgyfMBOPKctpJx5tAV4xB3f9r12X7qEeYmBeM_mc&m=EKuZWEmFJn6rxQthHof3RqZh5HPMOIiKoZGqroam6UQ&s=EFqEIrNHGuAuRs-8E9wxrMttl6GW__o35aWmQcgeW98&e=> . The mean for PCBs in the nearshore margins was 56.5 or 70 ug/kg (based on totals of 40 and 208 PCBs congeners, respectively). It is incorrect and inappropriate to refer to the 200 ug/kg as a background level for PCBs in the Proposed Plan.	
2.	The Proposed Plan does not call for any biota monitoring - after construction of the remedy. It will be impossible to evaluate the remedy's success and effectiveness without some biota monitoring data. We require some biota monitoring into the future to demonstrate that the remedy is working. This could be potentially accomplished via providing funds to the Regional Monitoring Program. The Pilot Study evaluated both bioavailability in clam tissue and impacts to the benthic community. Similar data collection should be conducted to evaluate the remedy. We recognize that a significant investment is being made in the remedy and additional monitoring beyond sediment concentrations and physical inspection of the capping material etc. must be included. Some commitment should be made to conduct biota monitoring to evaluate effectiveness and to inform the local recreational fishing community on PCB levels in fish/shellfish. It is also unclear how sediment levels can be monitored to reflect the bioavailable portion of the PCBs if sediment samples include sediments mixed with activated carbon.	Based on the results of the human health risk assessment, only the fish consumption exposure scenario presented unacceptable risk to human health. Due to uncertainties associated with fish movement in San Francisco Bay and potential contributions from other areas with PCB contamination within San Francisco Bay, the Navy has determined that site-specific fish tissue monitoring is not a good measure of Parcel F remedy effectiveness due the presence of PCBs and mercury in fish tissue throughout San Francisco Bay. Sediment sampling will be conducted within the Areas IX and X MNR remediation zone to demonstrate progress towards achieving the RAO 3 RG. Please see CBG Comment #4 for further discussion on activated carbon.
3.	Monitored Natural Recovery - it isn't clear from the Plan how long MNR will take to reduce PCBs levels and what is attainable in terms of sediment PCBs levels in the next 5-20 years.	The SedCam Model (Jacobs, L., R. Barrick, and T. Ginn. 1988) was used to evaluate reductions in sediment concentrations through MNR following active remediation within Areas IX and X (Area III was not evaluated because the RAO 3 RG of 200 µg/kg is expected to be met through active remediation). The modeling results demonstrated that MNR will achieve the RAO 3 RG of 200 µg/kg within 5 years for Area IX and within 8 years for Area X assuming there are no continuing sources of sediment contamination. The modeling results are presented in the Final Technical Memorandum,

Responsiveness Summary
Parcel F, Hunters Point Naval Shipyard, San Francisco, California

Written comments by Naomi Feger received May 7, 2018 via email.		Response
		Optimized Remedial Alternative for Parcel F (ECC-Insight, LLC and CDM Smith, 2017).
4.	The Proposed Plan includes information about unacceptable risk for fish consumption for area I (Table 1 noncancer hazard quotient) and then states that no action is required because PCBs concentrations are below background - which is inaccurate based on the discussion above. Additional explanation should be provided to the public and MNR should be required for this site.	The ROD will clarify that the baseline human health risk assessments for fish consumption were performed on a site-wide basis because of the movement of fish within Parcel F. The risk assessment determined that area specific risks to human health and the environment were within the risk management range within Area I and no COCs were detected in Area I sediment above the remedial goals established for Parcel F.

Responsiveness Summary
Parcel F, Hunters Point Naval Shipyard, San Francisco, California

Written comments by Jill Fox received May 6, 2018 via email.		**Response**
COMMENTS		
1.	The India Basin Neighborhood Association (IBNA) has two specific areas of concern about the Navy's proposed cleanup plan for Parcel F of the Hunters Point Shipyard: transportation of materials and use of the shoreline. The proposed transportation plan is unacceptable. The "preferred alternative" indicates that all materials leaving and entering the Shipyard for the Parcel F remediation will be transported by truck. This estimated 700 truck trips through our existing residential neighborhood places an unacceptable burden on the people who live, work, and play in our community. For the health of our community, the Navy must find an alternative transport of materials, such as barges.	The Navy will develop plans for the transport of sediment removed from Parcel F to minimize impacts to the surrounding community. For land-based transportation, approved truck routes will take into account concerns about minimizing the impact of the cleanup on the surrounding neighborhood and alternatives to truck transport for off-site disposal of contaminated sediment, such as transportation by barge, will be utilized to the extent practicable. See General Response 1.
2.	The "preferred alternative" that denies all access to the Shipyard shoreline is unacceptable. Recent votes are clear that San Franciscans do not want a wall on the waterfront. For over a decade IBNA has participated with the Port of San Francisco, Recreation and Park Department, the Trust for Public Land, and many advocacy groups on Blue Greenway planning to activate the southeast waterfront for transportation and recreation. All Blue Greenway plans include access to the Shipyard waterfront. Shipyard waterfront parks and open space were indicated to voters when they approved the Candlestick Park public land transfer. The Blue Greenway and Bay Trail will physically and emotionally link the Shipyard to the rest of San Francisco. Waterfront access can play an important role in creating much needed water-based transportation alternatives. The Navy must find an alternative to walling off our waterfront. Consider blocking specific access to specific areas where deemed absolutely necessary for health reasons, rather than a blanket ban on access to the entire shoreline. The mission of the India Basin Neighborhood Association is to preserve the maritime history, natural beauty, diverse character, and unique ambiance of the vibrant mixed-use neighborhood of India Basin through community organizing.	The proposed cleanup action at HPNS is consistent with the City of San Francisco reuse plan, which includes significant open spaces and piers, gardens, parks, and wetlands for the community to access the shoreline. The Parcel F sediment remedy will be designed and constructed to allow access to an uncontaminated shoreline at HPNS and to compliment the shoreline revetments and sea wall(s) that have and will be constructed as part of ongoing remedial actions (separate from the Parcel F remedial action) to prevent contaminated soil from entering San Francisco Bay as well as to prevent erosion and overtopping the rock wall during extreme conditions. In addition, the Navy will consider natural physical barriers, such as marsh vegetation, that are more compatible with future site use where necessary to prevent access to shoreline for the protection of human health. Please also refer to response to Maria Caine Comment #2. Please see the response to Hamman Comment #3. ICs will be designed to protect the remedy from disturbance and will only be in place until such time as the cleanup goals have been met and will be supplemented with public outreach and education activities. The Navy agrees that these ICs will only be applied in small areas where absolutely necessary and will be designed to minimize the amount of time the ICs are required. The controls will take into consideration future site development and will be tailored to address specific risks in a specific area.

Responsiveness Summary
Parcel F, Hunters Point Naval Shipyard, San Francisco, California

	Written and verbal comments by Michael Hamman received on April 2, 11, and 30 2018 via e-mail.	**Response**
COMMENTS		
1.	April 2, 2018: The Navy Clean-Up Plan discusses a variety of mechanisms by which the sediment contaminants on parcel "F" might affect human health. The pathways of human consumption of shallow water shellfish was examined and mitigations consisting of caps and or dredging are proposed, but only to a depth of 30 feet. The pathways of human consumption of free swimming fish was examined and it was determined that no specific mitigation was necessary. The pathways of human consumption of crabs was not considered. This is particularly alarming as crabs live in, and forage in, the highly contaminated areas deeper than 30 feet. The possible damage to crabs from exposure to PCB's, lead, and the other contaminates known to exist at depths exceeding 30 feet must be analyzed. Further, the impacts to humans from consuming crabs from these contaminated waters must be considered, and if warranted, appropriate mitigation measures must be employed. Please be sure to have someone attend the meeting able to discuss these issues regarding crabs. Also your plan calls for a large amount of earth movement, disposal of dredge spoils and importation of fills. Please be prepared to discuss how this will be done, by trucks through our neighborhood or via marine transport. Please identify the impacts of this movement to our neighborhood and the measures you propose to mitigate these impacts.	The cleanup plan proposed by the Navy was based on the results of an assessment of risks to human health and the environment. The results of this assessment determined that chemicals present in Parcel F sediments may pose unacceptable risks to birds that may consume fish and shellfish at the site and humans that may consume fish and shellfish at the site. Although crabs were not evaluated directly in the ecological risk assessment, sediment toxicity was within acceptable levels throughout Parcel F. For example, amphipod survival was greater than the defined reference threshold level in Areas I, III, VIII, IX and X as measured by a 10-day bulk sediment bioassay test (Validation Study, Battelle et al., 2005). The bird and human shellfish consumption assessment evaluated exposures associated with clam tissue (*Macoma Nasuta*). Clams were determined to be a more representative receptor of shellfish exposure to chemicals of concern present in Parcel F because clams are in direct contact with the sediment and are immobile. For crabs, evaluations are confounded by their feeding behavior which include exposure to chemicals present in fish from outside the HPNS Parcel F during scavenging. See General Response 1 regarding mitigation of potential impacts of the cleanup on the surrounding neighborhood.
2.	On April 11, 2018, during the Public Meeting, Mr. Hamman made the following comment to Derek Robinson paraphrased as follows: "I like the format of our meeting – I get specific questions answered and there isn't a bunch of time wasted with people asking questions that I don't care about. "	Comment acknowledged.
3.	April 30, 2018: The Plan has studied the risk to shellfish and free swimming fish from the contaminated sediment in the area and the risk to humans from consuming said creatures. Clams were the shellfish studied and they live their lives relatively immobile, embedded in the sediment. The pathway to humans is either by direct harvest of the clams, or by eating a predator of the clams such as birds. In both cases remediation of the sediment in water	See response to Hamman Comment #1 above. Crab exposure to chemicals of concern is confounded by their migratory behavior and scavenging of migratory fish exposed to chemicals from outside HPNS Parcel F. Please also refer to response to Maria Caine Comment #2. See General Response 1 regarding mitigation of potential impacts of the cleanup on the surrounding neighborhood.

Responsiveness Summary
Parcel F, Hunters Point Naval Shipyard, San Francisco, California

Written and verbal comments by Michael Hamman received on April 2, 11, and 30 2018 via e-mail.		**Response**
	less than 30 foot removes that risk. However, there is another sea creature, the crab that lives on the bay floor and is exposed to the contamination in areas less than 30 feet deep AND in the deeper water. Crabs will travel from the contaminated areas into shallow water and back again. Furthermore, crabs are recreationally harvested along the parcel F shoreline by many people, and they are consumed by a variety of predator animals in both shallow water habitats and in deeper water habitats. Crabs are an important component of the Parcel F shoreline and must be evaluated in any cleanup plan. As a minimum, a survey of the Parcel F crab population must be undertaken and samples collected and analyzed to determine the level to which the local crabs are contaminated. Further, an evaluation of their life habits must determine if remediation to only 30 feet deep will eliminate the risk to human health from the crab consumption pathway or, if some other remedy should be considered. The two preferred alternatives #4 and #4a envision excavating 1,790 cubic yards of spoil and importing approximately 5,000 cubic yard of capping material*. If hauled by truck this represents about 700** truck trips through our neighborhood. That much truck traffic would degrade the local air quality and impost unacceptable hardships on the local residents. For that reason it is important the Plan specify all spoil and fill be transported via marine transport. Such transport is environmentally more benign and probably less expensive as well. *Each truck hauls about 10 cubic yards of material thus 6,790 yds would require 670 truck trips. **68,670 square feet to be covered to a depth of two feet is 137,340 cubic feet or 5086 cubic yards of material. The lands adjacent to the Parcel F shoreline will soon be a vibrant community with tens of thousands of residents clambering to use their waterfront for a variety of recreational activities. A blanket prohibition against such activities as clamming, kayaking, swimming, etc. is excessive and impractical. The Institutional Controls imposed by the Plan must be: a.) Focused only on those small areas where absolutely necessary. b.) Each control must be appropriate to limit the specific risk in that area. c.) Informing people of the actual risks involved in an activity and allowing	Regarding prohibitions on activities such as clamming, kayaking, and swimming, these prohibitions will be in place only until such time as the cleanup goals have been met and will be supplemented with public outreach and education activities. The Navy agrees that these controls will only be applied in small areas where absolutely necessary. Modeling results show that PCB sediment concentrations are expected to reach background levels in 5 to 8 years in Areas IX and X (ECC-Insight and CDM Smith, 2017). However, due to the presence of PCBs in fish tissue throughout San Francisco Bay, a fish consumption advisory is currently in place for the entire San Francisco Bay water body: https://oehha.ca.gov/advisories/san-francisco-bay The ICs, remedial design, and remedial action will take into consideration future site development, including construction of fishing piers, kayak launches, and marinas, and will be tailored to address specific risks in a specific area. The controls will be advisory only and may include signage and other information devices to inform the community and future residents/recreational users of the potential risks.

Responsiveness Summary
Parcel F, Hunters Point Naval Shipyard, San Francisco, California

Written and verbal comments by Michael Hamman received on April 2, 11, and 30 2018 via e-mail.		**Response**
	them to decide on the appropriate action should in all cases be preferred to the outright prohibition of an activity. The shoreline of this new community must not become a dangerous restricted area, unusable by the residents who live there. The Institutional Controls prohibiting "Sediment Disturbing Activity" must be modified to provide a method to allow future constructions such as fishing piers, kayak launches, or even a marina to be built. The Shipyard development envisions such amenities, and it is an acceptable that such projects be prohibited. A process must be created whereby such projects can be constructed in a manner that repairs or creates an alternant remediation providing a similar level of protection from the contamination in the sediment.	

Verbal comment by Richard Laufman, received on April 11, 2018, as recorded by the Court Reporter.		**Response**
COMMENTS		
1.	I am on the shipyard CAC, Citizens Advisory Committee, and I am the board of India Basin Neighborhood Association. And I think that it should be cleaned up to the fullest possible extent in terms of, so Alternative 1 I guess is the cleanest. No caps. But my biggest issue is that they do not truck the sediment out through my neighborhood, thousands and thousands of trucks going out. We had huge problems during the building of this with trucks going out uncovered and stuff like that. So, that is my biggest thing, as well as the neighborhood association's. That's about it.	The Navy selected Alternative 4/4A for Area III and Alternative 7 for Areas IX and X based on the remedy selection evaluation criteria specified in the National Contingency Plan (NCP). The NCP evaluation criteria considers the cost and implementability of remedial alternatives in addition to other factors. Based on consideration of all the remedy selection evaluation criteria, the Navy has determined that Alternatives 4/4A for Area III and Alternative 7 for Areas IX and X are protective and cost effective. Regarding potential impacts associated with trucks moving through the neighborhood, see General Response 1.

Responsiveness Summary
Parcel F, Hunters Point Naval Shipyard, San Francisco, California

Written comment by Rafael Montes, San Francisco Bay Conservation and Development Commission, received on May 7, 2018, via e-mail.		Response
COMMENTS		
General		
1.	On April 1, 2018, the San Francisco Bay Conservation and Development Commission (BCDC) received a request for comments regarding a document entitled, "Hunters Point Naval Shipyard-Parcel ·F Proposed Plan for Offshore Sediment Cleanup/April 2018." Further, on April 2, 2018, this agency received a document entitled, "Draft Final Remedial Design Package, Parcel E, Hunters Point Naval Shipyard, San Francisco, California, March 30, 2018." As described in greater detail below, BCDC is concerned with the following aspects of the project: 1) public access guarantees, 2) the project's proposed sea level rise projections, 3) long-term shoreline erosion protection controls, 4) possible contaminated sediment in tidal and subtidal areas, and 5) sediment transportation management. According to project description, the remedial actions for this project will be conducted in compliance with all state "Applicable or Relevant and Appropriate Requirements" (ARARs), including the substantive provisions of the McAteer-Petris Act (MPA) and the San Francisco Bay Plan (Bay Plan). The Bay Plan was completed and adopted by BCDC as an enforceable plan to guide the future protection and use of San Francisco Bay and its shoreline. The McAteer-Petris Act (MPA), directs BCDC to ensure compliance with the Bay Plan and its policies for projects within its jurisdiction. To ensure that the Hunters Point Offshore Sediment Cleanup Project complies with these policies to the fullest extent possible, the following concerns and recommendations should be addressed.	The selected remedy will be implemented such that it addresses concerns about public access, potential sea level rise, long-term shoreline erosion protection controls, possible contaminated sediment in tidal and subtidal areas, and sediment transportation management. Additional details are provided in the responses to specific comments below. The selected remedy will also comply with ARARs including the San Francisco Bay Plan (See Table 4-2 of the ROD – Location Specific ARARs).
Specific		
1.	1) Public Access Guarantees For new development in San Francisco Bay or its shoreline, Bay Plan Public Access Policy No. 2 requires maximum feasible public access to and along the waterfront and on any permitted fills in new developments within BCDC's jurisdiction. In rare cases where public access would be clearly inconsistent with the project because of public safety considerations, the Bay Plan mandates projects provide public access at another location, preferably near the project. Therefore, BCDC recommends future public access to be considered in all areas of the project except in the case where it would be inconsistent with the needs of public safety. Further, to better inform the public of their access rights to areas near the project, we suggest that any proposed signage utilize	See response to Fox Comment #2 and Hamman Comment #3. The selected remedy will be implemented in such a manner that it reduces the risk to human health and the environment to acceptable levels. The selected remedy also includes ICs to ensure that the treatment areas are not disturbed to limit human exposure until such time as the RAOs for the site are achieved. The Navy will limit access restrictions to the extent practicable. The Navy will consider natural physical barriers that are more compatible with future site use in areas where necessary to restrict access for the protection of human health. However, limitations on some uses to protect the remedy may still be required. The Navy will work with the BCT and the local community on public

Responsiveness Summary
Parcel F, Hunters Point Naval Shipyard, San Francisco, California

Written comment by Rafael Montes, San Francisco Bay Conservation and Development Commission, received on May 7, 2018, via e-mail.		**Response**
	detailed multilingual graphics inclusive of anchoring, swimming or clamming activities.	outreach. Please see OEHHA fish advisories currently posted for San Francisco Bay: https://oehha.ca.gov/advisories/san-francisco-bay
2.	**Sea Level Rise Projections and Shoreline Erosion Protection Controls** Under the Bay Plan, Climate Change Policy No. 2 requires projects to prepare a risk assessment based on the estimated 100-year flood elevation. This assessment should consider the best estimates of sea level rise (SLR), as well as whether current and planned flood protection measures will be funded and constructed to provide protection for the project and any shoreline area. In March 2018, the State of California issued an update to its "Sea-Level Rise Guidance" that provides a synthesis of the best available science on SLR projections and rates for California. The State guidance provides a range of SLR projections for mid-century and end of century based on the best scientific data available and that would be suitable in the risk assessment. Bay Plan Shoreline Protection Policy No. 1 (c) requires shoreline projects to be properly engineered to provide erosion control and flood protection for the expected life of the project based on a 100- year flood event that takes future sea level rise into account. The Draft Final Remedial Design Package used design criteria for the shoreline protection along Parcel E that accounts for wave runup based on extreme tides (100-year flood) and a three-foot SLR projection above MHHW coupled with wave runup. The design elevations of the top of the revetment are based on the 2017 California Ocean Protection Council (OPC) and the California Natural Resources Agency statewide guidance for sea level rise for the "Likely Range" high emissions (representative concentration pathway (RCP 8.5)) sea level rise projections for 2100. However, based on the nature the infrastructure behind the shoreline protection, BCDC recommends use of design criteria that meets or exceeds the 2018 State of California Sea-Level Rise Guidance projected elevations for the "1-in-20 Chance" or "1-in-200 Chance" probabilities for 2100. Additionally, the 100-year flood elevation used for the design height of the revetment were taken from the USACE 1984 extreme tides data; the State uses the most recent FEMA 2016 100-year flood elevations. BCDC is concerned that the flood projection levels are not conservative enough and we recommend the use of FEMA 2016 100-year flood elevations and the 2018 OPC statewide guidance in designing the shoreline protection crest elevations.	The Selected Remedy will be implemented in such a manner to be resilient to the impact of sea level change on the constructed remedy. Best management practices will be developed during remedial design to include climate change adaptation measures. An updated hydrodynamic model that considers a 100-year storm evaluation will be prepared to confirm the effectiveness of natural recovery, refine the design of the sediment cap, appropriately size backfill material placed following removal activities, and to design shoreline features compatible with both future site development plans and wind and vessel generated waves. The State of California “Sea-Level Rise Guidance” sea level rise projections will be considered for incorporation into the hydrodynamic model. Along with the results of the hydrodynamic model, the Navy will also consider the use of Federal Emergency Management Agency (FEMA) 2016 100-year flood elevations, BCDC design criteria recommendations, and the 2018 OPC statewide guidance in designing the remedial action and shoreline protection crest elevations as recommended in the comment. The selected remedy includes shallow partial excavation of the shoreline within Areas IX and X followed by placement of backfill. Clean backfill with similar gradation to native sediments would be placed over the excavation areas to restore the sediment surface to pre-removal elevations. The backfill will be placed and sized in such a manner as to minimize erosion.

Responsiveness Summary
Parcel F, Hunters Point Naval Shipyard, San Francisco, California

Written comment by Rafael Montes, San Francisco Bay Conservation and Development Commission, received on May 7, 2018, via e-mail.		**Response**
	The flood water elevation design as described in the Remedial Design Package for Parcel E is significantly lower than the current flood elevation levels used by the State. Further, the project's SLR projections of 3 feet are also significantly lower than the 2018 State's Sea-Level Rise Guidance. The project indicates that certain areas of the parcel are suitable for a hybrid shoreline stabilization that includes relatively flat shoreline slopes, and placement of a 2-foot layer of coarse sand for shoreline protection. However, without an accurate estimate of potential SLR, the current design will not adequately protect the shoreline from erosion. The Guidance's sea-level rise estimates for the San Francisco Bay range from 4.4 to 6.9 feet for year 2100. Therefore, if placement of sand is meant as a permanent solution to protect the shoreline against SLR, this may require importation of sand for long term maintenance. Bay Plan policies require certain projects be regularly maintained according to a long-term maintenance program to protect the shoreline from tidal erosion and flooding. It further requires that the effects of the shoreline protection project on natural resources during the life of the project be the minimal necessary. Therefore, BCDC recommends that a long-term maintenance program be implemented to ensure shoreline protection against SLR. Finally, policies on shoreline protection require shoreline projects to consider design of living shorelines methods whenever feasible. The hydrodynamic conditions in the South Basin indicates that the area of Parcel E does not experience strong tidal currents. As such, it could benefit from nonarmored shoreline protection methods, such as marsh vegetation, especially in the intertidal areas after remediation treatment. This method may also provide a natural means for restricting public access in areas that need to remain undisturbed after project completion.	

Responsiveness Summary
Parcel F, Hunters Point Naval Shipyard, San Francisco, California

Written comment by Rafael Montes, San Francisco Bay Conservation and Development Commission, received on May 7, 2018, via e-mail.		**Response**
3.	**Contaminated Sediment Near Tidal Marshes and Tidal Flats.** The Bay Plan's Tidal Marsh and Tidal Flats policies require that tidal marshes and tidal flats be conserved to the fullest extent possible. Most significantly, Tidal Marshes and Tidal Flats Policy No. 2 requires that any proposed project be thoroughly evaluated to determine any effects a project has on tidal marshes and tidal flats, and if feasible, be designed to avoid any harmful effects. For these reasons, BCDC is concerned about any re-use of contaminated local sediments near the shoreline in light of the widespread mitigation of pollutants in the project. The proposed cleanup areas IX and X (South Basin) involve focused excavation and backfill near the shoreline, and the placement of carbon amendments (temporary fill) over some contaminated sediments in tidal and subtidal areas. BCDC recommends that the Navy utilize the carbon amendment that would result in the least amount of temporary fill, while still effectively reducing PCB bioavailability. Once the carbon treatment proves to be effective, the Commission recommends that the project sponsors investigate planting vegetation such as eelgrass as a means of stabilizing treated surface sediments in the intertidal areas that may be appropriate habitat for eelgrass.	Design of the selected remedy will comply with the San Francisco Bay Plan's Tidal Marshes and Tidal Flats policies. Within Areas IX and X, the selected remedy will be implemented to conserve tidal marshes and tidal flats through the placement of backfill following removal to pre-removal elevations. As noted in the response to Montes Comment #2 above, backfill material will be of similar gradation to native sediments while at the same time being designed to resist wave induced erosion. *In situ* treatment using carbon-based amendments will only take place in subtidal areas and thus is not expected to affect tidal marshes and flats. The Navy will minimize the volume of treatment material placed and will consider habitat mitigation and enhancement activities such as planting eelgrass.

Responsiveness Summary
Parcel F, Hunters Point Naval Shipyard, San Francisco, California

Written comment by Rafael Montes, San Francisco Bay Conservation and Development Commission, received on May 7, 2018, via e-mail.		**Response**
4.	Sediment Transportation Management The Bay Plan's Subtidal Areas Policy No. 1 requires any proposed filling or dredging project in a subtidal area of the Bay be thoroughly evaluated to determine the local and Bay-wide effects of the project on tidal hydrology and sediment movement, fish, other aquatic organisms and wildlife, aquatic plants, and the Bay's bathymetry. Figure 1 of the Parcel F Proposed Plan for Offshore Sediment Cleanup, Area III notes, among many actions to be taken, the implementation of capping of metals or PCBs in sediment, the focused removal and backfill of sediments to a depth of 2 feet, the off-site disposal and modified armored/reactive cap, and institutional controls in water depths less than 30 feet deep. We appreciate that the elevated contaminant sediment in deeper areas is beyond the foraging depth of the surf scoter. However, staff is concerned that the currents in the area may transport deeper sediments into the shallower portions of the site that have been remediated. Because strong tidal currents and wave action in Area Ill could transport contaminated sediments from areas deeper than 30 feet to relatively cleaner overlying sediment in the shallow areas, BCDC recommends any sediment transport from areas deeper than 30 feet is adequately monitored for potential contaminated sediments as they may exceed the set goal of the remedial action objectives.	The removal of sediment and placement of backfill and treatment material will be conducted to comply with applicable elements of the San Francisco Bay Plan and will be performed to minimize effects on tidal hydrology and sediment movement, fish, other aquatic organisms and wildlife, aquatic plants, and the Bay's bathymetry. Design elements that will be incorporated include placing backfill following sediment removal to pre-backfill elevations and minimizing the volume of capping and treatment material placed. Baseline monitoring may be performed prior to remedy implementation to characterize pre-remedy conditions and to aid in the design of the remedy prior to construction. Baseline monitoring may include sediment sampling as well as hydrodynamic modeling. Baseline monitoring results would be used to refine the remediation zones at Area III (focused removal with backfill and capping areas). Hydrodynamic modeling would be used to aid in the design of cap placement to resist erosion from tidal currents and wave action, as well as re-contamination potential from the deeper Area III sediments. The details of a baseline monitoring study would be determined during the remedial design.
5.	Thank you for providing BCDC with the opportunity to comment on the future remediation action at the HPNS site. We recognize the importance of this project and would like to continue to be participants as stakeholders during the process. Please feel free to contact me at (415) 352-3670. I can also be reached by email at Rafael.montes@bcdc.ca.gov.	Comment acknowledged. The Navy looks forward to coordinating with the BCDC on the design and construction of the selected remedy for Parcel F.

Responsiveness Summary
Parcel F, Hunters Point Naval Shipyard, San Francisco, California

Written comments by Christopher Mooney received on April 24, 2018, via e-mail.		**Response**
COMMENTS		
1.	As a seven-year resident of the nearby Bayview neighborhood, I write in support of the Navy's preferred Alternatives 4/4A for Area III and Alternative 7 for Areas IX and X of Parcel F as the most cost effective and thorough cleanup remediation alternatives for these areas. The Navy has my support on this proposed cleanup plan.	Comment acknowledged. Thank you for your feedback.

Responsiveness Summary
Parcel F, Hunters Point Naval Shipyard, San Francisco, California

Written comments by Darca Morgan, Ryan Schmidt, Meghan Sheedy, Michelle Lee-Schmidt, Leyla Momeny received on May 5, 2018 via e-mail.		**Response**
COMMENTS		
1.	We are writing you regarding the Parcel F Proposed Plan for Offshore Sediment Cleanup. Many of us take our kids to Hunter's Point, Candlestick Point SRA, Heron's Head, and Shoreline Park. We live here and are concerned about cleanup and development in the area continuing without a pause to investigate the public health impacts from the clean-up project so far. The tragic harm done to children and others from exposure to contaminated material during the past several years of shipyard cleanup must be remedied immediately. Furthermore, we are concerned that the Candlestick and HPNS Phase 2 CEQA/ NEPA documents are 'stale' under NEPA, and significant new information must be incorporated into the EIR/ EIS before any further action such as cleanup at Parcel F is done. Unfortunately, public trust in the shipyard cleanup process is at an all time low. In 2011, a FOIA request revealed that city public health officials and the EPA colluded with Lennar construction to mislead San Francisco residents about the public health impacts of dust exposure during the Parcel A grading in 2006-2009. Then last month, PEER informed the public that the TetraTech's radiological soil sampling fraud not only affects Parcel B & G, but all shipyard soil. A deposition by a former TetraTech employee revealed that soil in Parcel A exceeded (over 15 times) the Navy's human exposure threshold for Cecium-137. While the Navy is not directly involved in these scandals, the agency should still investigate these alarming problems immediately in order to regain public trust. The City of SF must also pause to investigate and ensure that the buildings and residents in and near the shipyard are safe. A remedy for addressing the harm to San Franciscans must be proposed before additional clean up or development is to take place. Lastly, neighboring communities of Brisbane, Pittsburg, and others must have time to investigate the impacts of receiving contaminated soil are before additional action at the shipyard occurs. All of these unforeseen events are connected to any proposed shipyard cleanup and development. The botched cleanup must be taken into account during future actions at the shipyard so that the decision maker and	Please see General Response 3.

Responsiveness Summary
Parcel F, Hunters Point Naval Shipyard, San Francisco, California

Written comments by Darca Morgan, Ryan Schmidt, Meghan Sheedy, Michelle Lee-Schmidt, Leyla Momeny received on May 5, 2018 via e-mail.		**Response**
	the public can make informed decisions about public and environmental health.	
2.	**The U.S. Navy's Duty to Inform Public Under the National Environmental Policy Act** We are concerned that the proposed plan announcement does not contain adequate information for the public to make informed comments on the project. Additional public information meetings should be offered, and the public comment period should be put on hold to allow time for a supplemental EIS to be prepared and released to the public. The CFR §1502.9 (c)ii compels the Navy to prepare a supplemental EIS before taking any more action at the shipyard, including cleanup at Parcel F: "(c) Agencies: (1) Shall prepare supplements to either draft or final environmental impact statements if: (i) The agency makes substantial changes in the proposed action that are relevant to environmental concerns; or (ii) There are significant new circumstances or information relevant to environmental concerns and bearing on the proposed action or its impacts. (2) May also prepare supplements when the agency determines that the purposes of the Act will be furthered by doing so. (3) Shall adopt procedures for introducing a supplement into its formal administrative record, if such a record exists. (4) Shall prepare, circulate, and file a supplement to a statement in the same fashion (exclusive of scoping) as a draft and final statement unless alternative procedures are approved by the Council. The Navy must prepare a new EIS/ EIR because the 2010 Phase 2 EIR no longer accurately represents the public health impacts of the shipyard cleanup and development. Thus the public and the decision maker are not informed about the cumulative impacts of the remaining proposed actions, as required under NEPA. A supplemental EIS must be prepared given that the original document is over 5 years old, and new circumstances and new information regarding environmental impacts of the project have come to light	The Proposed Plan provides an overview of the remedy selection process consistent with CERCLA and EPA guidance. Detailed reports and studies are available through the information repositories identified in the Proposed Plan – please see General Response 4. There is no requirement to perform an environmental impact analysis under the National Environmental Policy Act (NEPA) and conduct the NRPS public participation process for CERCLA response action selection decisions. CERCLA is the "functional equivalent" of NEPA. NEPA's emphasis on inter-agency coordination and cooperation and public participation are addressed by CERCLA processes and its implementing regulations prescribed in the NCP. Under CERCLA, a review of the remedy is required every 5 years. The purpose of a Five-Year Review is to determine whether the selected remedy at a site continues to be protective of human health and the environment as new information becomes available. Regarding HPNS radiological data concerns, please see General Response 3.

Responsiveness Summary
Parcel F, Hunters Point Naval Shipyard, San Francisco, California

Written comments by Darca Morgan, Ryan Schmidt, Meghan Sheedy, Michelle Lee-Schmidt, Leyla Momeny received on May 5, 2018 via e-mail.		**Response**
	since the EIR was published. Specifically, the soil removed from the shipyard has not been scanned properly for contaminants because scanners, conveyor belts, and alarms used to detect radiation and PCB hot spots were intentionally tampered with by TetraTech. And, the improperly scanned, improperly tested and improperly labeled soil was moved offsite, the contaminated dust blanketed parts of the Bayview in toxic dust, and still more of the shipyard toxic soil was put back into trenches and conveyed to the city of SF. The EIR must be updated with a new human health and safety risk assessment and a new wildlife impact statement (for surf scoter, clams, fish, etc. for Parcel F) and recirculated for public review. The details of the public health cover-up and the extent to which contaminated soil was likely spread across the state (according to the EPA) are still being discovered. An accurate view of the toxic reality created by attempted cleanup at the shipyard is still coming into focus. The Navy should solicit input from a public oversight commission to supervise the superfund cleanup process at HPNS and Treasure Island from now on.	
3.	**Parcel F Specific Clean-up Questions** We ask that the Navy answer the following questions about the proposed Parcel F cleanup: 1) We need to see the human health risk assessment in order to make meaningful comments. ▪ What hazardous materials tests have been done where, by whom, and what are the results? The specialist reports should be available to the public to review during the public comment period? ▪ What are results of "early site investigations" in Parcel F? ▪ What are concerns over contaminants on Parcel B (pg. 6 of BRAC public letter)? ▪ What contaminants were found and at what levels (pg. 4 of BRAC letter)? 2) It appears the Navy only calculated risk to shellfish collectors digging in the mud, and are somehow unaware that children go to shoreline park and other parks in the area and dig in the mud and get it on their clothes and stick their fingers in their eyes and mouth etc.	1) The results of the human health risk assessment are presented in the Validation Study Report (Battelle et al., 2005). This document as well as other reports and studies are part of the administrative record and are available for public inspection. Please see General Response 4. The human health risk assessment determined that risks to human receptors are generally limited to exposure to intertidal sediment. The exposure pathways evaluated include direct contact (i.e., ingestion and dermal contact) with sediment during clamming and indirect contact through the consumption of shellfish. Direct contact risks to both adults and children were evaluated. Please also see response to Caine Comments #5 and #8. 2) The risk assessment assumed that risks associated with direct contact to sediment via ingestion, inhalation, and dermal contact (e.g., from wading) would be accounted for by evaluating exposures from direct contact with sediments during clamming activities.

Responsiveness Summary
Parcel F, Hunters Point Naval Shipyard, San Francisco, California

Written comments by Darca Morgan, Ryan Schmidt, Meghan Sheedy, Michelle Lee-Schmidt, Leyla Momeny received on May 5, 2018 via e-mail.		**Response**
	▪ Table 1 and Table 3 (pg. 7 - 8 of BRAC letter) does not appear to consider exposure of sediment to young children. Why? 3) How is the Navy going to avoid what happened before regarding faked soil samples and withholding public health information from the community? ▪ What are current toxic substance present at the site, at what levels, in what locations at Parcel F? What are the set goals for these substances following clean up? ▪ What is name(s) of sub-contractor that conducted PCB and metal soil sampling? ▪ How can the NAVY ensure that sampling for PCB and metals was not tampered since they were being conducted by a sub-contractor for the same construction company, 5 Point (Lenar)? 4) Haul Routes ▪ What route soil be transported on from the shipyard? Please provide a map of haul routes and truck passes per hour for at least through the city of SF. ▪ Have trucking accidents happened during past shipments to Utah and elsewhere? ▪ What precautions will be taken to mitigate exposure to hazmat during excavation and transport? ▪ Has the Navy considered removing the sediment from Parcel F via barge to avoid exposure of a vulnerable community to additional risks, and to avoid trucking hazmat through a major city? ▪ What precautions will be taken to mitigate exposure to hazmat during excavation and transport?	Other exposure pathways such as exposure to construction workers during redevelopment activities are expected to be of limited duration and would likely involve minimal contact with offshore sediments. As a result, it is assumed that evaluation of exposures associated with consumption of shellfish and direct contact with sediments during clamming activities would capture any risks associated with this pathway. The RGs established for HPNS Parcel F are presented in Table 3 of the Proposed Plan and discussed in response to Caine's Comments #5 and #8. Data collection to support development of the RGs is presented in the Parcel F FS (Barajas and Associates, 2008) and the 2005 Validation Study Report (Battelle et al., 2005). Prior to commencement of the remedial action, the Navy will oversee data collection to refine the remedial footprint of selected treatment technologies. 3) Please see General Response 3. Investigations conducted at Parcel F determined that PCBs, copper, lead and mercury pose unacceptable risks to human health and the environment. Preliminary remediation goals (PRGs) for these COCs were presented in the Proposed Plan and are established as cleanup levels in the ROD. 4) Regarding Haul Routes, please see General Response 1. Contaminated sediment will be removed and transported by barge to the extent practicable.

Responsiveness Summary
Parcel F, Hunters Point Naval Shipyard, San Francisco, California

Written comments by Darca Morgan, Ryan Schmidt, Meghan Sheedy, Michelle Lee-Schmidt, Leyla Momeny received on May 5, 2018 via e-mail.		**Response**
4.	**E.O. 12898 and the Navy's Duty to Inform Low Income and Minority Communities** President Clinton signed Executive Order 12898, which focuses federal attention on the environmental and human health effects of federal actions on minority and low-income populations with the goal of achieving environmental protection for all communities. It requires that when federal actions could affect nearby communities, there be extra time allowed for the public to review and understand the potential impacts. This certainly applies to the clean up on Parcel F. The fraud surrounding the Candlestick/ HPNS Phase 2 development project has bearing on the proposed Parcel F cleanup. The public exposure to contaminated soil and dust during Phase 2 implementation is part of unforeseen cumulative public health impacts on San Francisco and surrounding communities that must be quantified and disclosed per NEPA and CERCLA. Some of us attended the public meeting on April 11, 2018 regarding clean up at Parcel F, and were frustrated by the lack of clarity on the site cleanup controversy given how serious the public health issues are.	The Navy has conducted and continues to conduct numerous events to provide the community information about investigation and cleanup activities at HPNS. For example, the Navy has made and continues to make presentations at local community group meetings, conducts guided bus tours and published community outreach newsletters. Please see Community Outreach activities on the Navy web site: https://www.bracpmo.navy.mil/BRAC-Bases/California/Former-Naval-Shipyard-Hunters-Point/ Please also see General Response 3.
5.	Here in the Bayview, a superfund cleanup underway in a major U.S. metropolitan area, so the public outreach and communication should be very clear. Instead, we were bounced from one official to another from different state and federal agencies. The decision maker for the entire project was not identified. Many times, the people we approached at posters referred us to others who more involved with the project who were not in attendance. The people stationed at the posters in the room seemed shell-shocked by Monday's breaking news from the environmental watchdog group PEER, and did not seem willing or able to share details we sought about the news. For example, the young guy at the Navy timeline poster could not answer the most basic questions about where we were in the CERCLA timeline and took my email to get back to me about it (I have yet to hear from him). A contractor geologist worked on another project, and had difficulty answering questions about the current project. The EPA representative was there but could not answer questions because she was just filling in for her boss, who was on vacation. A 2018 Annual Navy BRAC Update brochure was	Please see response above and General Response 3.

Responsiveness Summary
Parcel F, Hunters Point Naval Shipyard, San Francisco, California

Written comments by Darca Morgan, Ryan Schmidt, Meghan Sheedy, Michelle Lee-Schmidt, Leyla Momeny received on May 5, 2018 via e-mail.		**Response**
	helpful on paper, but isn't available online too many who didn't make it to the meeting and want a copy. Furthermore, the informal setting of the meeting created an environment by which officials from different agencies began sharing anecdotal information in conversation (ex. Amy Brownwell) that proved to downplay public health concerns or was entirely inaccurate when we followed up. While we appreciate that you and Ms. Bacey from the CaEPA were approachable and addressed some of our questions once we reached out, but it was frustrating that you did not provide some sort of basic overview of the project and their role in it. Further action at the shipyard needs to be discussed within the setting of the public health controversies that have affected low income and minority communities as a result of the Phase 2 project implementation so far.	

Responsiveness Summary
Parcel F, Hunters Point Naval Shipyard, San Francisco, California

Verbal Comment by Duy Nguyen, as recorded by the Court Reporter during the Public Meeting on April 11, 2018.		**Response**
COMMENTS		
1.	I guess my comment here would be that a scrolling Power Point is fine, but I would appreciate a presentation, so that we're a little bit more informed, so we can ask questions as well as we go from poster to poster instead of just kind of analyze a poster and ask relevant questions and figure out the posters for ourselves. That would be greatly appreciated. That's my only comment.	Comment acknowledged.

Verbal Comments by Monica Padilla Stemmelen recorded by the Court Reporter, received during the Public Meeting on April 11, 2018.		**Response**
COMMENTS		
1.	I am concerned with contamination like most individuals; however, I am also troubled with the possibility of lanes being used as a route to transport contaminants out of the Navy property. I would like for option where the contaminants and other materials are moved via water.	Please see General Response 1.

Responsiveness Summary
Parcel F, Hunters Point Naval Shipyard, San Francisco, California

<table>
<tr><th colspan="2">Written comments by Jon Previtali and Darca Morgan received via e-mail on May 7, 2018.</th><th>Response</th></tr>
<tr><td colspan="3">COMMENTS</td></tr>
<tr><td>1.</td><td>This memo is regarding the following five schools close enough to the project to be exposed to construction dust from the project site or roads traveled by construction vehicles. Please see map.
Erickson
Malcom X Academy
KIPP San Francisco College Prep
KIPPS Bayview Academy
Brent Harte
The project plan and budget should include:

Transport of toxic soil by ship and barge out of the area to avoid the risk of material lost on public roads. Please see map.
Loads on barges that are larger than trucks would also support better monitoring and reduce risk of trucks leaving outside monitoring hours, an issue with previous projects at the site.
A prescribed route for trucks and other project vehicles that is different than those used by parents and staff approaching and leaving schools. Please see map.
Monitoring by a qualified, independent party at random times of day at least three days a week to ensure compliance with safety measures.
Reports published publicly on the Internet within one week.
Covering piles of dirt rather to prevent both rainfall run-off and wind driven dust.
To avoid runoff, do not spray piles of dire with water.
Covering truck loads to prevent soil, dust or other material from escaping during transport.
Washing truck tires prior to entering public roadways to ensure no soil is tracked onto roads.
Nightly street cleaning to remove dust/dirt from public roadways.
</td><td>The Navy will develop plans for the transport of sediment removed from Parcel F to minimize impacts to the surrounding community including the schools identified. Please see General Response 1.

The transport and disposal plan developed during the remedial design and remedial action will include appropriate construction management, community air and noise monitoring. Quality assurance and quality control (QA/QC) protocols will be implemented to ensure that the work complies with applicable health and safety procedures, for both onsite workers and the surrounding community. In addition, all staff working on the project will have the necessary health and safety and construction training to ensure that the work is completed in safe manner.</td></tr>
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Responsiveness Summary
Parcel F, Hunters Point Naval Shipyard, San Francisco, California

Written comments by Jon Previtali and Darca Morgan received via e-mail on May 7, 2018.		Response
	▪ Spraying of any soil or other material during movement to prevent dust from becoming airborne. o Spraying should not be so great as to induce run off or seepage into soil. ▪ Covering, not spraying, of any soil or other material during storage to prevent dust from becoming airborne. ▪ Installing dust monitoring stations at construction sites with immediate alerting of an independent third-party if acceptable levels are exceeded. Third party will coordinate correction with project construction manager. ▪ Providing a handheld or fixed-place dust monitoring device to each school that will alert staff if acceptable levels are exceeded. School staff will bring children inside building. o Nina Bacey, Project Manager and Sr. Environmental Scientist for Brownfields & Environmental Restoration CalEPA – CA Dept. of Toxic Substances Control recommended the DustTrak DRX 853, a handheld which sells for about $11k each, but can also be rented. ▪ Another less expensive, handheld option is the Aeoqual PM10 / PM2.5 Portable Particulate Monitor that retails for about $1k. ▪ Reports of dust levels from all stations published publicly online within one week. ▪ Training for school staff on how to identify soil or dust that may be from the work sites and prevent exposure to children. ▪ A contact available by phone during normal business hours for school staff to call in case soil or dust from the project is observed. Contact will work with project construction manager to correct issue. ▪ An inspection of schools' windows, doorways, HVAC intakes and other points of entry by a qualified third party building inspector to ensure the facility's building envelope is reasonably capable of preventing soil and dust exposure of occupants. Inspector will recommended solutions for issues found.	

Responsiveness Summary
Parcel F, Hunters Point Naval Shipyard, San Francisco, California

Written comments by Jon Previtali and Darca Morgan received via e-mail on May 7, 2018.		**Response**
	▪ Reasonable measures to improve the schools' building envelope based on the inspector's recommendation. o For the sake of clarity, this does not mean new windows and doors, but instead it means ensuring the existing windows and doors can be properly closed and any openings are sealed using typical, inexpensive means such as foam tape. ▪ Ongoing testing of a statistically significant sample of soil and any other material disturbed by the project to identify radioactive or other toxins found at the Shipyard that would require special remediation with test reports completed and published publicly on the Internet within one week of testing. 	

Responsiveness Summary
Parcel F, Hunters Point Naval Shipyard, San Francisco, California

Written comments by Bridget Thorpe received on May 7, 2018, via e-mail.		Response
COMMENTS		
General		
1.	There are many aspects of "Parcel F Proposed Plan for Offshore Sediment Cleanup" that I find concerning to both public and environmental health. This clean up plan fails to address many of the blaring issues that may affect the safety of residents of the San Francisco Bay. There are reasonably foreseeable flaws in this [sic] proposition for Parcel F regarding both long term environmental impacts and public health. Hunter's Point Naval Shipyard (HPNS) has had a history of dangerous radioactivity and contamination that still presents a risk to the health of those in the vicinity of the shipyard.	Under CERCLA, all remedies must be protective. The Navy has determined that the selected remedy is protective of human health and the environment. Long-term performance and remedial goal monitoring will be performed to confirm that the selected remedy remains protective and the results of this monitoring will be reported in Five-Year Review reports. Please see General Response 1.
Specific		
1.	According to the proposed plan "The United States Environmental Protection Agency (EPA), the California Department of Toxic Substances Control (DTSC), and the San Francisco Regional Water Quality Control Board (Water Board), reviewed all the documents that helped the Navy develop this plan, and concur with the Navy's preferred cleanup alternative described below." (pg. 1). Documented proof of this approval, especially on EPA's part is necessary in order to accurately assess the risk of contamination in parcel F.	Please see response to Bauer Comment #2.
2.	This plan states that "Active cleanup is limited to Areas III, IX, and X because these are the only Parcel F areas that pose unacceptable risk to human health or the environment." (pg. 1) However the plan does not state which or whose standards were used to evaluate "unacceptable" risk as opposed to "acceptable" risk.	The Proposed Plan notes that under CERCLA, EPA's acceptable risk range is a 10^{-6} to 10^{-4} chance to develop cancer during one's lifetime. The Proposed Plan also states that the hazard quotient is a measure of noncancer health effects and is calculated as the potential exposure divided by the reference value set by regulatory agencies and that a hazard quotient value of 1 or less is considered an acceptable exposure level. The evaluation of risks to human health and the environment are documented in the Validation Study Report (Battelle et al., 2005). The evaluation of risks associated with radionuclides is presented in the 2017 FS Addendum (KCH, 2017). Please see General Responses 3 and 4.

Responsiveness Summary
Parcel F, Hunters Point Naval Shipyard, San Francisco, California

Written comments by Bridget Thorpe received on May 7, 2018, via e-mail.		Response
3.	This document raises concerns regarding the Institutional Controls. Effectiveness of the implementation of ICs "sitewide to ensure site conditions remain protective of human heath [sic] and wildlife" (pg. 1) is questionable. Are the ICs going to be long term? Will there be disclaimers given to residents who move in to the area regarding prior contamination and if so, will the signs posted also have information as to why certain activities (such as swimming) are not allowed? Local residents of HPNS should have disclaimers as to the possibility of contamination and negative side effects before moving in.	ICs will only be implemented until such time as they are no longer needed to maintain the protectiveness of the remedy. The Navy will work with the community and state and local public health agencies to develop educational and outreach materials and will make all information readily available to current and prospective community members.
4.	According to reports published in 1998 (and earlier), Tetra Tech conducted early sampling for contamination in Parcel F along the shoreline and waterfront. After the falsification and manipulation of Parcel B and G's soil sampling, how can we be certain that parcel F is not contaminated? Resampling of Parcel F is highly recommended. Pg. 3 of the proposed plan references studies that were conducted at the same time that Tetra Tech worked at HPNS. Whoever sampled Parcel F, the same failure of oversight by the Navy and others that allowed the Tetra Tech scandal to occur can result in unreliable results for Parcel F.	Please see General Response 3.
5.	The use of activated carbon (AC) amendments as opposed to proper and thorough cleanup of PCB contamination is concerning. The 14 month carbon study is inconclusive and therefore the proposed carbon method should not be used as there are still too many long term uncertainties regarding its effectiveness. According to Demonstration of Activated Carbon Amendments - Summary of Field Activities Up to the 14-month Post Carbon Amendment Placement Monitoring Event, "A second key question is whether the effect of AC dose will continue to have effects on the surrounding sediments (buffer zones and reference sites) as the porewater concentration in treatment plots tend to be equilibrated." (pg. 23 appendix F). The researchers themselves admit that the long term and long range effects are unknown and still need to be evaluated before any official conclusions or recommendations can be made. The Proposed Plan claims that "A pilot study that evaluated the effectiveness of two commercially available activated carbon-based products to reduce PCB bioavailability recently concluded at Parcel F Area X (South	Regarding the effectiveness of *in situ* treatment using activated carbon, see the response to Maria Caine, Specific Comment #3. Regarding the use of white sand clams in place of bent nose clams, the mortality of the white sand clams during initial placement limits the evaluation of bioaccumulation using field clam data. However, other measures of bioaccumulation and bioavailability demonstrate that *in situ* treatment will be effective. For example, during the 26-month monitoring event, an average 90% reduction in sediment pore water concentrations was observed and total PCB tissue concentrations in lab exposed clam tissue was reduced by an average of 84% (KCH, 2018). Because the treatment material does not reduce bulk sediment concentrations but rather reduces bioavailability, comparison to baseline bulk sediment levels does not measure the effectiveness of the technology. The pilot study evaluated the application of treatment in both intertidal and subtidal sediments and included a hydrodynamic evaluation. Although the pilot study results show that *in situ* treatment is effective in both intertidal and subtidal sediments, the potential for storm induced waves may limit the long-

Responsiveness Summary
Parcel F, Hunters Point Naval Shipyard, San Francisco, California

Written comments by Bridget Thorpe received on May 7, 2018, via e-mail.		**Response**
	Basin)" (pg. 8) however, the pilot study to which they refer only monitored 14 of the 26 months Furthermore, this study only evaluated a 14 month test cycle for activated carbon and the proposed plan for parcel F recommends a 26 month renewal time for activated carbon placement. The field study with the clams has many discrepancies, starting with the use of white sand clams in place of bent nose clams. This altered the baseline data for the study thereby altering the results of monitoring biological accumulation of PCBs. The entire study of bioaccumulation of PCBs is therefore completely lacking in evidence due to the loss of baseline data from the white sand clams. The data shows that the PCB concentrations in sediments decline by 30 to 50 percent (after 8 months and 14 months respectively) however, they only decline minimally because of the addition of carbon, basically, the sediment seems to be diluted which is resulting in the lower PCB concentrations. Moreover, there is no assurance that bioaccumulation of PCBs declines after 14 months, let alone 26 months. According The long term effects of placing carbon into the Bay has also not been researched or disclosed. More research on long term effects to the biological community is necessary before wide-scale implementation of AC amendments. How long will activated carbon have to be renewed every 26 months? The Plan is silent as to whether it proposes a one-time addition of activated carbon, or whether more would have to be added, at what intervals, and who would be responsible for such addition in perpetuity. If carbon is not to be continuously added, there is no evidence provided that a one-time addition, even if initially effective in reducing uptake, will continue at a specified rate of effectiveness over decades. More questions relate to the effectiveness of activated carbon is deeper waters along Parcel F. There are discrepancies within the 14 month study and the work plan regarding the depth of the South Basin and whether or not the areas with high PCB concentrations are too deep. The Proposed plan for parcel F suggests that activated carbon amendments will be used in "deeper water," however the field study conducted in the South Basin was specifically chosen for its shallow depth.	term effectiveness of *in situ* treatment in nearshore, intertidal areas. As a result, *in situ* treatment will be applied to subtidal sediments only. The Navy expects this to be a one-time application. The concentration of carbon amendment and placement of material will be determined during the remedial design and will be based on the results of the Hunters Point pilot study. Following placement, natural mixing through bioturbation and physical mixing will distribute the treatment material through the biologically active portion of the sediment bed where exposure to the benthic community takes place. The *in situ* treatment will bind to the PCBs in sediment, making them unavailable for uptake by benthic organisms and subsequent biomagnification up the food chain. Therefore, the bioavailability of PCBs will be significantly reduced, resulting in human and ecological risk reduction, until MNR results in achievement of the RAO 3 RG. South Basin is a net depositional environment, and sediment from the greater San Francisco Bay will overlay the *in situ* treatment remediation zone over time. After the remedy is implemented, performance monitoring will be conducted to verify that the remedy is performing as intended. Immediately following construction, data will be collected to ensure that the *in situ* treatment materials have been placed to design specifications. Long-term remedial goal monitoring will be conducted in the MNR remediation zone to monitor progress toward achieving the RAO 3 200 µg/kg total PCB RG on an area-weighted average basis. Under CERCLA, a review of the remedy is required every 5 years. The purpose of a Five-Year Review is to determine whether the selected remedy at a site is protective of human health and the environment. Performance and long-term remedial goal monitoring results will be presented in a Five-Year Review report. Please see response to Bauer Comment #6 and Caine Comment #4 regarding the surf scoter Also, please see General Response 3 regarding radiological data at HPNS.

Responsiveness Summary
Parcel F, Hunters Point Naval Shipyard, San Francisco, California

Written comments by Bridget Thorpe received on May 7, 2018, via e-mail.		**Response**
	The focus on the surf scoter is extremely arbitrary considering that in “Demonstration of Activated Carbon Amendments - Summary of Field Activities Up to the 14-month Post Carbon Amendment Placement Monitoring Event” there is mention that the South Basin “supports a diversity of birds” that feed on fish, crabs, and shrimp. Looking at data from only one species of birds neglects the full scope of contamination and detriment to wildlife in the vicinity of Parcel F. The study goes on to state that “The South Basin posed a potential risk to birds from ingesting PCBs in sediment and prey. PCB concentrations also exceeded levels considered safe for benthic invertebrates directly exposed to sediment” (pg. 8). Further assessment of wildlife risk needs to be conducted, especially when activated carbon does not remove the PCBs from the benthic community. Another issue that this study raises is the reliability of the radiological screening. According to pg. 12 of the study, “The pilot test was conducted in an area where low-level radiological contamination could be present. The Navy's Basewide Radiological Safety Contractor (Tetra Tech) was responsible for radiological screening of site personnel and equipment. No radionuclide exceedances were experienced on the site for equipment or personnel during execution of the pilot Project.” After Tetra Tech’s falsification and manipulation of soil samples, how can their screenings be trusted? The Proposed Plan to clean Parcel F also states that “The amendments also did not result in any long-term negative impacts to the local benthic community” (pg. 8) however, multiple studies on carbon amendments, specifically the one conducted at South Basin claim that long term effectiveness has not been assessed yet and cannot be accurately determined. According to EPA’s “Use of Amendments for In Situ Remediation at Superfund Sediment Sites”, “periodic maintenance or replacement of the layer or mat may be necessary” (pg. 29) regarding the layer of activated carbon amendments on top of the sediment. The lack of a long term plan, schedule, or future costs to replace and maintain the AC amendments at HPNS is concerning. In the results the study “Field Testing of Activated Carbon Mixing and In Situ Stabilization of PCBs in Sediment at Hunters Point Shipyard Parcel F San Francisco Bay, California” conducted by Stanford University in	

Responsiveness Summary
Parcel F, Hunters Point Naval Shipyard, San Francisco, California

Written comments by Bridget Thorpe received on May 7, 2018, via e-mail.		**Response**
	2005 claims that "the AC treatment is more appropriate for sediments having a low- to mid-range PCB concentration" (pg. 10). However, PCB contamination has reached TMDL in the SF bay, according to EPA, meaning that perhaps the AC amendment method would not be the best suited method for this remediation program. Overall, the effectiveness of the AC amendments method is extremely questionable and should not be implemented without further research	
6.	The proposed plan for parcel F focuses on cancer as the health concern from radioactive contamination. However, this plan fails to address other possible health risks from both radioactive contamination as well as other harmful materials such as: PCBs, mercury, lead, and copper. These chemicals have the potential to have adverse health effects on both humans and sea life. The proposed plan states that "For the fish consumption exposure pathway, it exceeds 1 for total PCBs, which indicates that adverse noncancer human health effects are possible." (pg 7) Fallout from exposure to various chemicals found at HPNS are still plausible, according to the Navy, these must be examined. Moreover, "Risk to human health from fish consumption represents all areas in Parcel F because fish migrate between areas and potentially outside of the parcel boundary. San Francisco Bay contains elevated concentrations of PCBs. In addition to the contamination at Parcel F, PCB sources outside of HPNS may have also contributed to calculated fish consumption risks." (pg 7). Fish and sea life migrate which spread the possible health effect from eating or interacting with contamination, ICs are not in place outside of HPNS which leaves nearby populations at risk. According to the EPA "Recreational and subsistence fishers who eat large amounts of locally caught fish" are at risk from PCBs in fish populations (https://www.epa.gov/sites/production/files/documents/213061.pdf). Not properly cleaning contamination puts public health and livelihoods in jeopardy. There are high risks associated with exposure to other chemicals found in parcel F whose health affects need to be researched more in depth. Lead exposure too, poses a high health risk to those living in the area. Any type of ingestion	Please see General Response 3. The selected remedy for Parcel F sediments at HPNS focuses on reducing the risks to human health and the environment associated with exposure to PCBs, copper, lead and mercury to acceptable levels. Following completion of the remedy, all chemical concentrations will either be at protective or background concentrations.

Responsiveness Summary
Parcel F, Hunters Point Naval Shipyard, San Francisco, California

Written comments by Bridget Thorpe received on May 7, 2018, via e-mail.		Response
	of lead can seriously detriment IQ in children and lead to lead poisoning.	
7.	This document does not fully address the dangers of radionuclides. Although on page 4 the risk from "radioluminescent" areas are discussed, this is different from radionuclides and there has not been assurance that Parcel F is free of radionuclides. "A series of investigations were conducted between 2009 and 2013 to characterize radionuclides of concern (ROCs) at Parcel F. These investigations concluded that concentrations of ROCs in sediment at Parcel F were equal to or less than background and that there was no evidence of bioaccumulation of ROCs in clam tissue at Parcel F. Therefore, there is no unacceptable risk to human health and the environment due to the presence of ROCs." I have concerns over where this evidence came from. Any evidence that comes from Tetra Tech, its predecessors or contractors, is unreliable. Even were the measurements made by others, the same failure of Navy oversight that led to the Tetra Tech fiasco undermines the reliability of any such sampling results. Furthermore, bioaccumulation needs to be monitored over long term and there is a lack of evidence to back up the claims that there is a "safe" amount of radionuclides being bioaccumulated.	Please see General Response 3.
8.	The Proposed Plan refers to "wave action" and "strong currents," though it doesn't take into account the possibility of climate change to raise sea level as well as the long term ineffectiveness of erosion mitigation efforts. These mitigation efforts that try to reduce exposure pathways should be implemented with climate change factored in, especially in reference to wave impact.	The Navy agrees that climate change must be considered. As noted in the 2017 Final Technical Memorandum – Optimized Remedial Alternative for Parcel F (ECC Insight and CDM Smith, 2017), climate change adaptation measures including vulnerability monitoring of tidal currents, surface water flow velocity, and wave action will be integrated into the remedial design. These measures will allow the Navy to monitor the effects of climate change on the selected remedy. In addition, a detailed hydrodynamic and sediment transport model that considers a 100-storm event will be performed to support remedial design, as well as, incorporation of resiliency remedial design components in accordance with EPA's "Climate Change Adaptation Technical Fact Sheet: Contaminated Sediment Remedies" (April 2015).

Responsiveness Summary
Parcel F, Hunters Point Naval Shipyard, San Francisco, California

Written comments by Bridget Thorpe received on May 7, 2018, via e-mail.		**Response**
9.	"Re-use opportunities of removed sediments will be considered during remedial design" (pg 14). How can sediment that has been removed due to contamination and health risks be safely used for anything else? Previous claims as to the improper disposal of contaminated soils from HPNS should warrant future caution towards the proper disposal of contaminated soils.	During construction of the remedy, sediment may be generated that is safe for upland placement or other uses. Sediment will be characterized to determine whether re-use opportunities that are also protective of human health and the environment are possible.
10.	"The adjacent shoreline will likely be redeveloped as open space for a park or similar use. People could potentially use this area for fishing and collecting shellfish for food. No other potential uses have been identified" (pg. 6). If there are concerns around fish contamination and bioaccumulation of COCs, how can the adjacent shoreline be safe when fish and sea life migrate? Institutional controls at HPNS prohibit residents from swimming in the water and should also keep citizens from eating poisonous local seafood.	The selected remedy will be protective of human consumers of fish and shellfish and people who come into direct contact with sediment while harvesting shellfish. However, due to the presence of PCB contamination throughout San Francisco Bay, a fish consumption advisory is currently in place for the San Francisco Bay water body: https://oehha.ca.gov/advisories/san-francisco-bay Please also see response to Caine Comment #5.
Conclusion		
1.	The Navy proposal is to essentially do no cleanup of radioactive contamination in Parcel F, and no cleanup of any toxic chemical contamination except PCBs. For PCBs, the Navy proposed for most of the contamination to do no cleanup either. For some, very high concentrations, the Navy proposes to just walk away from the contamination. For other, even higher concentrations, the Navy proposes to not remove the PCBs but use an entirely speculative approach of dumping some activated carbon on them, not to neutralize the PCBs, which it can't do, but to hopefully make it somewhat harder for the benthic community to take up the PCBs. This proposal is based on a very minimal, short-term experiment that showed uptake somewhat slowed but by no means eliminated, with no evidence that this would be effective over the long term, or that such alteration of the Bay environment would not have its own deleterious impacts. The Parcel F proposal should be withdrawn and redone. In light of the Tetra Tech scandal, there is a serious crisis in confidence. Proposing to not clean up any radioactive contamination and any contamination by pollutants other than PCBs is unacceptable. The proposal to not clean up most of the PCB contamination is similarly problematic.	Please see General Response 3. PCB contamination at Parcel F will be remediated through a combination of removal, capping, *in situ* treatment, and MNR. The highest concentrations of chemicals of concern including mercury, copper, lead and PCBs will be remediated. In Area III, removal and capping will be used to address metals and PCB exceedances in areas less than 30 feet. In Area X, all sediment with metals exceedances will be removed. For PCBs in Area X, a 26-month pilot study was performed at Parcel F to test the effectiveness of *in situ* treatment of PCB contaminated sediments using two commercially available treatment products. The results of the study demonstrated that carbon-based amendments reduce the bioavailability and toxicity of PCBs in Parcel F sediments by approximately 90%. As presented in Figure 9 of the ROD, *in situ* treatment using carbon-based amendments will target levels of PCBs where treatment has been demonstrated to be effective. In addition, the study demonstrated that the treatment material did not adversely affect the benthic community health and actually resulted in an improvement in benthic community health based on a comparison to baseline conditions prior to placement of the treatment material. Therefore, in Area X, PCBs in sediments will be addressed through a multi-component strategy that includes removal, *in situ* treatment, and MNR.

Responsiveness Summary
Parcel F, Hunters Point Naval Shipyard, San Francisco, California

Written Comments by the Yosemite Slough Cooperating Parties Group (YSCPG), signed by Nicholas W van Aelstyn and Robert Hines, received on May 7, 2018, via e-mail.		**Response**
COMMENTS		
1.	The Yosemite Slough Cooperating Parties Group (the "YSCPG"), in coordination with its technical consultants TIG Environmental and Integral Consulting Inc., have reviewed the Hunters Point Naval Shipyard - Parcel F Proposed Plan for Offshore Sediment Cleanup dated April 2018 (the "Proposed Plan") and the available supporting information. The YSCPG submits these comments on the Proposed Plan for consideration by the U.S. Navy (the "Navy") and the U.S. Environmental Protection Agency ("EPA").	Comment Acknowledged
2.	**The YSCPG and the Yosemite Slough Site** The Yosemite Slough Superfund Site consists of the sediments in Yosemite Slough (the "Slough"), an approximately 1,600-foot long and 200-foot wide shallow marine channel or slough (i.e., a tidal inlet channel), and a small portion of the sediments in the adjacent South Basin, a part of San Francisco Bay that lies between Hunters Point to the north and Candlestick Point to the south. The Yosemite Slough Site shares a common boundary with that portion of Parcel F of the Hunters Point Naval Shipyard ("HPNS") Site located in the South Basin, which the Navy has designated as Area X ("Area X"). See Proposed Plan Figure 1. The entire Slough is intertidal. Of critical importance, there is no physical separation between the two sites; they are inexorably connected by wind, wave and tide. The only division between the Yosemite Slough Site and Area X of the HPNS Site appears on a map; there is a historic, north-south property line drawn through South Basin just to the west of the mouth of the Slough. A non-time-critical removal action selected for the Yosemite Slough Site as described in EPA's Final Engineering Evaluation/Cost Analysis (EPA and E&E, 2013) (the "EE/CA") and EPA's Action Memorandum signed March 17, 2014 (the "AM") is currently in the pre-design stage. The YSCPG is performing technical pre-design studies in accordance with Appendix C of the Interim AOC (the Statement of Work); other entities are preparing related pre-design technical studies under a separate Administrative Settlement Agreement and Order on Consent with EPA.	The Navy acknowledges the presence of the Yosemite Slough site as adjacent to Parcel F, the two sites share a common boundary and that there is no physical separation between the two sites. Please see General Response 2.

Responsiveness Summary
Parcel F, Hunters Point Naval Shipyard, San Francisco, California

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3.	**<u>The Proposed Plan's Conceptual Site Model Speculates that Yosemite Slough Is an On-Going Source of Contamination in Area X Sediments Without Support.</u>** Figure 3 of the Proposed Plan is a conceptual site model ("CSM") that purports, without legal or technical support, that the Slough is a source of contaminants of concern ("COCs") in Area X sediments. Polychlorinated biphenyls ("PCBs") are the primary COC at both sites. The identification of the Slough as a source of contaminants appears to stem from the May 2007 Parcel F Feasibility Study Data Gaps Investigation report (the "Parcel F Data Gaps Report"), which states that "two apparent major source areas of PCBs to South Basin have been identified: the Parcel E-2 landfill area and Yosemite Creek." Parcel F Data Gaps Report at iv. This assertion is likely based on a cursory analysis of PCB compositions, which concludes only that there may be an additional source of PCBs in the subsurface near the mouth of the Slough. As discussed below, the evidence is not sufficient to support a determination that the Slough is a source in addition to Parcel E-2, much less a "major source." The most recent CSM for Parcel F is presented in the Navy's 2008 Final Feasibility Study (the "Final FS"). The Final FS, which was completed prior to the conducting of many of the studies for the Yosemite Slough Site, concludes that additional evaluation is needed to understand whether the Slough has the potential to be an on-going source to Area X: [T]hree areas will need to be further addressed before work begins on Parcel F to prevent recontamination. The additional source control measures include remediation of soil contamination at Parcel B, further removal in the ... PCB hotspot area along the shoreline in Parcel E-2, and an evaluation of Yosemite Creek as a potential ongoing source of contamination to Area IX/X (South Basin). Final FS at ES-4 (emphasis added). Further, in response to comments from the City and County of San Francisco on the Revised Draft Feasibility Study Report for Parcel F, the Navy stated that "additional characterization of Yosemite Creek would be needed to assess the potential ongoing contribution of the creek to South Basin." Final FS at E-6. Based on our review of the record, it does not appear that the Navy has performed any "additional characterization" of the Slough	Yosemite Slough was identified conceptually as a potential source of contamination to Parcel F in Figure 3 of the Proposed Plan based on detections of PCBs in Yosemite Slough and tidal exchange between Yosemite Slough and the South Basin. The Navy does not agree that these PCBs have migrated from the South Basin to Yosemite Slough. The FS Data Gaps Report (Barajas et al., 2007) identified Yosemite Slough and the Parcel E-2 landfill as the two apparent major sources of PCBs to the South Basin. The report also concluded that the presence of elevated PCB concentrations in surface sediments in Yosemite Slough suggested that there may be ongoing sources to the Yosemite Slough. The Validation Study Report (Battelle et al. 2005) concluded that given the weak tidal circulation in South Basin, significant upstream transport of contaminated sediments from the Parcel E shoreline adjacent to the Parcel E-2 landfill into Yosemite Slough is unlikely.

Responsiveness Summary
Parcel F, Hunters Point Naval Shipyard, San Francisco, California

Written Comments by the Yosemite Slough Cooperating Parties Group (YSCPG), signed by Nicholas W van Aelstyn and Robert Hines, received on May 7, 2018, via e-mail.		**Response**
	as was called for in the Final FS. Thus, neither the Proposed Plan nor the supporting documents in the record support the Navy's identification of the Slough as a source of PCBs in Area X sediments. In contrast to the mere speculation that the Slough may be a source, there is abundant information in the record indicating that the landfill located in the uplands adjacent to South Basin in that portion of the HPNS Site, which is designated as Parcel E-2, constitutes a known, major source of PCBs in Area X sediments. The Parcel F Data Gaps Report states: PCB concentration gradients indicate that the highest concentrations of PCBs discharged to South Basin adjacent to the former [landfill] at the north end of the basin. The most significant PCB releases in this area appear to have coincided with periods when Parcel E-2 was being filled based on available information on sedimentation rates. This suggests that the fill material itself, or waste materials disposed with the fill, served as the primary sources of PCBs to South Basin. Shoreline erosion and surface runoff from Parcel E-2 also probably transported contaminants to the basin. Parcel F Data Gaps Report at iv-v. The conclusion that Parcel E-2 is a major source of PCBs in Area X sediments is echoed in the Final FS. Final FS at 1-20. Subsequent Navy reports, such as the 2011 Remedial Investigation/Feasibility Study Report for Parcel E-2 and the February 2018 Draft Demonstration of Activated Carbon Amendments to Reduce Bioavailability (the "Activated Carbon Study"), also concluded in nearly identical language that Parcel E-2 is the major source of contaminants in South Basin: The most significant PCB releases into the South Basin appear to have occurred during the 1960s, coinciding with periods when Parcel E-2 was being filled, suggesting that the fill material itself or waste materials disposed with the fill, served as the primary sources of PCBs (Battelle et al., 2007). Shoreline erosion and surface runoff likely transported contaminants to the basin. Activated Carbon Study at 1-1 (emphasis added). In sum, there are neither adequate data nor sufficient analyses to support the conclusion that the Slough is a source of PCBs in Area X sediments. On the other hand, the landfill at Parcel E-2 is consistently identified as a known and major source. That conclusion is supported by trends identified in	

Responsiveness Summary
Parcel F, Hunters Point Naval Shipyard, San Francisco, California

Written Comments by the Yosemite Slough Cooperating Parties Group (YSCPG), signed by Nicholas W van Aelstyn and Robert Hines, received on May 7, 2018, via e-mail.		Response
	sampling data and detailed analyses of site history. Given these data gaps and associated technical uncertainties, it is inappropriate for the Proposed Plan's CSM to speculate that the Slough is also a contaminant source. To the contrary, Parcel E-2 has been identified in the record as a source of the PCBs in sediments at the Yosemite Slough Site.	
4.	**<u>The Parcel F and Yosemite Slough Remedies, Currently Inconsistent, Must Be Coordinated to Ensure Efficacy.</u>** The Area X and Yosemite Slough Site share a common boundary. Because there is no physical separation between the two sites - only an historical property line drawn through a map of South Basin - significant technical issues could arise if there were inconsistent cleanup plans for Area X and the Yosemite Slough Site. If sediments on one side of this invisible map line are remediated to a different standard or rely on different technologies than those on the other side of the invisible line there is a significant possibility that remaining PCBs could migrate from one side to the other and cause recontamination. Controlling contaminant sources so as to prevent recontamination is the first principle of sediment remediation. Because the two sites coexist in a common waterbody, it is critical to implement uniform and consistent cleanup approaches that are equally protective and effective at the two sites to ensure efficacy across their common border. The Proposed Plan's preferred alternative calls for different remedial technologies than those selected for the Yosemite Slough Site. The approved action at the Yosemite Slough Site includes the removal of sediments at varying depths (up to two feet within polygons where the NTE goal is exceeded in surface sediments) and placement of an engineered cap over these areas, with the potential application of enhanced monitored natural attenuation or monitored natural attenuation ("EMNR/MNR") in other areas. The Proposed Plan for the intertidal portion of Area X, including the entire area that borders the Yosemite Slough Site, calls for removal to a depth of one foot of all surface sediments, even those not exceeding the NTE goal, followed by backfill (i.e., cover material only, not an engineered cap). The Proposed Plan also calls for application of other technologies in other portions of Area X, including the use of activated carbon as an	The Navy agrees that Parcel F and Yosemite Slough remedies must be protective, effective, and implemented in a manner that will minimize the potential for recontamination. Remedial design and remedial action activities will collect the necessary data and perform the necessary analyses to design and construct a remedy that will appropriately take into account the response action for the adjacent Yosemite Slough and avoid conflict between the Navy's response for Parcel F and the response for Yosemite Slough.

Responsiveness Summary
Parcel F, Hunters Point Naval Shipyard, San Francisco, California

Written Comments by the Yosemite Slough Cooperating Parties Group (YSCPG), signed by Nicholas W van Aelstyn and Robert Hines, received on May 7, 2018, via e-mail.		Response
	amendment in subtidal areas, and relies heavily upon institutional controls and long-term monitoring to ensure achievement of the remedial action objectives ("RAOs"). For reasons set forth in more detail below, additional data and analyses are necessary to demonstrate that the shallower depth of removal combined with backfill in the intertidal areas and the use of activated carbon in the subtidal areas of Area X will be sufficiently protective and appropriate given the adjacent Slough. If it can be demonstrated, then it may be appropriate to consider how best to harmonize the two sites' cleanups. If not, then it may result in recontamination of the Slough.	
5.	**<u>Additional Studies Are Required to Adequately Demonstrate the Protectiveness of the Parcel F Proposed Plan.</u>** The Navy asserts that the Proposed Plan's preferred alternative for Area X is protective of human health and the environment, largely relying on as yet unperformed studies that at this point are only planned to be performed in the future. As further detailed below, the current record lacks sufficient technical support to demonstrate that the Navy's preferred cleanup alternative for Area X will be protective. If the remedies at Area X and Yosemite Slough are to be harmonized, they must rely on hard science, not speculation. For example, the maximum depth of removal in the Proposed Plan is one foot based on site-specific studies (Barajas and Associates 2008; Battelle, BBL and Neptune and Company 2005) that show that sediments below one foot are expected to remain stable in the environment. EPA's comments on the draft Optimized Remedial Alternative for Parcel F Technical Memo requested additional information to support this conclusion, because the sediments left in place after removal to one foot have documented concentrations of PCBs exceeding cleanup goals. Attachment VI to the Technical Memorandum. The Navy's response cites reports conducted in 2000 and 2008 but provides no additional analysis. Attachment VI to the Technical Memorandum. Instead, the Navy responds that modifications will be made during remedial design, leaving the scope of the final remedy in doubt. Based on discussions with the YSCPG's technical consultants, we recommend that the Navy conduct a breakthrough analysis to demonstrate that the proposed backfill	The Navy agrees with the need for an analysis to demonstrate that the proposed backfill design will not escape and cause recontamination and will be completed as part of the remedial design. The removal depth of 1-foot for subtidal sediments was developed for feasibility study level evaluation purposes. The 1-foot removal depth will be refined during remedial design. The goal is to remove a minimum of 1 foot of sediment contamination. The final depth will be determined during remedial design and will be sufficient to ensure that backfill that resists wave and current induced erosion can be placed and remain protective over the long term. The proposed analysis will be based on a detailed hydrodynamic and sediment transport model that considers a 100-year storm event. In addition, a baseline resiliency evaluation was performed to determine climate change impacts on long-term effectiveness of the proposed remedy. This evaluation identified applicability of remedial technologies based on wave action and currents, as well as identified adaptation measures that will be considered during remedial design to construct a resilient remedial action. The Navy also evaluated natural recovery processes within the South Basin using the results of the SedCam Model (Jacobs, L., R. Barrick, and T. Ginn. 1988). The modeling results demonstrated that MNR will achieve the RAO 3 RG of 200 µg/kg within 5 years for Area IX and within 8 years for Area X. The modeling results are presented in the Final Technical Memorandum, Optimized Remedial Alternative for Parcel F (Tech Memo, ECC-Insight, LLC and CDM Smith, 2017). As described in the Technical Memorandum, Optimized Remedial Alternative for Parcel F (ECC-Insight and CDM Smith, 2017), a

Responsiveness Summary
Parcel F, Hunters Point Naval Shipyard, San Francisco, California

Written Comments by the Yosemite Slough Cooperating Parties Group (YSCPG), signed by Nicholas W van Aelstyn and Robert Hines, received on May 7, 2018, via e-mail.		Response
	design will ensure that the high contaminant concentrations to be left in place below one foot will not escape and cause recontamination. We also recommend that studies be performed of the hydrodynamic conditions present within South Basin, including an analysis of how the proposed remedy would perform during 25- year and 100-year storm events, so that it is possible to make an informed determination of whether the proposed remedy will be effective. Scour potential, inputs to the system, and particle settling hydrodynamic impacts are all important factors to consider over the lifetime of the proposed remedy, but it does appear that these factors were assessed prior to remedy selection. The Proposed Plan and Feasibility Study do not evaluate long-term impacts or sufficiently guarantee long-term remedy performance. Moreover, no hydrodynamic study report that is necessary for such an analysis is available for review in the record. These gaps collectively point to a lack of crucial data necessary to confirm that the proposed remedy for the intertidal areas of Area X will be protective and effective. Without this additional information, it is difficult to determine whether the Proposed Plan will achieve the RAOs. Leaving significant aspects of the remedy uncertain until the actual design phase may result in a final remedy that conflicts with the remedy selected for the Yosemite Slough Site. As noted above, the first principle of sediment cleanups is to prevent recontamination. To achieve this at adjacent sites within a common waterbody, the remedies at each site must not only protective and effective, they must be consistent with one another. We therefore recommend that these analyses be completed and that the cleanups of the two sites be coordinated before a final remedy is selected for Area X of the HPNS Site. In addition to the documentation noted above that is absent from the record there are other underlying materials that should be included in support of the Proposed Plan and which do not appear to be present in the record. These include the following: A report or study with a quantitative evaluation of EMNR/MNR; Documentation of the rationale supporting the Proposed Plan's differential treatment of intertidal versus subtidal sediment areas	technology assignment framework was used to support the development of the selected remedy for Area IX and X. The technology assignment considered the following site-specific factors: contaminant of concern sediment concentrations, water depth, hydrodynamics, natural recovery rate, and constructability. The factors were evaluated based on available data and may be refined during the remedial design. The evaluation also relied on the SedCam Model (Jacobs 1988) to evaluate MNR. The results of the model and the technology assignment framework are included in the Technical Memorandum, Optimized Remedial Alternative for Parcel F (ECC-Insight and CDM Smith, 2017). Based on application of these factors, sediment removal followed by backfill was selected for intertidal areas while *in situ* treatment was selected for subtidal areas. The basis for removal of intertidal sediments was based primarily on the higher levels of PCB contamination and increased potential for erosion of intertidal sediments. Regarding the effectiveness of *in situ treatment* using activated carbon, see the response to Maria Caine, specific Comment #3. Comments from EPA and other regulatory agencies regarding the effectiveness of *in situ* treatment have been addressed through preparation of the Final Demonstration of Activated Carbon Amendments to Reduce PCB Bioavailability (KCH, 2018). Regarding state concurrence with the proposed remedy, as noted in the Proposed Plan, State of California concurrence with the selected remedy has been evaluated through on-going discussions with State of California regulatory agencies. Please see response to Bauer Comment #2 and General Response 4.

Responsiveness Summary
Parcel F, Hunters Point Naval Shipyard, San Francisco, California

Written Comments by the Yosemite Slough Cooperating Parties Group (YSCPG), signed by Nicholas W van Aelstyn and Robert Hines, received on May 7, 2018, via e-mail.		**Response**
	Documentation of the rationale for removal of all intertidal sediments, rather than just those with PCBs greater than the proposed cleanup goals. and Documentation addressing the concerns raised by the regulatory agencies that the activated carbon amendment may not be sufficiently protective and may not achieve the objectives outlined in the Proposed Plan. Lastly, the Navy also asserts that "[EPA], the California Department of Toxic Substances Control (DTSC), and the San Francisco Regional Water Quality Control Board (Water Board) ... concur with the Navy's preferred cleanup alternative." Proposed Plan. However, we have been unable to locate any such statements of concurrence by these agencies in the record. Indeed. The Proposed Plan does not address concerns previously raised by these agencies, including those mentioned above. Any documentation evidencing such concurrence by these agencies should be included in the record.	
6.	Because the two sites share a common waterbody, the remedy at Area X is inextricably linked to the Yosemite Slough Site. Additional data and analyses may show that the proposed remedy for the intertidal portions of Area X is protective of human health and the environment, but if the remedy implemented at Area X leaves significant concentrations of PCBs in sediments that later become exposed, it is likely those contaminated sediments would be transported to the Slough and elsewhere via wind, wave and tidal action. It is critical that the remedies selected for implementation at the two adjacent sites be harmonized and coordinated in order to ensure a comprehensive and effective long-term remediation of both South Basin and Yosemite Slough.	Comment acknowledged. See Response to YSCPG Comment #4.

Responsiveness Summary
Parcel F, Hunters Point Naval Shipyard, San Francisco, California

Written comments by Haakon Williams received on May 7, 2018 via email.		**Response**
COMMENTS		
General		
1	I am writing to you with my comments on the recently-released Parcel F Proposed Plan for Offshore Sediment Cleanup (hereafter Parcel F Plan). After reviewing the document, I have identified areas of concern that call into question the methods, conclusions, and ultimately the validity of the Navy's designation of its preferred cleanup alternative. The core of these concerns is that the Parcel F "Cleanup" Plan does not really propose cleanup at all; for much of the contamination, the Navy proposes to leave the contamination where it is.	The selected remedy for Parcel F uses a combination of removal, capping, *in situ* treatment, and MNR to reduce risks to human health and the environment to acceptable levels. Within Areas IX and X, removal with off-site disposal and backfill placement will be used to target areas with the highest levels of contamination. In Area III, removal with off-site disposal and backfill placement will be implemented in areas too shallow for capping.
Specific		
1.	Problematic Data Sourcing The Parcel F Plan suffers from insufficient sourcing of data and information. The section titled "Summary of the CERCLA Process" (p. 3) lists the documents that contain the "studies and evaluations" on which the cleanup plan is based. However, little guidance is provided throughout the rest of the document as to which document, and which section(s) within that document, are being relied upon at any specific point. For instance, on page 4, in determining which of Parcel F's 11 subareas merit further evaluation, the document cites "early site investigations" without making it clear which investigations purportedly support those conclusions. The determination of which subareas had unacceptable risks was made in "follow-on investigations" (p. 4), another vague reference. As the studies and evaluations cited comprise thousands of pages of detailed technical analysis, failure to provide specific citations constitutes considerable hindrance to anyone trying to fact-check the document, and reads as passive obstruction by the Navy to independent analyses of its work.	Extensive studies were performed at Parcel F including the 2005 Validation Study Report (Battelle et al., 2005) the 2007 FS Data Gaps Investigation Report (Battelle and others, 2007), and the 2008 FS (Barajas and Associates,. 2008). The 2008 FS provides a summary of previous investigations and associated findings. The evaluation of risks to human health and the environment are documented in the Validation Study Report. The evaluation of risks associated with radionuclides is presented in the 2017 FS Addendum (KCH, 2017). Please see General Response 4.

Responsiveness Summary
Parcel F, Hunters Point Naval Shipyard, San Francisco, California

Written comments by Haakon Williams received on May 7, 2018 via email.		Response
	The problems with data sources do not end there. The Parcel F Plan identifies some documents it relies upon, but several of the documents are not posted online. The "investigations [that] fulfilled the Site Inspection phase of CERCLA" (p. 3) are identified as the 1991 Environmental Sampling and Analysis Plan (ESAP) and the 1994 Phase 1A and 1996 Phase 1B Ecological Risk Assessments (ERAs). Another of the cited documents is called the 2007 Feasibility Study Data Gaps Investigation. These documents do not appear on the Navy BRAC's website for Hunters Point, nor on the DTSC's EnviroStor, nor on the EPA's Hunters Point website. I had to get in touch with the EPA's Lily Lee to acquire the 1991 study. (I did not request the 1994, 1996, or 2007 studies because I did not realize at the time of my request that they were also not to be found). Considering their importance to the statements made in the Parcel F Plan, there is simply no good reason for these critical documents to not be available electronically to the public. Finally, several important bits of information must be regarded as unverifiable, because the Parcel F Plan does not specify their source. The section regarding radionuclides (pp. 4) vaguely references "a series of investigations...conducted between 2009 and 2013." My best guess is that this is referring to the Radiological Data Gap Investigations, Phases 1, 2a, and 2b, released in 2013; but since the Parcel F Plan does not refer to these studies by name, it's not possible to directly fact check this. A similar problem comes up with the "pilot study" meant to prove the efficacy of the activated carbon amendments (pp. 8). No reference is given for this pilot study, so we must take the claims made here on faith. Later in my comment, I will discuss a study found on EnviroStor that seems to be the Navy's source here; but again, without a specific citation, it is impossible to know.	
2.	Tetra Tech Radiological Investigations However, the actual content of the 1994 and 1996 ERAs is somewhat irrelevant given what else we know about these investigations: they were conducted by Tetra Tech EMI, at that time going by the name PRC Environmental Management, Inc. Tetra Tech has been heavily involved with the HPS cleanup for over two decades. Most recently, the 2017 Feasibility Study Addendum (which is cited in the Parcel F Plan) relied on data supplied by Tetra Tech subcontractor Sea Engineering, Inc. This same Tetra Tech subcontractor was a contributor to the 2009-2013 studies vaguely referenced to determine that radionuclides of concern at the site were present at levels below background and so no remediation is required by CERCLA. Given the site's intense radiological history, it's hard to believe that radionuclide levels could be somehow below background. Tetra Tech was recently revealed to have arranged to falsify 90-97% of the	Please see General Response 3.

Responsiveness Summary
Parcel F, Hunters Point Naval Shipyard, San Francisco, California

Written comments by Haakon Williams received on May 7, 2018 via email.		Response
	soil samples in its studies of parcels B and G of the HPS [3]. This massive scandal destroys public trust in this contractor, casting a pall over all their work and rendering unworkable anything they've had a hand in. Until there is a comprehensive investigation of Tetra Tech and its work, there is no reason to think that they haven't compromised the cleanup in other ways. We would not tolerate such a blatant breach of trust in our personal lives, and should be even stricter when lastingly toxic materials are involved. Considering the lives of the families who will be living on this land once redeveloped, the Navy has a responsibility to conduct this cleanup with integrity. The Navy must consider its contract with Tetra Tech EMI irredeemably broken, and find a new contractor who will be honest in all affairs. Unfortunately, given that the Navy's own review of this corrupted data identified less than half of the falsification, our faith that the Navy will operate with integrity has been similarly compromised. Given the untrustworthiness of the 1994 Phase 1A and 1996 Phase 1B Ecological Risk Assessments, we are left without any verifiable foundation for many of the statements made in the Parcel F Plan regarding site conditions.	
3.	False Statements About Radioactive Contamination The establishment of Project Action Limits for radionuclides was deeply flawed. Values were chosen that are orders of magnitude weaker than the PALs for terrestrial contamination, and those terrestrial PALs are themselves far less protective than current EPA PRGs would mandate. [Even so, radium was found at levels above background and exceeding PALs, but the results appear to have been ignored.] PALs are supposed to be based on the actual measured value; instead they based them on incremental values (i.e., true value minus background). One is thus faced with an extraordinary situation: in the face of the Tetra Tech scandal and serious questions about the validity of release criteria being used for radionuclides site-wide, the Navy ignores all of that and proposes instead NO cleanup of radiological contamination in Parcel F, with the minor exception of large radiation objects that are accidentally encountered during dredging. This cannot be defended and should not stand. Since the Parcel F Plan decision to do NO cleanup of potential radioactive contamination in Parcel F (with the exception of institutional controls to manage and dispose of radioactive objects if encountered during dredging), and since that decision is based on a false statement that all radioactivity was at or below background (p. 4) and since that work was conducted by a Tetra Tech contractor, and since the action levels themselves are questionable, the entire decision to do no cleanup of radionuclide contamination in Parcel F is invalid and should be revisited.	Please see General Response 3. In addition, the radiological data gap investigations concluded the following: 1. The Parcel F median radionuclide sediment concentrations were equal to or less than the median background concentrations for all six Radionuclides of Concern (ROCs). 2. There is a highly statistically significant rejection (p-value < 0.0001) of the null hypothesis that the median ROC concentration in Parcel F exceeds the median ROC concentration in the San Francisco Bay reference areas for the intertidal and subtidal exposure scenarios. 3. No individual sample had ROC concentrations exceeding the PAL + background. Based on the radionuclide investigation, radiological risks were estimated as $4x10^{-6}$ for exposure to the intertidal sediments and $6x10^{-8}$ for exposure to subtidal sediments. The results of the extensive radionuclide investigation determined that ROC concentrations were comparable to ROC concentrations in San Francisco Bay reference areas and the estimated risks were within or below the EPA acceptable risk range of 10^{-6} to 10^{-4}. Based on this information, the Navy determined that actions to address radionuclides at Parcel F of the HPNS are not required.

Responsiveness Summary
Parcel F, Hunters Point Naval Shipyard, San Francisco, California

Written comments by Haakon Williams received on May 7, 2018 via email.		**Response**
4.	Institutional Controls Institutional controls are ineffective cleanup methods, especially for radioactive materials, which remain dangerous for hundreds, if not thousands, of years. Part of the problem is the generally poor implementation. For instance, according to the Parcel F Plan section on Source Control Measures (pp. 6), the extent of mitigation for some of the most contaminated areas on the site will consist of placing erodible caps on top. For instance, on parcel E-2: "Installation of a sheet pile wall and riprap along shoreline, capping of the former landfill, shoreline cleanup, metal slag removal, metal debris reef removal, PCB hotspot removal, and installation of a slurry wall along the shoreline" (pp. 6). This sounds ok, until you recall how long these institutional controls must remain effective for, and how quickly institutions become out of touch through staff turnover and normal human inattention. We are assured that the "climate change impacts...were compared for each alternative" (pp. 11), but one wonders if the various types of revetment planned will be engineered to withstand the projected increase in wave intensity caused by climate change, or the massive earthquake that the West coast is overdue for.	ICs can be an effective means of protecting human health until such time as RAOs are achieved. In addition, ICs that limit certain activities can be effective at protecting sediment remedies from disturbance following construction. Please also see response to Hamman Comment #3 regarding ICs. The selected remedy will be constructed such that it is compatible with source control measures implemented along the shoreline of Parcels B, E and E-2 and to minimize the loss of tidal marshes and flats. A baseline resiliency evaluation was performed to determine climate change impacts on long-term effectiveness of the proposed remedy (ECC-Insight and CDM Smith, 2017). This evaluation identified applicability of remedial technologies based on wave action and currents, as well as identified adaptation measures that will be considered during remedial design to construct a resilient remedial action. In addition, a detailed hydrodynamic and sediment transport model that considers a 100-year storm event will be performed to support remedial design. Consideration of climate change impacts will be performed in accordance with EPA's "Climate Change Adaptation Technical Fact Sheet: Contaminated Sediment Remedies" (April 2015).
5.	**Human Health Risk Assessment** "In the human health risk assessment, the Navy considered the ways humans might be exposed to COCs [contaminants of concern], the concentrations of COCs, and the amount of current and future exposure to the COCs" (p. 7). "The adjacent shoreline will likely be redeveloped as open space for a park or similar use. People could potentially use this area for fishing and collecting shellfish for food. No other potential uses have been identified" (p. 6). This is a very flawed prediction of site use, because it leaves out the possibility of people swimming and wading at the shoreline. This calls into question the rest of the exposure pathway, based as it is on this unrealistic assumption. If the plan is to merely institute an IC warning people not to swim, this does not seem a desirable set of affairs compared to a full cleanup that would let people use the shoreline normally. While on the subject of migration pathways: dry dock 1 (which is elsewhere referred to as Dry dock 4) doesn't seem to be included in the Conceptual Site Model (CSM). No rationale is provided for this. Perhaps the most troubling statement in the Human Health Risk Assessment is this: "excess lifetime cancer risks due to direct contact with sediment and through fish and shellfish	The human health risk assessment evaluated direct contact (i.e., ingestion and dermal contact) with sediment during clamming and indirect contact through the consumption of shellfish. Direct contact risks to both adults and children were evaluated. The risk assessment assumed that risks associated with direct contact to sediment via ingestion, inhalation, and dermal contact (e.g. from wading) would be accounted for by evaluating exposures from direct contact with sediments during clamming activities. As presented in Table 9-7 of the Validation Study Report (Battelle et al., 2005), risks to human health associated with direct contact were within EPA's acceptable risk range and the noncancer hazard index was below one.

Responsiveness Summary
Parcel F, Hunters Point Naval Shipyard, San Francisco, California

Written comments by Haakon Williams received on May 7, 2018 via email.		**Response**
	consumption were within the EPA acceptable risk range of a 1 in 10,000 chance to a 1 in 1,000,000 chance to develop cancer during one's lifetime." This statement gives the impression that that entire range is acceptable. Let's look at the regulation where that acceptable risk range comes from, Code of Federal Regulations, Title 40, Section 300.430, otherwise known as the National Contingency Plan. "For known or suspected carcinogens, acceptable exposure levels are generally concentration levels that represent an excess upper bound lifetime cancer risk to an individual of between 10 -4 and 10 -6 using information on the relationship between dose and response." This is the 1 in 10,000 to 1 in 1,000,000 range mentioned. However: "The 10 -6 risk level shall be used as the point of departure for determining remediation goals for alternatives when ARARs are not available or are not sufficiently protective because of the presence of multiple contaminants at a site or multiple pathways of exposure." So when there are multiple contaminants present at the site, or multiple pathways of exposure – at HPS, both are true – 1 in 1,000,000 is to be the risk goal for the number of humans who will develop cancer from this exposure. The less protective goal of 1 in 10,000 is to be used only when one can demonstrate one has good reasons for not being able to meet the higher goal.	
6.	**PCBs in Areas IX and X Preferred Alternative** Preferred Alternative 7 for Areas IX and X sets PCB cleanup levels thusly: • "PCB concentration exceeding 12,400 µg/kg = removal; • PCB concentration exceeding 1,240 µg/kg, but below 12,400 µg/kg = in situ treatment; and • PCB concentration equal to or less than 1,240 µg/kg = MNR." (p. 13) "MNR" refers to Monitored Natural Recovery, which is just a fancy way of saying 'do no cleanup or treatment whatsoever at that concentration of PCBs'. The California Regional Water Quality Control Board adopted a Total Maximum Daily Load (TMDL) in 2009 (approved by the EPA in 2010), setting a goal of an average concentration of 1 µg/kg of PCBs in surface sediment in the Bay. So for PCB sediment concentrations up to 1240 times the Water Board's goal, the Navy plans are to do nothing. For concentrations up to 12,400 times that level, the Navy plans are also to leave the PCBs uncleaned up, but to rely upon a highly questionable approach of just dumping activated carbon on the sediment in the hope that would reduce the uptake in shellfish (see below). The concentrations seem pretty arbitrary, but	As noted in Figure 9 of the ROD, MNR will be used to remediate PCBs with chemical concentrations below the not-to exceed RAO 1 cleanup level of 1,240 µg/kg. SedCam modeling results show that MNR will reduce PCB concentrations to background levels in 5 years for Area IX and 8 years for Area X (ECC-Insight and CDM Smith 2017). MNR at Parcel F relies primarily on the deposition of cleaner sediment to reduce chemical concentrations over time. As noted in EPA's sediment remediation guidance (EPA 2005), MNR may be an appropriate approach to control risk from areas of wide-spread, low-level sediment contamination, following dredging or capping of more highly-contaminated areas as is the case in Areas IX and X. Long-term performance and remedial goal monitoring will be conducted to monitor the effectiveness of MNR at meeting RAOs for the HPNS site. Under CERCLA, a review of the remedy is required every 5 years. The purpose of a Five-Year Review is to determine whether the selected remedy at a site continues to be protective of human health and the environment. Monitoring results, including an evaluation of MNR, will be presented in a Five-Year Review report.

Responsiveness Summary
Parcel F, Hunters Point Naval Shipyard, San Francisco, California

Written comments by Haakon Williams received on May 7, 2018 via email.		**Response**
	in any case, the bottom line is that the Navy is proposing for much of the PCB contamination to not clean it up.	
7.	**Activated Carbon Study** A pilot study is cited to provide evidence supporting the Parcel F Plan's claim that "activated carbon amendments...remain in place for up to 26 months post-placement" (p. 8). In truth, the study does not support this claim, as carbon amendments had only been monitored for 14 months at the time of the study's publication. There is no discussion of how often more carbon would need to be deposited, what the effects of altering the marine environment by such dumping, or how, even under the best of assumptions, this would merely marginally reduce uptake but in no way eliminate it.	The results of the pilot study demonstrated that application of the treatment material resulted in an approximately 90% reduction in PCB pore water concentrations relative to baseline within 26 months. Regarding the effectiveness of *in situ* treatment using activated carbon, see the response to Caine Comment #3 and Thorpe Comment #4. The Navy expects this to be a one-time application. The concentration of carbon amendment and placement of material will be determined during remedial design and will be based on the results of the Hunters Point pilot study. Following placement, natural mixing through bioturbation and physical mixing will distribute the treatment material through the biologically active portion of the sediment bed where exposure to the benthic community takes place. The *in situ* treatment will bind to the PCBs in sediment, making them unavailable for uptake by benthic organisms and subsequent biomagnification up the food chain. Therefore, the bioavailability of PCBs resulting from Navy activity will be significantly reduced, resulting in human and ecological risk reduction, until MNR results in achievement of the RAO 3 RG. South Basin is a net depositional environment, and sediment from the greater San Francisco Bay will overlay the *in situ* treatment remediation zone over time. After the remedy is implemented, performance monitoring will be conducted to verify that the remedy is performing as intended. Immediately following construction, data will be collected to ensure that the *in situ* treatment materials have been placed to design specifications. Long-term remedial goal monitoring will be conducted in the MNR remediation zone to monitor progress toward achieving the RAO 3 200 µg/kg total PCB RG on an area-weighted average basis. Under CERCLA, a review of the remedy is required every 5 years. The purpose of a Five-Year Review is to determine whether the selected remedy at a site is protective of human health and the environment. Performance and long-term remedial goal monitoring results will be presented in a Five-Year Review report.

Responsiveness Summary
Parcel F, Hunters Point Naval Shipyard, San Francisco, California

Written comments by Haakon Williams received on May 7, 2018 via email.		**Response**
8.	**Scope of Cleanup** "Past shipyard operations left hazardous materials and chemicals on site. These chemicals migrated to San Francisco Bay through groundwater discharge, storm and surface water runoff, and soil erosion, resulting in sediment contamination in some areas of Parcel F" (p. 4). Given this, why does the Parcel F Plan only examine sediment at the site? As the plan itself admits, chemical contamination from HPS has migrated off-site. Is the Navy not liable for pollution it causes that spreads beyond its borders? And crucially, the Plan appears to ignore essentially all contaminants except PCBs. Under CERCLA, the risks from all radionuclides and all toxic chemicals are supposed to be addressed and summed, with the allowable remaining concentrations of each reduced to take into account the risks from the rest. The refusal to address cleanup of radioactive contamination at all and the ignoring of the other chemicals that also have added contamination, are fundamental flaws. In the light of the Tetra Tech scandal and the failure of Navy oversight, the Navy should withdraw this proposal to essentially not clean up the great bulk of the contamination it is responsible for in Parcel F, and start over.	Characterization of Parcel F sediments was performed to determine the nature and extent of sediment contamination offshore of the HPNS Site. The characterization determined that only Areas III, IX, and X posed unacceptable risk to human health or the environment. Within Areas III, IX, and X, the sampling was sufficient to determine the areas that exceed risk-based clean up concentrations and to bound the extents of this contamination. For example, within Area IX and X, it was determined that contamination above the risk-based cleanup levels were not exceeded near the entrance to the South Basin or into San Francisco Bay. Similarly, it was determined that the outer portion of Area III (greater than approximately 500 feet from shore) also did not exceed risk-based cleanup levels. The selected remedy is designed to address all chemicals that were found to pose unacceptable risks to human health or the environment. These include copper, lead and mercury in addition to PCBs. See response to Thorpe Comment #1. The selected remedy is protective of human health and the environment, is based on a balancing of the remedy selection factors, is cost effective and utilizes treatment to the extent practicable consistent with CERCLA.

Responsiveness Summary
Parcel F, Hunters Point Naval Shipyard, San Francisco, California

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Responsiveness Summary
Parcel F, Hunters Point Naval Shipyard, San Francisco, California

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Exhibits for Responsiveness Summary

Exhibit 1. Approved Truck Route (2018)

Exhibit 2 – Parcel F Sediment and Shorelines Locations – Areas I and II

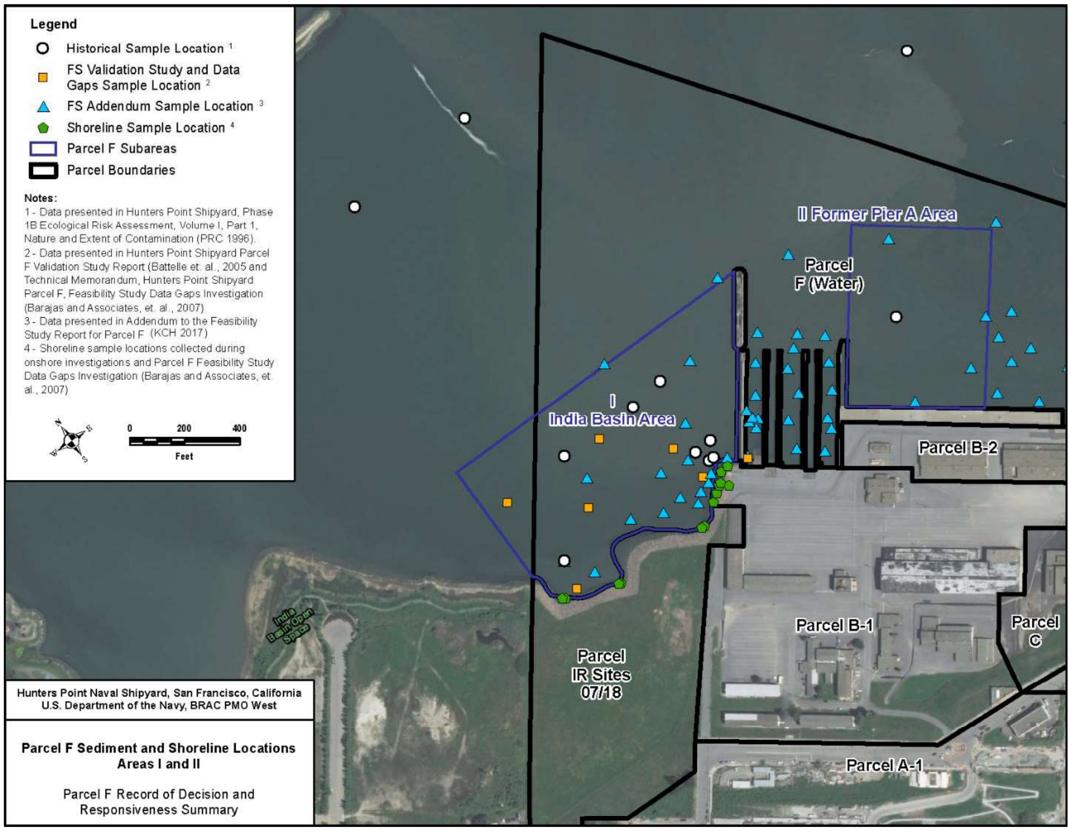


Exhibit 3 – Parcel F Sediment and Shorelines Locations – Areas IV through VII

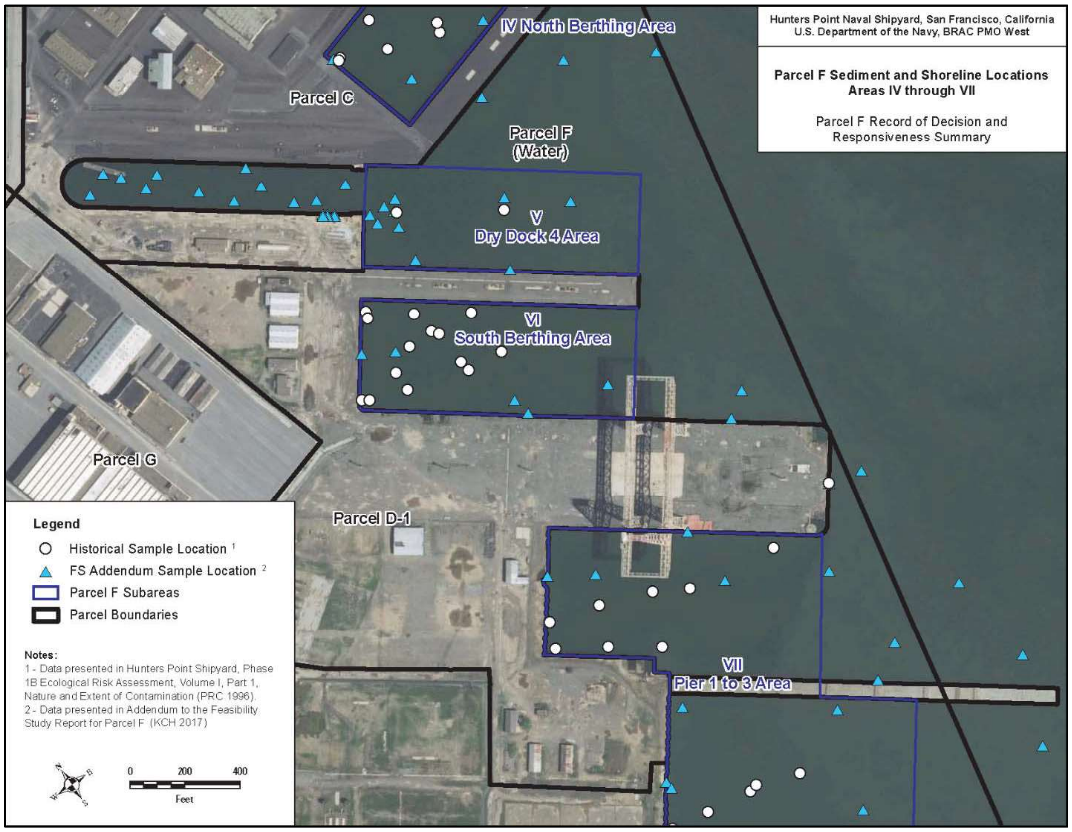
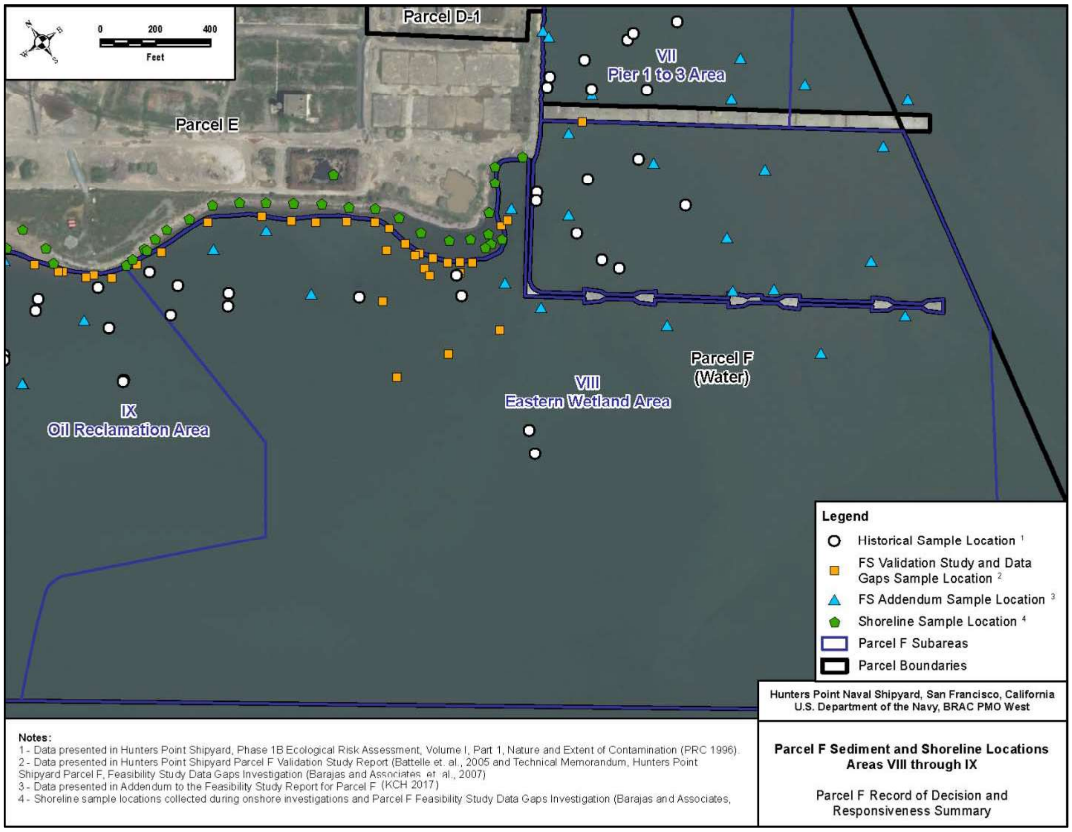


Exhibit 4 – Parcel F Sediment and Shorelines Locations – Areas VIII and IX



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ATTACHMENT 4

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

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Attachment 4 - Table 4-1: Chemical Specific ARARs

Requirements	Prerequisite	Citation[b]	ARAR Determination	Comments
Sediment				
Federal Requirements				
Resource Conservation and Recovery Act (42 USC, ch. 82, §§ 6901 through 6991[i])[c]				
Defines RCRA hazardous waste. A solid waste is characterized as toxic, based on the toxicity characteristic leaching procedure, if the waste exceeds the toxicity characteristic leaching procedure maximum concentrations.	Waste	Characteristic hazardous waste requirements, 40 CFR § 261.24	Applicable	Applicable for determining whether waste is hazardous.
Toxic Substances Control Act (15 USC, ch. 53, §§ 2601 through 2692)[c]				
Regulates storage and disposal of PCBs.	Soil, debris, sludge or dredged materials contaminated with PCBs	PCB remediation waste cleanup standards, 40 CFR § 761.61 (a)(4)(i)	Applicable	TSCA sets forth disposal requirements for PCB waste that is greater than 50 ppm. TSCA decontamination and disposal requirements are applicable to contaminated sediments found to contain PCBs above 50 mg/kg. Based on current data, PCB concentrations above 50 mg/kg are not expected but if found, the cleanup will comply with this standard.

Attachment 4 - Table 4-1: Chemical Specific ARARs

Requirements	Prerequisite	Citation[b]	ARAR Determination	Comments
State Requirements				
State and Regional Water Quality Control Board[c]				
Definition of "non-RCRA hazardous waste"	Waste	Cal. Code Regs. tit. 22, §§ 66261.22(a)(3) and (4), 66261.24(a)(2)-(a)(8), 66261.101, 66261.3(a)(2)(C), or 66261.3(a)(2)(F)	Applicable	Applicable for determining whether a waste is a non-RCRA hazardous waste.
Definitions of designated waste, nonhazardous waste, and inert waste	Waste	Cal. Code Regs. tit. 27, §§ 20210,20220, and 20230	Applicable	Potential ARAR for classifying waste. These soil classifications determine state classification and siting requirements for discharging waste to land.
Surface Water				
Federal Requirements				
Discharges to waters of the United States Waste	Impact to surface water	Water Quality Standards, National Toxics Rule and California Toxics Rule 40 CFR § 131.36(b) and 131.38	Applicable	Potentially applicable to the discharge of PCBs to surface water expected during dredging. Not an ARAR for cleanup of the sediment at Parcel F because surface water is not the medium of concern.

Attachment 4 - Table 4-1: Chemical Specific ARARs

Requirements	Prerequisite	Citation[b]	ARAR Determination	Comments
State and Regional Water Quality Control Board[c]				
Beneficial use of surface water in San Francisco Bay. Establishes water quality objectives including narrative and numerical standards.	Impact to surface water	Comprehensive Water Quality Control Plan for the San Francisco Bay (Cal. Water Code § 13240) Chapter 2 Beneficial Uses Chapter 3 Water Quality Objectives for turbidity and dissolved oxygen, and Basin Plan Table 3-3.	Applicable	The Comprehensive Water Quality Control Plan for San Francisco Bay was updated in May 2017. Substantive requirements pertaining to beneficial uses and water quality objectives for turbidity and dissolved oxygen are potentially applicable during dredging activities. Not an ARAR for sediment cleanup because surface water is not the medium of concern.

Notes:

[a] Many potential action-specific ARARs contain chemical-specific limitations and are addressed in the Table 4-3, Potential Action-Specific ARARs.

[b] Only the substantive provisions of the requirements cited in this table are potential ARARs.

[c] Statutes and policies, and their citations, are provided as headings to identify general categories of potential ARARs for the convenience of the reader; listing the statutes and policies does not indicate that the Navy accepts the entire statutes or policies as potential ARARs; specific potential ARARs are addressed in the table below each general heading; only pertinent substantive requirements of specific citations are considered potential ARARs.

§	Section
ARAR	Applicable or relevant and appropriate requirement
Cal. Code Regs.	California Code of Regulations
CFR	Code of Federal Regulations
ch.	Chapter
mg/kg	milligrams per kilogram
PCB	Polychlorinated biphenyl
ppm	parts per million
RCRA	Resource Conservation and Recovery Act
tit.	Title
TSCA	[The] Toxic Substances Control Act
USC	United States Code

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Attachment 4 – Table 4-2: Location-Specific ARARs

Location	Requirements	Prerequisite	Citation[a]	ARAR Determination[a]	Comments
Biological Resources - Federal Requirements					
Migratory Bird Treaty Act of 1972 (Title 16 USC § 703 through 712)[b]					
Migratory bird area	Protects almost all species of native migratory birds in the United States from unregulated "take," which can include poisoning at hazardous waste sites.	Presence of migratory birds	16 USC §703	Relevant and appropriate	The substantive portions are relevant and appropriate as migratory birds have been observed at the site.
Marine Mammal Protection Action (Title 16 USC §§ 1361 through 1421h)					
Marine mammal area	Protects any marine mammal in the United States except as provided by international treaties from unregulated	Presence of marine mammals	16 USC § 1362(a)(2)	Applicable	Marine mammals are known to be present near Parcel F, thus substantive provisions are potentially applicable if the selected response action constitutes a take.
Endangered Species Act (Title 16 USC § 1536)[b]					
Habitat for threatened or endangered species	Actions may not jeopardize the continued existence of threatened or endangered species. If threatened or endangered species are present, coordination with National Marine Fisheries Service or U.S. Fish and Wildlife Service is required.	Activities have the potential to affect threatened or endangered species	16 USC § 1536, 50 CFR 17.11, 17.12 and 17.95	Applicable	Potentially relevant because the sediment clean has the potential to affect threatened or endangered species such as steelhead (Central California Coast Distinct Population Segment) and green sturgeon.

Attachment 4 – Table 4-2: Location-Specific ARARs

Location	Requirements	Prerequisite	Citation[a]	ARAR Determination[a]	Comments
Fish and Wildlife Coordination Act (Title 16 USC §§ 662 and 663)[b]					
Habitat for fish and wildlife	Requires federal agencies to consider the effects of the project on fish and wildlife and mitigate or compensate for project related losses.	Activities have the potential to affect fish and wildlife	16 USC §§ 662 and 663, 50 CFR 6.302(g)	Applicable	Potentially relevant because the sediment clean has the potential to affect fish and wildlife.
Coastal Resources - Federal Requirements					
Coastal Zone Management Act (Title 16 USC §§ 1451 through 1464)[b]					
Within coastal zone	Conduct activities in a manner consistent with approved state management programs.	Activities affecting the coastal zone, including lands there under and adjacent shore land.	16 USC § 1456(c) 15 CFR Part 930	Relevant and appropriate	Potentially relevant because Parcel is located on the coast.
Hydrologic Resources - Federal Requirements					
Rivers and Harbors Act of 1899 (Title 33 USC §§ 401 through 413)[b]					
Navigable waters	Permits required for structures or work in or affecting navigable waters.	Activities affecting navigable waters.	33 USC § 403 33 CFR Part 322	Relevant and appropriate	The substantive provisions of this requirement are relevant and appropriate requirements for dredging and capping that may affect navigable waters.

Attachment 4 – Table 4-2: Location-Specific ARARs

Location	Requirements	Prerequisite	Citation[a]	ARAR Determination[a]	Comments
Wetlands Protection - Federal Requirements					
Executive Order No. 11990, Protection of Wetlands[b]					
Wetland	Action to minimize the destruction, loss, or degradation of wetlands.	Wetland meeting definition of Section 7.	40CFR § 6.302(a)	Applicable	The substantive provisions of 40 CFR § 602(a) are applicable requirements for the response action. The Navy will minimize the effects to wetlands when implementing the response action.
Clean Water Act of 1988, as Amended, Section 404 (33 USC § 1344)[b]					
Wetland	Action to prohibit discharge of dredged of fill material into wetland without permit	Wetland as defined by Executive Order No. 11990 Section 7.	33 USC § 1344 33 CFR §§ 320.4 and 323 40 CFR §§ 230.10; 230.11; 230.20 through 230.25; 230.31; 230.32; 230.41; 230.42; 230.530	Applicable	The substantive provisions are applicable for the discharge of dredged or fill material to a wetland.
Biological Resources - State Requirements					
Habitat for bird nests and eggs	Prohibits the take, possession or needless destruction of the nest or eggs of any bird.	Presence of nests and eggs	Cal. Fish and Game Code § 3503	Applicable	The substantive provisions of this requirement are potential ARARs.

Attachment 4 – Table 4-2: Location-Specific ARARs

Location	Requirements	Prerequisite	Citation[a]	ARAR Determination[a]	Comments
Habitat for Nongame birds	Prohibits the take of nongame birds.	Presence of nongame birds.	Cal. Fish and Game Code § 3800	Applicable	The substantive provisions of this requirement are potential ARARs.
Nongame mammals	Prohibits the take or possession of nongame mammals.	Presence of nongame mammals	Cal. Fish and Game Code § 4150	Applicable	The substantive provisions of this requirement are potential ARARs.
Wildlife Species	Action required to avoid take of birds and mammals by poison or other methods referenced in the code.	Presence of birds and mammals.	Cal. Fish and Game Code § 3005	Not an ARAR	The DON has determined that F&GC Section 3005 is not a state ARAR because it is not applicable or relevant and appropriate. The State of California Department of Fish & Wildlife asserts that F&GC Code Section 3005 is a state ARAR because it is relevant and appropriate. Whereas the DON and the State have not agreed upon whether F&GC Section 3005 is an ARAR, this ROD documents each party's position on the statute but does not attempt to resolve the issue.

Attachment 4 – Table 4-2: Location-Specific ARARs

Location	Requirements	Prerequisite	Citation[a]	ARAR Determination[a]	Comments
Take of threatened or endangered species	Action must be taken to avoid take of threatened and endangered species during remedial activities.	Presence of threatened or endangered species.	Cal. Fish and Game Code § 2080	Applicable	The DON accepts Fish and Game Code Section 2080 as a state ARAR subject to the following conditions. The State of California, through CDFW, concurs that this statute addresses prohibited conduct but does not provide for or prescribe affirmative measures to avoid a "taking." Notwithstanding the absence of specific affirmative measures in the statute, the DON will implement reasonable measures to ensure adequate protection of ecological receptors during response action construction following issuance of the ROD. The DON will coordinate with the State, through CDFW, prior to implementation of such reasonable measures. The DON understands that the State reserves the right to conduct periodic site visits during removal or remedial activities to confirm implementation of avoidance measures.

Attachment 4 – Table 4-2: Location-Specific ARARs

Location	Requirements	Prerequisite	Citation[a]	ARAR Determination[a]	Comments
Fully protected bird species and their habitat	No fully protected birds may be taken or possessed at any time.	Presence of fully protective birds including the California Brown Pelican (Pelecanus occidentalis califomicus) and American Peregrine Falcon (Falco pergrinus anatum)	Cal. Fish and Game Code § 3511	Applicable	The Navy accepts California Fish & Game Code §3511 as a state ARAR subject to the following conditions. The State of California, through CDFW-OSPR, concurs that this statute addresses prohibited conduct but does not provide for or prescribe affirmative measures to avoid a "taking."
Birds of Prey	Action must be taken to prevent the take, possession, or destruction of any birds of prey or their eggs.	Presence of birds of prey.	Cal. Fish and Game Code § 3503.5	Not an ARAR	In accordance with an agreement with the State, Navy does not cite this State requirement as an ARAR when the Migratory Bird Treaty Act is cited as an ARAR.
Habitat for mollusks, crustaceans, and invertebrates	Prohibits the take or possession of unless expressly permitted, mollusks, crustaceans, and invertebrates	Presence of mollusks, crustaceans, and invertebrates.	Cal. Fish and Game Code § 8500	Not an ARAR	The substantive provisions of this requirement are potential ARARs.

Attachment 4 – Table 4-2: Location-Specific ARARs

Location	Requirements	Prerequisite	Citation[a]	ARAR Determination[a]	Comments
Coastal Resources - State Requirements					
Within the San Francisco Bay coastal zone	Reduce fill and disposal of dredged material in San Francisco Bay, maintain marshes and mudflats to the fullest extent possible to conserve wildlife, abate pollution, and protect the beneficial uses of the bay.	Activities affecting San Francisco Bay and 100 feet shoreline.	San Francisco Bay Plan at Cal. Code Regs. tit. 14, §§ 66600 through 66682 (McAteer-Petris Act)	Relevant and appropriate	The remedial alternatives will comply to the extent possible with the substantive purposes of the San Francisco Bay Plan.
Wetlands Protection - State Requirements					
Waters of the State	Prohibits depositing in, permitting to pass into, placing where it can pass into waters of the state petroleum acid, coal, or any substance or material harmful to fish, plant life, or bird life.	Deposit of material harmful to fish, plant, or bird life.	Cal. Fish and Game Code § 5650	Relevant and appropriate	The substantive provisions of §5650(a) are relevant and appropriate.

Attachment 4 – Table 4-2: Location-Specific ARARs

Notes:

[a] Only the substantive provisions of the requirements cited in this table are potential ARARs.

[b] Statutes and policies, and their citations, are provided as headings to identify general categories of potential ARARs for the convenience of the reader; listing the statutes and policies does not indicate that the Navy accepts the entire statutes or policies as potential ARARs; specific potential ARARs are addressed in the table below each general heading; only substantive requirements of the specific citations are considered potential ARARs.

§	Section
ARAR	Applicable or relevant and appropriate requirement
Cal.	California
Cal. Code Regs.	California Code of Regulations
CDFW	California Department of Fish and Wildlife
CFR	Code of Federal Regulations
DON	Department of the Navy
OSPR	Office of Spill Prevention and Response
Regs.	Regulations
ROD	Record of Decision
TBC	To-be-considered
tit.	Title
TSCA	[The] Toxic Substances Control Act
USC	United States Code

Attachment 4 – Table 4-3: Action Specific ARARs

Location	Requirements	Prerequisite	Citation[a]	ARAR Determination[a]	Comments
Dredging and Excavation					
Federal Requirements					
Resource Conservation and Recovery Act (42 USC, ch. 82, §§ 6901 through 6991[ij])*					
On-Site generation of waste	Person who generates waste shall determine if generation of waste is a RCRA hazardous waste.	Generator of waste	Cal. Code Regs. tit. 22, §§ 66262.10(a) and 66262.11	Applicable	These regulations are applicable to any operation that generates waste. The Navy will make the determination of whether the waste is RCRA hazardous waste at the time it is generated.
On-Site generation of waste	Requirements for analyzing waste for determining whether waste is hazardous.	Generator of waste	Cal. Code Regs. tit. 22, §§ 66264.13(a) and (b)	Applicable	These regulations are applicable to any operation that generates waste. The Navy will make the determination of whether the waste is RCRA hazardous waste at the time it is generated.
Stockpiling sediment for off-site disposal	Allows generators to accumulate solid remediation waste in an EPA-designated pile for storage only up to 2 years during remedial actions without triggering land disposal restrictions.	RCRA hazardous waste temporarily stored in piles	40 CFR §§ 264.554(a), (d), (g), (h), (i), (o), and (k)	Relevant and appropriate	The Navy will temporarily stockpile sediment in staging piles prior to off-site disposal. The Navy does not anticipate that all sediment will be RCRA hazardous waste; however, the Navy has determined that these requirements are relevant and appropriate for all stockpiled sediment.

Attachment 4 – Table 4-3: Action Specific ARARs

Location	Requirements	Prerequisite	Citation[a]	ARAR Determination[a]	Comments
Clean Water Act of 1988, as Amended, Section 402 (33 USC § 1342)*					
Discharge of stormwater	Discharge of stormwater must be in compliance with discharge standards.	Discharge of stormwater	40 CFR §§ 122.44(k) (2) and (4)	Relevant and appropriate	Potentially relevant and appropriate to remedial activities that result in a point source discharge of stormwater to surface water. Requires compliance with the standards, limitations and regulations promulgated per Sections 301, 304 306, 307, 308 of the CWA. CWA §301(b) requires all direct dischargers to meet technology-based requirements.
Clean Water Act of 1988, as Amended, Section 404 (33 USC § 1344)*					
Discharge of water	Owners and operators of construction activities must be in compliance with discharge standards.	Discharge of waste	40 CFR §§ 122.44(k) (2) and (4)	Relevant and appropriate	The substantive requirement of 40 CFR Part 122 Subpart C will be followed in addressing discharges.
Discharge to surface water	Monitor the mass for each pollutant limited permit; the volume of effluent discharged from each outfall. Monitor according to test procedures approved under 40 CFR Part 136 for the analyses of pollutants having approved methods.	Permit requirements under CWA 301 (b)	40 CFR §122.44(i)(1)(iiv)	Relevant and appropriate	Substantive provisions are relevant and appropriate for the discharge of dewatering effluent. Specific discharge requirements will be provided in the remedial design.

Attachment 4 – Table 4-3: Action Specific ARARs

Location	Requirements	Prerequisite	Citation[a]	ARAR Determination[a]	Comments
Clean Water Act of 1988, as Amended, Section 404 (33 USC § 1344)*					
Discharge to surface water	Technology-based treatment requirements for permits	Permits requirements under CWA 301(b)	40 CFR §125.3	Relevant and appropriate	Substantive provisions are relevant and appropriate for the discharge of dewatering effluent. Specific discharge requirements will be provided in the remedial design.
Toxic Substances Control Act (15 USC ch. 53, §§ 2601-2692)*					
Disposal of PCBs	Provides options for disposing of PCB remediation waste and requirements to implement each option.	Remedial actions involving PCBs.	40CFR § 761.61 (a)(5)(i)(B)(2)(ii) and (iii)	Relevant and appropriate	TSCA sets forth disposal requirements for PCB waste that is greater than 50 ppm. TSCA decontamination and disposal requirements are applicable to contaminated sediments found to contain PCBs above 50 mg/kg. Based on current data, PCB concentrations above 50 mg/kg are not expected but if found, the cleanup will comply with this standard.
Toxic Substances Control Act (15 USC ch. 53, §§ 2601 through 2692)*					
Storage of PCB remediation waste	Establishes requirements for storage of PCB remediation wastes released into the environment.	Storage of PCB	40 CFR §§ 761.65(c)(4) and (c)(9)	Relevant and appropriate	Excavated sediment that contains PCBs may be stored on site up to 180 days. The storage area must have a liner, cover, and runoff control system.

Attachment 4 – Table 4-3: Action Specific ARARs

Location	Requirements	Prerequisite	Citation[a]	ARAR Determination[a]	Comments
Decontamination standards for water containing PCBs	Establishes standards for the disposal of water used for decontamination of equipment used in excavation, storage, and treatment of PCB remediation waste.	Decontamination of water	40 CFR § 761.79(b)(1)	Relevant and appropriate	The decontamination standard for PCBs is less than 3 ug/L for water discharges to a publicly owned treatment works or to navigable waters or less than or equal to 0.5 ug/L PCBs for unrestricted use.
Off-Site Rule (40 CFR § 300.440)*					
Waste disposal at an off-site disposal facility	The Off-Site Rule as set forth in the NCP requires that CERCLA wastes transferred off-site of the cleanup site be placed in a facility operating in compliance with RCRA or other applicable federal or state requirements.	Disposal of waste	40 CFR §300.440	Applicable	This NCP requirement is applicable to contaminated sediments or shoreline material disposed of at an off-site facility.
State Requirements					
State Water Resources Control Board					
Stormwater discharge	Establishes the state stormwater permit program and sets forth substantive conditions for construction sites larger than 1 acre.	Stormwater discharge	State Water Resources Control Board Order 99-08 adopted pursuant to 40 CFR Part 122, Subpart C	to be considered	Order 99-08-DQW applies to excavation activities that affect at least 1 acre. Pursuant to the substantive permit requirements, best management practices will be taken to prevent construction pollutants from contacting stormwater and keep erosions products from moving off site.

Attachment 4 – Table 4-3: Action Specific ARARs

Location	Requirements	Prerequisite	Citation[a]	ARAR Determination[a]	Comments
Dredging and Excavation	Actions taken by or at the direction of public agencies to clean up or abate conditions of pollution or nuisance resulting from unintentional or unauthorized releases of waste or pollutants to the environment; provided that wastes, pollutants, or contaminated materials removed from the immediate place of release shall be discharged according to the SWRCB-promulgated sections of Article 2, Subchapter 2, Chapter 3, Subdivision 1 of this division (§ 20200 at seq.); and further provided that remedial actions intended to contain the wastes at the place of release shall implement applicable SWRCB-promulgated provisions of this division to the extent feasible.	Action taken by or at the direction of a public agency to cleanup release of pollutant.	Cal. Code Regs. tit. 27, § 20090(d)	Relevant and appropriate	This is a potential ARAR for the Navy's response actions

Attachment 4 – Table 4-3: Action Specific ARARs

Location	Requirements	Prerequisite	Citation[a]	ARAR Determination[a]	Comments
California Civil Code*					
Institutional controls	Provides conditions under which land use restrictions will apply to successive owners of land.	Transfer property from the Navy to a nonfederal agency.	Cal. Civil Code §1471	Relevant and appropriate	Substantive provisions are the following general narrative standard: "to do or refrain from doing some act on his or her own land...where (c) Each such act relates to the use of land and each such act is reasonably necessary to protect present or future human health or safety of the environment as a result of the presence of hazardous materials, as defined in § 25260 of the Cal. Health & Safety Code." This narrative standard would be implemented through incorporation of restrictive covenants in the deed at the time of transfer.
California Health and Safety Code*					
Institutional controls	Allows DTSC to enter into an agreement with the owner of a hazardous waste facility to restrict present and future land uses.	Transfer property from the Navy to a nonfederal agency.	Cal. Health and Safety Code § 25202.5	Relevant and appropriate	The substantive provisions of this section are the general narrative standards “to restrict present and future uses of all or part of the land on which the facility …is located.”

Attachment 4 – Table 4-3: Action Specific ARARs

Location	Requirements	Prerequisite	Citation[a]	ARAR Determination[a]	Comments
Institutional controls	Provides a streamlined process to be used to enter into an agreement to restrict specific use of property in order to implement the substantive use restrictions of Cal. Health and Safety Code § 25232(b)(1).	Transfer property from the Navy to a nonfederal agency.	Cal. Health and Safety Code § 25222.1 and 25355.5(a)(1)(c)	Relevant and appropriate	This section is a potential ARAR when the Navy is transferring property to a nonfederal entity. Cal. Health & Safety Code § 25222.1 provides the authority for the state to enter into voluntary agreements to establish land-use covenants with the owner of the property. The substantive provision of Cal. Health and Safety Code § 25222.1 is the general narrative standard: "restricting specified uses of the property."
Institutional controls	Provides a process for obtaining a written variance from a land use restriction	Transfer property form the Navy to non-federal entity.	Cal. Health and Safety Code §§ 25233(c) and 25234	Relevant and appropriate	This section is a potential ARAR for institutional controls where the Navy is transferring property to a nonfederal entity. Cal. Health and Safety Code § 25233(c) sets forth substantive criteria for granting variances from the uses prohibited in § 25232(b)(1)(A)-(E) based on specific environmental and health criteria.

Attachment 4 – Table 4-3: Action Specific ARARs

Location	Requirements	Prerequisite	Citation[a]	ARAR Determination[a]	Comments
California Code Regulations Title 22					
Institutional controls	A land use covenant imposing appropriate limitations on land use shall be executed and remedial or removal action, or other response actions are undertaken and hazardous materials, hazardous wastes or constituents, or hazardous substances will remain at the property at levels which are not suitable for unrestricted use of the land.	Transfer by federal government to non-federal entity.	Cal. Code Regs. tit. 22, § 67391.1	Relevant and appropriate	Relevant and appropriate when the Navy is transferring property to a nonfederal agency. EPA specifically considers substantive portions of §§ (a), (b), (d), and (e) to be ARARs for this FS.
On-site waste generation	Person who generates waste shall determine if the waste is a RCRA hazardous waste.	Generator of waste.	Cal. Code Regs. tit. 22, Chapter 11, §§ 66262.10(a), 66262.11	Applicable	These regulations are applicable to any operation that generates waste.
On-site waste generation	Person who generates waste shall determine if the waste is a RCRA hazardous waste.	Generator of waste.	Cal. Code Regs. tit. 22, Chapter 11, §§ 66261.10 - 66261.126 and appendices thereto; Chapter 6.5, Section 25100, et. Seq.	Applicable	These regulations are applicable to any operation that generates waste.
Hazardous remediation waste accumulation	Establishes requirements for accumulation of hazardous remediation waste accumulation.	Hazardous remediation waste accumulation	Cal. Code Regs. tit. 22 Chapter 11, § 66262.34	Applicable	These regulations are applicable to any operation that generates hazardous waste.

Attachment 4 – Table 4-3: Action Specific ARARs

Location	Requirements	Prerequisite	Citation[a]	ARAR Determination[a]	Comments
Transport of hazardous waste	Establishes requirements for transport of hazardous waste	Transport of hazardous waste	Cal. Code Regs. tit. 22, Chapter 11, §§ 66263.10 -66263.18	Applicable	These regulations are applicable to any operation that results in the transport of hazardous waste.
California Code Regulations Title 23					
Surface water monitoring	Establishes requirements for surface water monitoring	Surface water monitoring	Cal. Code Regs. tit. 23, Chapter 15, Article 5, Sections 2550.7 - 2550.10	Relevant and appropriate	Long-term monitoring of surface water not expected; may be relevant and appropriate for construction monitoring.

Notes:

* Statutes and policies, and their citations, are provided as headings to identify general categories of potential ARARs for the convenience of the reader. Listing the statutes and policies does not indicate that the Navy accepts the entire statutes or policies as potential ARARs; specific potential ARARs are addressed in the table below each general heading; only substantive requirements of specific citations are considered potential ARARs.

§	Section	ppm	parts per million
Cal. Code Regs.	California Code of Regulations	RCRA.	Resource Conservation and Recovery Act
CFR	California Code of Regulations	SWRQB	State Water Resources Control Board
CWA	Clean Water Act	tit	Title
DTSC	Department of Toxic Substances Control	USC	United States Code
mg/kg	milligrams per kilogram	µg/L	micrograms per liter
PCB	polychlorinated biphenyl		

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ATTACHMENT 5
RESPONSES TO COMMENTS AND TECHNICAL MEMORANDUM

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ATTACHMENT 5
PART 1:
RESPONSE TO BCT COMMENTS ON THE DRAFT ROD

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Response to BCT Comments on the Draft Record of Decision for Parcel F, Hunters Point Naval Shipyard, California, August 2018

The following comments were submitted in a letter by Ms. Judy C. Huang, P.E. of United States Environmental Protection Agency (EPA) on 10 December 2018

Comment		Response
	GENERAL COMMENTS	
1.	**Yosemite Slough Site Remedial Action Coordination:** The Yosemite Slough Site is located immediately adjacent to Area X of Parcel F and has been identified by the 2007 Feasibility Study Data Gap Investigation Report as a source of Parcel F PCB contamination. The design, implementation, monitoring, and maintenance of the Parcel F remedy must be closely coordinated with the Yosemite Slough Site Parties to protect the integrity and ensure the effectiveness of both remedies. Please revise the Draft Record of Decision (Draft ROD) to include coordination with the Yosemite Slough Site Parties during design, implementation, monitoring, and maintenance of the remedy.	*The following sentence has been added at the end of Section 2.10.1 as follows:* *"The selected remedy for Areas IX and X and the Yosemite Slough site will be compatible with respect to timing and constructability to ensure that the cleanups are complimentary and to minimize any potential for recontamination of either area."*
2.	**Potential Area III Foot Print Expansion:** In the September 2018 Draft Final Sediment Investigation Beneath Former Parcel B and C Pier and Wharf Structures and Bathymetric Survey for Parcel F Report, the Navy committed to "conducting additional investigation in Area III, including identifying the extent of contamination above remedial goals around Wharf #2, to further refine the areal extent of Area III requiring remedial action. Hence the extent of Area III will be modified during the subsequent investigation and incorporated in to the remedial action for Area III." Please ensure areas around Wharf #2 with contamination above remedial goals are included as a part of Parcel F Area III footprint.	*The following bullet has been added to Section 2.3 to include the Final referenced report as follows:* • *"Final Sediment Investigation Beneath Former Parcels B and C Pier and Wharf Structures and Bathymetric Survey of Parcel F (ECC-Insight and CDM Smith, 2018). Field activities included collection of grab surface sediment samples within the footprint of six separate former Parcels B and C pier and wharf structures (Pier B, Pier C, Berth 61, Berth 64, the wooden Quay Wall, and Wharf #2)."* *In addition, a row has been added to reference the following report "Final Sediment Investigation Beneath Former Parcels B and C Pier and Wharf Structures and Bathymetric Survey" with the following description in the Activities Column:* *"Characterization of the footprint of six separate former Parcels B and C pier and wharf structures (Pier B, Pier C, Berth 61, Berth 64, the wooden Quay Wall, and Wharf #2) and an updated bathymetric survey (ECC-Insight and CDM Smith, 2018)."* *The following sentence has also been added in Section 2.10.2 "Description of Selected Remedy" for Area III:* *"Characterization will be required prior to remedy construction for the purpose of refining the remedial footprint including incorporating the recommendations for refining the remedial action footprint around Wharf #2 (ECC-Insight and CDM Smith, 2018), establishing dredge volumes, assessing geotechnical characteristics and managing and disposing of contaminated sediments and any water generated during construction. The characterization activities will be performed by the remedial action (RA) contractor prior to construction at Area III, including in the vicinity of Wharf #2."*

Response to BCT Comments on the Draft Record of Decision for Parcel F, Hunters Point Naval Shipyard, California, August 2018

Comment		Response
		The following sentence has also been added in Section 2.10.2 for Areas IX and X, before the bullets: *"Characterization will be required prior to remedy construction for the purpose of refining the remedial action footprint, establishing dredge volumes, assessing geotechnical characteristics, managing and disposing of contaminated sediments and any water generated during construction, as well as coordinating with the Yosemite Slough site and HPNS Parcel E shoreline remedial activities."*
3.	Based on Figures 6 (Area III Alternative Evaluation Summary), "Costs from Parcel F FFS [Final Feasibility Study] have been escalated by 2.1% [percent] per year to represent costs in 2017 dollars;" however, information to support this escalation percentage is not provided and/or referenced. Similar language is utilized in Figure 7 (Areas IX and X Alternatives Evaluation Summary). As such, it is unclear if the costs presented in the Draft ROD are appropriate. Please revise the Draft ROD to provide information to support the 2.1% per year escalation utilized.	*Footnote (1) on Figures 6 and 7, has been revised to clarify that it is the same escalation rate used in the Parcel F Final Feasibility Study as follows:* *"The 2017 costs were updated based on the same escalation factor of 2.1% (1.021) which was utilized in the Final Feasibility Study (FS) for Parcel F (Barajas & Associates, Inc., 2008) and was developed based on the Remedial Action Cost Engineering and Requirements System (RACER) Cost Database Software, Version 8.1.0 (Earth Tech, Inc. 2006)."*
4.	Section 2.10.1 (Rationale for the Selected Remedy) indicates that the selected remedy for Parcel F sediments include Parcel F site-wide Institutional Controls (ICs); however, the Institutional Controls subsection of Section 2.10.2 (Description of Selected Remedy) states, "The Navy will implement ICs as a component of the selected remedy in Areas III, IX, and X." As such, it is unclear if the ICs will be applied to Areas III, IX, and X or Parcel F site-wide. Given that low-level radiological objects may be present in other areas, particularly where there are piers, dry docks and berths, ICs should be applied site-wide. Please revise the Draft ROD to clarify that ICs will be applied site-wide as part of the selected remedy.	*The Parcel F Site-wide ICs bullet within Section 2.10.1 has been revised to read:* *"<u>ICs will be implemented to require proper management of low-level radiological objects that may be encountered in sediment during future site activities.</u>"* *Additionally, the Institutional Control description for Section 2.10.2 of the ROD has been updated to clarify Parcel F Site-wide ICs and Parcel F Areas III, IX, and X ICs. The Parcel F Site-wide ICs have been added as follows:* • *"Parcel F Site-wide ICs – Procedures for the proper assessment of sediments and the segregation, proper management and disposal of low-level radiological objects (e.g., radioluminescent dials, gauges, and deck markers) if encountered during future site redevelopment or other sediment disturbing activities, such as dredging or sampling."*
	SPECIFIC COMMENTS	
1.	**Section 1.1, Selected Remedy, Pages 1-1 to 1-2:** Section 6.2.4 (Description of the Selected Remedy) of the A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents, EPA 540-R-98-031, July 1999 (the ROD Guidance) indicates that a brief description, in bullet form, of the major components of the selected remedy, should be provided; however, the descriptions of the major components of the selected remedies for Areas III and IX/X are not provided in bullet form in Section 1.1. Please revise Section 1.1 to include	*Section 1.1 of the ROD has been revised to include the major components of the selected remedy for Area III and Areas IX and X in bullet form consistent with the July 1999 ROD Guidance.* *The following text and bullets have been added to Area III in Section 1.1:* *"The Parcel F selected remedy for Area III,* ***Alternatives 4/4A*** *– Focused Removal/Backfill, Off-Site Disposal, Capping, and ICs are described as follows:*

Response to BCT Comments on the Draft Record of Decision for Parcel F, Hunters Point Naval Shipyard, California, August 2018

Comment		Response
	descriptions of the major components of the selected remedies for Areas III and IX/X in bullet form.	• ***Focused Removal/Off-Site Disposal/Backfill***. *Focused sediment removal and backfill for sediments where COC concentrations exceed RAO 1 RGs in the nearshore area with water depths less than 5 feet (i.e., sediments too shallow to be capped) will be removed followed by backfilling with clean sediment to pre-removal elevations. Hence, all sediments with concentrations of total PCBs above 1,240 µg/kg, copper above 271 milligrams per kilograms (mg/kg), and mercury above 1.87 mg/kg that are too shallow to be capped will be remediated through removal to a maximum depth of 2 feet followed by backfilling.* • ***Capping***. *Contaminated sediments in water depths greater than 5 feet but less than 30 feet will be capped. An estimated 68,670 square feet of contaminated sediment will be capped with approximately 2 feet of material. The cap will be designed to contain the contaminated sediments and resist erosion and will extend beyond the boundary of contaminated sediments to ensure complete coverage and to allow for a shallow slope along the edge of the cap. The dimensions of the cap and the capping material will be determined during remedial design.* • ***Institutional Controls***. *ICs will be implemented in Area III (see Section 2.10.2) to maintain the integrity of the remedy and until cleanup goals have been achieved to ensure that Site conditions remain protective of human health."* *The following text and bullets have been added under Areas IX and X in Section 1.1:* *"The Parcel F selected remedy for Areas IX and X*, ***Alternative*** *7 – Focused Removal/Backfill, In situ Treatment, Off-Site Disposal, MNR, and ICs is described as follows:* • ***Focused Removal/Off-Site Disposal/Backfill***. *All intertidal sediment (i.e., areas with a surface elevation above 0 feet MLLW ([National Geodetic Vertical Datum [NGVD29] El.-2.78]) with total PCB concentrations above the RAO 1 PCB cleanup level of 1,240 µg/kg will be remediated through removal to a minimum depth of 1 foot. Subtidal sediments (i.e., areas with a surface elevation below 0 feet MLLW (NGVD29 El.-2.78)) with total PCB concentrations exceeding 12,400 µg/kg (10 times the RAO 1 cleanup level) will be remediated through removal to a minimum depth of 1 foot. In addition, all sediments with copper concentrations above the RAO 1 copper cleanup level of 271 mg/kg and mercury concentrations above the RAO 1 mercury cleanup level of 1.87 mg/kg will be remediated through removal to a minimum depth of 1 foot regardless of tidal zone location. Following sediment removal, the areas will be backfilled.*

**Response to BCT Comments on the Draft Record of Decision for Parcel F,
Hunters Point Naval Shipyard, California, August 2018**

Comment		Response
		• ***In situ treatment.*** *Subtidal sediment with total PCB concentrations exceeding the RAO 1 PCB cleanup level of 1,240 µg/kg, but less than 12,400 ug/kg (10 times the RAO1 cleanup level), will be treated using carbon based amendments.* • ***MNR****. Surface sediments within Areas IX and X with PCB concentrations below the RAO 1 PCB cleanup level of 1,240 µg/kg will be remediated through MNR.* • ***Institutional Controls****. ICs will be implemented in Areas IX and X (see Section 2.10.2) to maintain the integrity of the remedy and until cleanup goals have been achieved to ensure that Site conditions remain protective of human health."* *The following subsection has been added after 'Areas IX and X:'* ***"Parcel F Site-wide Institutional Controls:*** *ICs will be implemented to require proper management and disposal of any low-level radiological objects that may be encountered in sediment during future site activities. Site-wide ICs will be maintained until RAOs are achieved and all radiological concerns have been addressed."*
2.	**Section 1.4, Authorizing Signatures, Page 1-3:** Ms. Angeles Herrera is the Assistant Director of Federal Facilities and Site Cleanup Branch for EPA Region 9. Please add her name to the signature page.	*The ROD has been revised to include Ms. Angeles Herrera, Assistant Director of the Federal Facilities and Site Cleanup Branch for United States Environmental Protection Agency (EPA), on the signature page (Section 1.4).*
3.	**Section 2.1, Site Description and History, Page 2-1:** Section 6.3.1 (Site Name, Location, and Description) of the ROD Guidance indicates that the lead and support agencies and source of cleanup monies should be identified; however, this information is not provided in Section 2.1. Please revise Section 2.1 to identify the lead and support agencies and source of cleanup monies.	*The second to last sentence in the first paragraph of Section 1 has been revised as follows:* *"The Navy, as the lead federal agency, provides funding under the Base Realignment and Closure (BRAC) program for site cleanups at HPNS."* *In Section 2.1, first paragraph, the following underlined wording was added to clarify funding source:* *"In 1991, HPNS was designated for closure pursuant to the terms of the Defense BRAC Act of 1990, <u>which provides funding for site cleanups</u>."*
4.	**Figure 1, Parcel F Areas, Page 2-1:** Please modify the figure and the associated legend to indicate the areas requiring institutional controls in Parcel F.	*A new Figure 10 has been prepared to include the location where Institutional Controls will be implemented in Parcel F.*
5.	**Section 2.3.1, Previous Investigations, Page 2-4:** The bulleted list in Section 2.3.1 highlights key investigations conducted at Parcel F; however, the series of radiological investigations conducted between 2009 and 2013 are not included in the bulleted list. Although discussed in Table 1	*The bulleted list of investigations presented in Section 2.3.1 was updated to include a summary of the radiological investigations conducted between 2009 and 2013 listed in Table 1 as follows:*

Response to BCT Comments on the Draft Record of Decision for Parcel F, Hunters Point Naval Shipyard, California, August 2018

Comment		Response
	(Investigation Summary Table), please revise the bulleted list of key investigations in Section 2.3.1 to discuss the radiological investigations conducted between 2009 and 2013 at Parcel F.	• *"Phase 1, 2a, and 2b Radiological Investigations for Parcel F consisted of radiological data gap investigations conducted between 2009 and 2011. The investigations included the advancement of over 300 sediment cores for radiological, total PCB and physical analysis."*
6.	**Section 2.8, Remedial Action Objectives, Page 2-15:** Section 2.8 states, "Lead is collocated with PCBs [polychlorinated biphenyls] in sediment, so achieving the cleanup goals for PCBs is expected to address any risks associated with lead;" however, activated carbon sorbs PCBs but will not sorb lead. In areas that will receive in situ treatment, it is unclear how lead or the other metals (i.e., copper, mercury) will be addressed. Please revise the Draft ROD to provide information to substantiate that in situ treatment for PCBs in sediment will also address lead, copper and mercury or acknowledge that in situ treatment will not address these metals.	*As noted in the comment, in situ treatment using carbon-based amendments is not expected to be effective for metals. The selected remedy for Areas IX and X includes excavation of all metal COCs exceeding the RAO 1 copper concentrations above 271 mg/kg and mercury concentrations above 1.87 mg/kg regardless of tidal zone location. See detailed remedy description added per response to EPA Specific Comment 1. Section 2.10.2, Description of Selected Remedy for Areas IX and X, second paragraph, has been modified as follows:* *"Sediments with metal concentrations above the RAO 1 RGs (or ER-M for lead) are confined to intertidal sediments, or areas of subtidal sediment with PCB concentrations exceeding 12,400 ug/kg, and are planned for removal to a depth of approximately 1 foot. Hence, copper concentrations above 271 mg/kg and mercury concentrations above 1.87 mg/kg will be remediated through removal regardless of tidal zone location. Since the distribution of lead concentrations follows the distribution of PCBs, achieving the RGs for PCBs via removal will also reduce the risks associated with lead."* *In addition, the following text was added in Section 2.10.2, fourth paragraph, to clarify that in situ treatment is only being used to treat PCBs and that any metals exceeding the RAO 1 cleanup level will be remediated through removal as follows:* *"In situ treatment will be used to treat PCBs only. Metals exceeding RAO 1 RGs are to be remediated through the removal action per the above paragraph regardless of the tidal zone location."* *As described in the 2008 FS, a numerical remediation goal was not calculated for lead because of the uncertainty associated with both the bioavailability and toxicity of lead. Because the distribution of lead concentrations follows the distribution of PCBs, achieving the remediation goals for PCBs via removal should also reduce risks associated with lead to acceptable levels.*
7.	**Section 2.9.4, Area III, Pages 2-23 to 2-24 and Section 2.9.5, Areas IX and X, Pages 2-26 to 2-27:** The discussion of short-term effectiveness for each alternative in Sections 2.9.4 and 2.9.5 does not include an estimate of the time each specific remedy would take to achieve RAOs. As a result, the timeframe to achieve RAOs is unclear and a complete comparison of alternatives based on short-term effectiveness cannot be conducted. Please revise the short-term effectiveness subsections of Sections 2.9.4 and 2.9.5 to	*Sections 2.9.4 and 2.9.5 have been revised to include estimated timeframes to achieve RAOs.*

**Response to BCT Comments on the Draft Record of Decision for Parcel F,
Hunters Point Naval Shipyard, California, August 2018**

Comment		Response
	provide an estimated timeframe to achieve RAOs for each alternative in each area.	
8.	**Section 2.10.1, Rationale for the Selected Remedy, Page 2-28**: Since the site-wide ICs are to address the presence of unknown low-level radiological objects as noted in Section 2.10.1, Parcel F Site-wide ICs must be maintained until all radiological concerns have been addressed. Please revise the Parcel F Site-wide ICs to clarify that the site-wide ICs must be maintained until the RAOs are achieved and all radiological concerns have been addressed.	*Please see response to EPA Specific Comment 1. This comment has been addressed within Section 1.1, Selected Remedy.*
9.	**Figure 8, Footprint, Page 2-30:** Based on Figure 8, some of the areas that exceed RAO 1 (red squares) will not be addressed by Alternatives 4/4A (Focused Removal/Backfill, Off-Site Disposal, Capping, and ICs). According to Section 2.10.2 (Description of Selected Remedy), "Contaminated sediments in deeper water exceeding RAO 1 RGs [remedial goals] will not be addressed through capping or removal due to the lack of exposure by the surf scoter, which does not forage in water depths greater than 30 feet;" however, RAO 1 applies to fish-eating birds, not just surf scoters and leaving contaminated sediment in place allows sediment transport to uncontaminated areas to occur. While information in the Section 3 Responsiveness Summary discusses the contaminated sediment that will not be addressed through capping or removal, Section 2.10.2 should be revised to incorporate the information presented in Section 3. Please revise the text to clarify why the surf scoter applies to other fish-eating birds and how baseline and hydrodynamic modeling will be used to ensure the design of the cap resists erosion from tidal currents and wave actions as well as re-contamination potential from the deeper Area III sediments.	*The first paragraph of Section 2.5.3 has been revised as follows:* *"In the **ecological risk assessment**, the Navy concluded that contaminated sediment in Parcel F poses a potential threat to wildlife. Unacceptable risks were identified for birds, such as the surf scoter, feeding on organisms such as clams, snails, worms, or insects. The surf scoter, a diving duck, was chosen as a representative species in evaluating ecological risk at Area III for the following reasons:* • *The scoter is present in large numbers from late fall through winter at HPNS.* • *The scoter is a benthic-feeding bird that forages primarily on mollusks. As such, it is exposed directly to contaminated sediment.* • *The scoter can feed in the intertidal zone during high tide and forages in the subtidal to depths up to 30 ft. Therefore, it represents bird species potentially exposed to both intertidal and subtidal habitats. Many other species are only appropriate for one habitat or the other, or primarily consume surface dwelling fish, which are not directly exposed to contaminated sediment:* ○ *Brown pelicans, cormorants and terns can forage in water depths of 150 feet but typically eat surface-schooling fish such as mackerel, sardines, anchovy, and smelt.* ○ *Diving ducks that eat fish such as mergansers feed primarily in shallow water less than 20 feet deep.* ○ *Wading birds such as great blue herons forage only in shallow water.* ○ *Gulls cannot dive and feed only on the surface."*

Response to BCT Comments on the Draft Record of Decision for Parcel F, Hunters Point Naval Shipyard, California, August 2018

Comment		Response
		In addition, the following paragraph has been added as a fourth paragraph under the Area III Description of the Selected Remedy, Section 2.10.2: *"A hydrodynamic model that considers a 100-year storm event in conjunction with sea level rise will be used to develop backfill and cap particle size requirements that resist erosion from tidal current and wave action during remedial design."*
10.	**Section 2.10.2, Description of Selected Remedy, Page 2-31:** Section 2.10.2 indicates that in situ treatment will be applied to PCB concentrations exceeding 1,240 micrograms per kilogram (ug/kg) but below 12,400 ug/kg; however, the basis for concluding that in situ treatment can address concentrations up to 12,400 ug/kg is not provided and/or referenced. In addition, the maximum concentration addressed during the pilot study should be provided to support the conclusion that PCB concentrations of 12,400 ug/kg can be addressed by in situ treatment. Please revise the Draft ROD to provide the basis for concluding that in situ treatment can address concentrations up to 12,400 ug/kg. In addition, please revise the Draft ROD to provide the maximum concentration addressed during the pilot study to support the conclusion that PCB concentrations of 12,400 ug/kg can be addressed by in-situ treatment.	*The following sentences have been added to Section 2.10.2, Description of the Selected Remedy for Areas IX and X:* *"The maximum total PCB concentration subject to treatment during the pilot study (KCH, 2018) was 1,410 µg/kg. Although this concentration is less than the maximum total PCB concentration to be treated using carbon-based amendments, bioavailability of PCBs was reduced by 90% during the pilot study. Therefore, assuming the RA in situ treatment will achieve similar results, the effective, i.e., bioavailable, PCB concentrations will be reduced by 90% in the treatment zone, e.g., from 12,400 ug/kg to 1,240 ug/kg."*
11.	**Section 2.10.2, Description of Selected Remedy, Institutional Controls, Page 2-31:** Please insert the following language after the second sentence: "The Navy will prepare a LUC Remedial Design (LUC RD) as the land use component of the Remedial Design within 90 days of ROD signature. The Navy shall prepare and submit to EPA, DTSC, and the Water Board for review and approval, a LUC RD that shall contain implementation and maintenance actions, including periodic inspections."	*The following text has been added after the third sentence under Institutional Controls:* *"The Navy will prepare a LUC RD document that will contain the IC implementation and maintenance actions, including periodic inspections. The LUC RD will be prepared subsequent to signature of the ROD and submitted to EPA, DTSC, and the Water Board for review and concurrence."*
12.	**Section 2.10.2, Description of Selected Remedy Performance Monitoring, Third Sentence, Page 2-33:** This sentence states that: "Physical inspections (e.g, for erosion) of the backfill and cap remediation zones and Area III and the focused removal with backfill remediation zone in Areas IX/X will be conducted annually in years 1 through 5 post-construction, and then at 5-year intervals during the five-year review process thereafter." Due the potential for intense storms which may disturb and alter the backfill and cap thickness or location, the backfill and cap remediation zones in Area III and the focused removal with backfill remediation zone in Areas IX/X should be inspected after every intense storm and repaired as necessary. In addition, periodic sediment analysis and bioavailability monitoring will be necessary to ensure that the contaminated sediments	*The following sentence was added at the end of the paragraph under Monitoring and Maintenance:* *"Performance and long-term effectiveness monitoring details, including the frequency and triggers, will be included in a post-RA monitoring plan."* *In addition, the following sentences have been added to the end of the paragraph under Performance Monitoring:* *"Inspections, monitoring, and repairs, as necessary, will also be conducted of the backfill and cap zones and Areas IX/X in situ treatment area after high intensity storms. The five-year review process will include sediment sampling and Areas IX/X in situ treatment area bioavailability monitoring, such as porewater or biota analysis and carbon amendment mixing zone depth, to ensure that the remedy continues to perform*

Response to BCT Comments on the Draft Record of Decision for Parcel F, Hunters Point Naval Shipyard, California, August 2018

Comment		Response
	remaining on site are still contained beneath the backfill and capping material, and the carbon amendment is functioning as designed. Please revise the Draft ROD to specify: 1) post high intensity storm inspections, monitoring, and repairs, as necessary, for the backfill and cap remediation zones in Area III and the backfill remediation zone in Area IX/X and 2) sediment sampling and bioavailability monitoring, including carbon amendment mixing zone depth, at least every 5 years post construction for the entire Parcel F foot print to ensure that the remedy continue to perform as designed.	*as designed. If it is determined that the remedy is not performing as intended, contingency measures will be evaluated and implemented as necessary."*

END OF EPA COMMENTS

Response to BCT Comments on the Draft Record of Decision for Parcel F, Hunters Point Naval Shipyard, California, August 2018

The following comments were made by Ms. Janet Naito Branch Chief, Site Mitigation and Restoration Program-Berkeley Branch, California Department of Toxic Substances Control (DTSC), on 10 December 2018:

Comment		Response
	GENERAL COMMENTS	
1.	DTSC defers to the San Francisco Regional Water Quality Control Board (SFRWQCB) on selecting the appropriate ambient level concentration to use for total PCBs in sediment at the Hunters Point Site.	*Comment noted.*
2.	The RAOs as provided in the draft ROD provide site specific cleanup levels (remediation goals) for total PCB concentrations in sediment based on both ecological and human health risk. These remediation goals may not be applicable when measuring the success of the in situ carbon treatment alternative. The degree of success of the remedy may be assessed by demonstrating the overall percent reduction in pore water concentrations and demonstrating the correlation to benthic invertebrate toxicity. Or it may be demonstrated by measuring the concentration in benthic invertebrate tissue (e.g. clams) directly in a laboratory bench study. Please include a discussion of how the success of the in situ carbon treatment will be measured to demonstrate achievement of the RAOs.	*Please see the response to EPA Specific Comment 12 regarding performance monitoring of the in situ treatment area to assess effectiveness of the remedy. As stated in the response to EPA Specific Comment 12, the details of performance and long-term effectiveness monitoring will be described in a comprehensive post-RA monitoring plan. Demonstration of achievement of the RAOs and cleanup levels is discussed in the Long-Term Remedial Goal Monitoring section.*
3.	The remedy includes monitored natural attenuation and net sediment accumulation as a means to reduce exposure to PCBs in sediment over time in Areas IX and X. The low sediment accumulation rate that was determined (1 cm/year), has some uncertainty (see Specific Comment 3 and 4 below). Therefore, based on this uncertainty, DTSC recommends that the alternative selected include a contingency that will allow for follow-up actions, if necessary, if the net sediment accumulation rate is significantly less than predicted (1 cm/year).	*The ROD will not include a contingency plan. Rather the results of the long-term effectiveness monitoring program will be used to evaluate whether the remedy is functioning as intended during the statutorily mandated five-year review process. Any potential changes to the remedy will be assessed during the five-year review consistent with EPA guidance (EPA 2001, Comprehensive Five-Year Review Guidance, OSWER No. 9355.7-03B-P. June).* *In addition, a semi-quantitative comparison of bathymetric surveys conducted in 2003 (Noble Consultants, 2003) and 2018 (ECC-Insight and CDM Smith, 2018) will be presented in the RD showing an average sediment deposition rate of 3.4 centimeters per year (cm/yr). Also refer to City and County of San Francisco Department of Public Health General Comment 8.*
	SPECIFIC COMMENTS	
1.	Section 1.1, Parcel F Site-wide Institutional Controls -Please add the following to the end of the sentence "...until cleanup goals have been achieved to ensure that Site conditions remain protective of human health."	*Section 1.1 of the ROD has been revised as requested under Area specific IC bullets.*

**Response to BCT Comments on the Draft Record of Decision for Parcel F,
Hunters Point Naval Shipyard, California, August 2018**

Comment		Response
2.	Section 1.4, Authorizing Signatures - Please change the DTSC representative to Mark Malinowski, CEA, Northern California Cleanup Division, Site Mitigation and Restoration Program.	*Section 1.4 has been revised to include Mark Malinowski, CEA, Northern California Cleanup Division, Site Mitigation and Restoration Program, Department of Toxic Substances Control on the signature page.*
3.	Section 2.2.1, Hydrodynamic Setting, Area IX and X - This section indicates that the net sediment accumulation rate is approximately 1 centimeter per year due to erosion during storm events. Please clarify if this is from the nearby shoreline or elsewhere in the San Francisco Bay, or both.	*The respective sentence in Section 2.2.1, Hydrodynamic Setting, Areas IX and X has been revised to add the following clarification and follow-on sentence, with changes and additions shown as underlined:* *"The results of this evaluation determined that the net sediment accumulation rate is approximately 1 centimeter per year <u>based on sediment trap data. Sediment deposition within Areas IX and X represents a combination of shallow sediments within the South Basin and sediment from elsewhere within San Francisco Bay</u>."*
4.	Section 2.2.1, Hydrodynamic Setting, Area IX and X - Remediation has recently occurred along the shoreline of Parcel E-2, and is planned for the Parcel E-2 panhandle, Parcel E shoreline, and Yosemite Slough. Please include this information and discuss the assumed reduction of shoreline erosion and the future impact to the net sediment accumulation rate in the South Basin.	*The following sentence has been added to the paragraph for Section 2.2.1, Hydrodynamic Setting, Areas IX and X:* *"Planned shoreline remedial measures for Parcel E and Parcel E-2 are in progress and remedial measures are planned for Yosemite Slough. These remedial measures are and will be designed to limit the erosion and transport of contaminated material to Areas IX and X. Parcel F cleanup is being coordinated with the current and planned remedial measures for Parcel E, Parcel E-2 and Yosemite Slough."*
5.	Section 2.2.1, Hydrodynamic Setting, Area IX and X - Does the net deposition rate consider 100-year winter events and king tide events? If not, the erosion model should be re-evaluated using these parameters and the results included in this document.	*Please see response to SFDPH Specific Comment 1. The following sentence was added to the respective paragraph in Section 2.2.1, Hydrodynamic Setting, Areas IX and X:* *"**Updated Hydrodynamic Model for 100-year Storm Events.** A hydrodynamic model is being prepared to support remedial design activities which considers 100-year storm events, sea level rise and extreme tidal events such as king tides."*
6.	Section 2.3.2, Nature and Extent of Contamination, Paragraph 2 - Please include the ER-M for PCBs.	*The ROD will not be revised to include the effects range-median (ER-M) for PCBs because it was not utilized in the development of cleanup levels at Parcel F of the HPNS and thus is not relevant. No change to the ROD was made in response to this comment.*
7.	Section 2.8 Remedial Action Objectives - The RAOs (1, 2 and 3) should indicate that they will be achieved by reducing total PCB concentrations in sediment in Areas III and IX, and by reducing bioavailability of total PCB concentrations in Area X. Please include this information.	*The mechanism by which the remedial technology will achieve RAOs, such as reductions in PCB concentrations and bioavailability, is not relevant to presenting the RAOs since a range of technologies and associated mechanisms to meet the RAOs were evaluated. The mechanism of how the remedial alternatives will meet the RAOs has been clarified in Section 2.9.1, Summary of Remedial Alternatives.*

**Response to BCT Comments on the Draft Record of Decision for Parcel F,
Hunters Point Naval Shipyard, California, August 2018**

Comment		Response
8.	Section 2.9.4 Area III Overall Protection of Human Health and the Environment, paragraph two, Alternatives 3 and 3A **-** Indicates that institutional controls would control residual risk from contaminated sediments that remain under the cap. Although institutional controls are included for Alternatives 4 and 4A, this is not mentioned in paragraph three of this same section. DTSC suggests adding the same general statement to paragraph three.	*The following sentence as indicated for Alternatives 3 and 3A in Section 2.9.4 Area III Overall Protection of Human Health and the Environment has been added for Alternatives 4 and 4A as requested:* *"Although contaminated sediments would remain isolated under the cap, the residual risk would be controlled by implementing ICs."*
9.	Section 2.10.2 Description of Selected Remedy. Areas IX and X **-** indicates that sediment will be removed to a depth of approximately 1 foot and that the excavated areas will then be backfilled. Language should be added to indicate that clean material will be backfilled to the same depth as was removed. And that monitoring will be included to ensure the depth of the backfilled material (approximately 1 foot) remains generally consistent over time.	*The following sentence (second sentence in the second paragraph) of Section 2.10.2, Description of Selected Remedy, Areas IX and X, was revised with changes underlined as follows:* *"…<u>excavated</u> areas will be backfilled with clean material <u>to the same elevation as was removed. In addition, long-term monitoring will include performance of periodic bathymetric surveys to monitor that the surface elevation of the backfilled material remains consistent over time.</u>"*
10.	Section 2.10.2 Description of Selected Remedy, Areas IX and X **-** Paragraph two is not clear and differs from the Alternative 7 description provided on page 10 of the Proposed Plan. Will all intertidal sediments within the polygons along the shoreline be removed to a depth of one foot as shown in Figure 9? Please clarify the shape and extent of excavation of sediments in all areas.	*Figure 9 of the ROD has been revised for clarity. The final removal depth and remedial footprint will be established based on the remedial design and pre-RA sediment characterization. Please see clarification text added per EPA Specific Comment 1. The removal depth will be based on ability of the backfill material to contain contamination left in place and resist erosion. Section 2.10.2, Areas IX and X, last sentence before the bullets, has been clarified as follows, with changes underlined:* *"<u>Sediments</u> will be cleaned up based on PCB concentration, as follows:* • *<u>Intertidal PCB concentration exceeding 1,240 ug/kg = focused removal with backfill;</u>* • *<u>Subtidal</u> PCB concentration exceeding 12,400 ug/kg = focused removal with backfill;* • *<u>Subtidal</u> PCB concentration exceeding 1,240 ug/kg but below 12,400 ug/kg = in situ treatment; and…"* *In addition, the first sentence under Alternative 7 within Table 7 has been clarified to read, with changes underlined:* *"In situ treatment of subtidal sediments <u>exceeding the RAO 1 RGs</u>…"*

Response to BCT Comments on the Draft Record of Decision for Parcel F, Hunters Point Naval Shipyard, California, August 2018

Comment		Response
11.	Section 2.10,2 Description of Selected Remedy, Areas IX and X - The Navy indicated in response to Comment #5 from the Yosemite Slough Cooperating Parties Group on the Proposed Plan for Parcel F that the 1-foot remedial depth would be refined during the remedial design. The Navy also indicated that 'The goal is to remove a minimum of 1 foot of sediment contamination. The final depth will be determined during remedial design and will be sufficient to ensure that backfill that resists wave and current induced erosion can be placed and remain protective over the long term. The proposed analysis will be based on a detailed hydrodynamic and sediment transport model that considers a 100-year storm event." The model should also consider King tide events. Please include this information in this Section.	*Please see response to DTSC Specific Comment 5.*
12.	Section 2.10.2 Description of Selected Remedy, Areas IX and X - DTSC recommends that paragraph two be formatted similarly to Paragraph one, e.g., Intertidal sediments will be cleaned up based on PCB concentrations, as follows: PCB concentration exceeding 1,240 ug/kg = 1 ft depth removal with backfill. Please clarify in the text that any PCB concentrations above 1,240 ug/kg will be removed or treated in situ in areas IX and X.	*Additional clarification has been added per response to EPA Specific Comments 1 and 6. The following sentence was added to Section 2.10.2, Description of Selected Remedy, Areas IX and X after the bullets:* *"Based on the above bullets, intertidal and subtidal sediments with total PCB concentrations above 1,240 µg/kg and 12,400 µg/kg respectively will be removed to a minimum of 1-foot. The final removal depth will be based on ability of the backfill material to contain contamination left in place and resist erosion, and will be determined during remedial design. Subtidal sediments with total PCB concentrations ranging from 1,240 to 12,400 µg/kg will be treated in situ and PCB concentrations ranging from 200 to 1,240 µg/kg will be designated for MNR."*
13.	Section 2.10.2 Description of Selected Remedy, Areas IX and X - Indicates the post construction area weight average (AWA) for total PCB concentrations in sediment will be 260 ug/kg and 330 ug/kg for Areas IX and X, respectively. Is this immediately post-construction? Please clarify. Per the SFRWQCB, the post- construction AWA for total PCBs should be no greater than 200 ug/kg. Therefore, it would seem appropriate to increase the excavations within the subtidal area to include the highest PCB concentrations in sediment (not just those over 12,400 ug/kg) in order to achieve the 200 ug/kg goal. Please revise.	*Please see response to EPA Specific Comments 1 and 6, and DTSC Specific Comment 12. The following sentence has been added after the first sentence in the fifth paragraph in Section 2.10.2, Description of Selected Remedy, Areas IX and X:* *"The selected remedy will rely on MNR to achieve the RAO 3 cleanup level for total PCBs as a long-term remediation goal."*
14.	Section 2.10.2 Description of Selected Remedy, Institutional Controls, first sentence of first paragraph - Please revise the sentence so that institutional controls apply to all of Parcel F, not just areas Ill, IX, and X, in regard to proper handling and surveying of sediments for potential	*Please see response to EPA General Comment 4.*

Response to BCT Comments on the Draft Record of Decision for Parcel F, Hunters Point Naval Shipyard, California, August 2018

Comment		Response
	radiological objects. Relying on a document such as an unexpected condition response plan in lieu of sediment restrictions will not be acceptable to DTSC.	
15.	Section 2.10.2 Description of Selected Remedy, Institutional Controls, Bullet Four - Please revise the bullet as follows: Procedures for segregation, proper management, and disposal of low-level radiological objects (e.g. radioluminescent dials, gauges, and deck markers) if encountered during future site activities, such as dredging and sampling.	*Please see response to EPA General Comment 4.*
16.	Section 2.10.2 Description of Selected Remedy, Performance Monitoring - The Proposed Plan indicated that performance monitoring may require both bulk sediment and pore water sampling. This is not included in Section 2.10.2. Please include this information in the ROD.	*Please see the response to EPA General Comment 12.*
17.	Section 2.10.2 Description of Selected Remedy, Performance Monitoring - See General Comment #1 above. Monitoring must include post-remediation monitoring to determine the success of the in situ remedy in Area X. Additionally, the forthcoming remedial design and monitoring plan must include post- remediation monitoring of the in situ treatment area to ensure that following placement of the carbon treatment, and fill material in the intertidal backfill areas, that they are not displaced by storm events. DTSC recommends semi-annual monitoring for the first two-years and then annually thereafter. Additionally, monitoring data will be required as part of the CERCLA five-year review.	*Please see the response to DTSC General Comments 2 and 3, and USEPA Specific Comment 12.*
18.	Section 2, Costs (including Figure 6 and 7) - The costs presented do not appear to include post-remediation monitoring to ensure that the remediation was effective and has achieved or is achieving the RAOs over time as presented in the ROD. Monitoring could include: measuring sediment deposition and dispersal, pore-water monitoring and associated data evaluation and reporting. Please clarify and/or revise the Cost sections and figures as necessary.	*The following sentence has been added to the "Cost" section for Area III:* *"Cost estimates for Area III alternatives include post-RA monitoring, data evaluation and reporting."* *The following sentence has been added to the "Cost" section for Areas IX and X:* *"Cost estimates for Areas IX and X alternatives include post-RA monitoring, data evaluation and reporting."*
19.	Table 1 - DTSC requests that additional relevant documents be added to the table (e.g., Documents finalized in 2016 - 2018, including the Radiological Addendum to the Feasibility Study, 2018). DTSC understands that Table 1 is not a complete list of the Administrative Record; however, documents relevant to the decisions made in the ROD	*Table 1 of the ROD has been revised to include the following documents, as well as a summary in the Activities column:* • *2017 Feasibility Study Addendum (KCH, 2017a)*

Response to BCT Comments on the Draft Record of Decision for Parcel F,
Hunters Point Naval Shipyard, California, August 2018

Comment		Response
	should be included.	• *2017 Final Technical Memorandum, Optimized Remedial Alternative for Parcel F (ECC-Insight and CDM Smith, 2017)* • *2018 Final Demonstration of Activated Carbon Amendments to Reduce PCB Bioavailability (KCH, 2018)* • *2018 Final Sediment Investigation Beneath Former Parcels B and C Pier and Wharf Structures and Bathymetric Survey (ECC-Insight and CDM Smith, 2018)* *In addition the title of Table 1 has now been changed to "Investigation and Key Document Summary Table"***,** *with changes underlined***.**
20.	Table 6 and 7 **-** Please include which RAOs would be applicable for each alternative and, for intertidal and subtidal areas, if different.	*The following sentence has been added to the sentence that introduces Table 5 – Remediation Goals for Parcel F Surface Sediment COCs:* *"All RAOs are applicable for each alternative evaluated, as well as for the entire remedial footprint for Area III (per Table 6) and Areas IX and X (per Table 7)."*
21.	Figure 8 **-** It is unclear if the area between the excavated areas and the carbon treatment area currently meets the RAO 1 goal. Please clarify in text and figure.	*Please see revisions specified in response to EPA Specific Comments 1 and 6. Carbon treatment is only for Areas IX and X as depicted on Figure 9.*
22.	Figure 9 **-** It's unclear which areas of the intertidal area will be excavated. The figure is small and difficult to read with the number of details indicated. Recommend providing two figures, one showing the contaminants of concern and one showing the various tidal areas and treatment areas.	*Figure 9 of the ROD has been revised for readability.*
23.	Attachment A **-** ARARS **-** Please add the following ARAR for on-site waste generation, 40 CFR 262; 22, CCR Sections 66262.10(a) (Applicable).	*The ARAR has been added as requested.*
24.	Attachment A **-** ARARS **-** Please add the following ARAR for generated waste, Title 22, Chapter 11, Sections 66261.10 **-** 66261.126 and appendices thereto; Chapter 6.5, Section 25100, et. Seq.	*The ARAR has been added as requested.*
25.	Attachment A **-** ARARS **-** Please add the following ARAR for Surface Water monitoring **-** CCR, Title 23, Chapter 15, Article 5, Sections 2550. 7 **-** 2550.10	*The ARAR has been added as requested.*
26.	Attachment A **-** ARARS **-** Please add the following ARAR for Transport of hazardous waste in California **-** CCR Title 22, 66263.1O	*The ARAR has been added as requested.*

**Response to BCT Comments on the Draft Record of Decision for Parcel F,
Hunters Point Naval Shipyard, California, August 2018**

Comment		Response
	-66263.18	
27.	Attachment A - ARARS - Please add the following ARAR for hazardous remediation waste accumulation - 40 CFR 262; 22 CCR Section 66262.34 (Applicable).	*The ARAR has been added as requested.*
28.	Attachment A. ARARS - Please include the McAteer-Petris Act (Sections 666000-66694; Relevant and Appropriate) as this was included in other Site RODs. The Bay Plan, developed under the authority of the McAteer-Petris Act, is an approved state coastal zone management program. Any remedial actions taken by the Navy that will affect San Francisco Bay or that will occur within 100 feet landward of the shoreline will be consistent with the goals of the Bay Plan.	*The ARAR was included in the Attachment 4, Table 4-2, Action Specific-ARAR under* ***Coastal Resources - State Requirements*** *with the Title 14 citation. The words "McAteer-Petris Act" has been added in parentheses under the citation column to avoid confusion.*

END OF DTSC COMMENTS

Response to BCT Comments on the Draft Record of Decision for Parcel F,
Hunters Point Naval Shipyard, California, August 2018

The following set of comments was made by Mr. Sheetal Singh, Senior Health Physicist from the California Department of Public Health – Environmental Management Branch (CDPH-EMB) on 11 September 2018:

Comment		**Response**
	GENERAL COMMENTS	
1.	*The California Department of Public Health – Environmental Management Branch (CDPH-EMB) recognizes that the remedies addressed in this document so not discuss remediation for possible radiological contamination. Although, radiological investigations previously performed focused on ^{60}Co, ^{137}Cs, $^{230/240}$Pu, ^{226}Ra, ^{90}Sr, and ^{235}U did not find any radiological contamination, the site should maintain relevant Institutional Controls (ICs) indefinitely or until proof of compliance with the California Code of Regulations (CCR), Title 17, Section 30256(k).*	*Please see response to EPA General Comment 4.*
2.	*Before the property is transferred, EMB recommends discussing future use and potential restrictions for the site with Radiological Health Branch within CDPH.*	*Comment noted.*

END OF CDPH-EMB COMMENTS

Response to BCT Comments on the Draft Record of Decision for Parcel F, Hunters Point Naval Shipyard, California, August 2018

The following comments were made by Ms. Kimberly C. Gettmann, Ph.D. of the DTSC, Human and Ecological Risk Office (HERO) on 10 October 2018:

Comment		Response
	GENERAL COMMENTS	
1.	Remediation Goals (RGs) a) HERO does not concur with the proposed PCBs RG for RAO 2. The PCB RG under RAO 2 was developed for consumption of shellfish, and is based on a lifetime cancer risk of 1×10^{-5}. As HERO stated in our June 22, 2017 memorandum on the *Draft Technical Memorandum, Optimized Remedial Alternative for Parcel F*, HERO recommends presenting PRGs (preliminary remediation goals) based on 1×10^{-6} 1×10^{-5} and 1×10^{-4} for each RAO, and then a risk management decision can be made regarding which PRG is most appropriate for the site, taking into consideration site- specific parameters. While HERO concurred with the Navy's response to our June 22, 2017 comment, that concurrence was based on the Navy's response that "Because the proposed human health [goal] for total PCBs is based on background, a range of PRGs representing various risk levels for the clam and fish consumption pathways is not required.", inferring that the human health risk was based on PCB nearshore background concentration. However, according to text on page 2-14 of the ROD under review here, the final RG is based on human consumption rates and a forward risk calculation based on a risk level of $1x 10^{-5}$. HERO Acknowledges that the PCB RG for RAO 3 is based on the nearshore San Francisco Bay PCB ambient sediment concentration. HERO again recommends presenting RGs based on 1×10^{-6}, 1×10^{-5} and 1×10^{-4} for RAO 2 such that a risk management-decision can be made regarding which RG is most appropriate for the site, taking into consideration site-specific parameters. HERO does not concur with the proposed PCBs RG being set at a $x 10^{-5}$. b) Please discuss how the area-weighted average (AWA) for the PCB RG under RAO2 will be calculated and applied at Parcel F.	*a) The PRG identification and selection process as well as the range of PRGs representing various risk levels was presented in the 2008 final FS for HPNS Parcel F. The chosen cleanup goal for RAO 2 of 1,350 µg/kg, based on a lifetime excess cancer risk of 1×10^{-5}, was presented in Table 2-1 of the 2008 FS. The RAO 3 long-term clean-up goal of 200 ug/kg for total PCBs is based on background. Reducing the cleanup goal from 1,350 µg/kg to 135 µg/kg based on a lifetime excess cancer risk of 1×10^{-6} would reduce the cleanup level to a concentration below background, which is not in accord with Navy policy. It should be noted that based on an incoming sediment particle concentration of 121 µg/kg, SEDCAM modeling provided in the 2017 Optimization Tech Memo indicates the value of 135 µg/kg would be achieved between 19 and 22 years following remedy construction within Areas IX and X and would be achieved immediately following remedy construction within Area III.* *b) Section 2.8 Remedial Action Objectives has been revised to describe the methodology for estimating area weighted averages by adding the following sentence and equation prior to presentation of Table 5 as follows:* *"Area weighted averages will be calculated using surface sediment concentrations according to the following formula:* *$AWA = \sum Ci \times Ai / \sum Ai$* *Where C = the concentration of the chemical and A = the area associated with that concentration.* *Areas will be assigned to each chemical concentration using Thiessen polygons or similar geo-spatial technique."*

Response to BCT Comments on the Draft Record of Decision for Parcel F, Hunters Point Naval Shipyard, California, August 2018

Comment		Response
2.	RAO 3. The PCB RG for RAO 3 is the nearshore San Francisco Bay PCB ambient sediment concentration. The text on page 2-14 discusses a range of PCB RGs for both cancer risk and non-cancer hazard but does not include the basis for the range of concentrations presented. Please provide this information in the ROD.	*The following sentence in the description of RAO 3 (Section 2.8) has been clarified as follows, with additional text shown as underlined:* *"Despite these uncertainties, a range of RGs for PCBs was developed in the 2017 Optimization Tech Memo based on a fish consumption rate of 48 g/day, <u>derived from literature-based and site-specific biota sediment accumulation factors (ECC-Insight and CDM Smith, 2017)</u>."*
3.	Please note recently the State of California Office of Administrative Law approved and adopted Title 22, California Code of Regulations section 69021 of the Toxicity Criteria for Human Health Risk Assessments, Screening Levels, and Remediation Goals rule. The· rule is a list of required toxicity criteria for specific chemicals to be used in human health risk assessments, human health risk-based screening levels and human health risk- based remediation goals (cleanup levels). The Rule went into effect September 4, 2018. Please note, the toxicity criteria used to calculate the PCB RG is not listed in Appendix I of the Rule, thus, the calculation of the RG is not affected.	*Comment noted.*

END OF DTSC HERO COMMENTS

Response to BCT Comments on the Draft Record of Decision for Parcel F, Hunters Point Naval Shipyard, California, August 2018

The following comments were made by Ms. Tami LaBonty of the California Department of Fish and Wildlife on 8 November 2018:

	Comment	Response
	SPECIFIC COMMENTS	
1.	Page 2-3, Section 2.2.2 Ecological Setting. This section does not provide specific information on the species that are present or may be present on or adjacent to the site. Please include a reference in this section to pages 1-12 to 1-14 of Attachment 2, which discusses Open-Water Habitat (Section 1.4.4.1) and Intertidal Wetlands and Mudflat Habitat (Section 1.4.4.2) or include this information in Section 2.2.2.	*Section 2.2.2 has been revised to include information regarding the species that occupy the various habitats at the site in the section titled* ***Intertidal Wetlands and Bay Mudflats Habitat***, as follows: *"The shallow bay habitat of Parcel F is a feeding area for dozens of species of fish, many with commercial or recreational value, including the Pacific herring, northern anchovy, lingcod, starry flounder, jacksmelt, and several surf perches as well as at least 40 other species of fish, crabs, and shrimp. The areas of shoreline that are riprapped support species that attach to or use hard substrate for shelter, including crabs, isopods, mussels and barnacles. The soft Bay Mud substrate associated with intertidal and mudflat habitat provides habitat for many benthic invertebrates, including worms, crustaceans, copepods, isopods, insects, gastropods, and bivalves."*
2.	Appendix D Cost Estimates. This section should include cost estimates for biological avoidance, minimization, and mitigation measures for remedial activities, including biological surveys, biological monitoring, and habitat restoration costs. It is unclear If these cost estimates are included In this section. Please verify.	*Cost estimates for biological avoidance, minimization and mitigation were not developed in the FS and, as a result, cost estimates for biological avoidance, minimization, and mitigation measures will not be included in the cost estimates presented in the ROD. No change was made to the document in response to this comment.*
3.	Attachment 4: Applicable or Relevant and Appropriate Requirements, Table 4-2 Location-Specific ARARs. a. Page 5. Under "Wetlands Protection - State Requirements ", please correct "Cal. Fish and Game Code §8500" to "Cal. Fish and Game Code §5650". b. Please include Fish and Game Code §3005 in the table (see Attachment 1 to this memorandum). There is potential for take of birds and mammals by contaminants during remedial activities at Parcel F. c. Please include Fish and Game Code §2080 in the table (see Attachment 1 to this memorandum). The longfin smelt (Spirinchus thafeichthys), a State threatened species, has the potential to be present on site (PBS&J, 2009) and may be impacted by remedial activities. d. Please include Fish and Game Code §3511 in the table (see Attachment 1 to this memorandum). The California Brown	*The ARARs have been added or modified as follows:* *a. Cal Fish and Game Code Section 8500 has been changed to Cal Fish and Game Code Section 5650.* *b. The Department of the Navy (DON) has determined that F&GC Section 3005 is not a state ARAR because it is not applicable or relevant and appropriate. The State of California Department of Fish & Wildlife asserts that F&GC Code Section 3005 is a state ARAR because it is relevant and appropriate. Whereas the DON and the State have not agreed upon whether F&GC Section 3005 is an ARAR, this ROD documents each party's position on the statute but does not attempt to resolve the issue.* *c. The DON accepts Fish and Game Code Section 2080 as a state ARAR subject to the following conditions. The State of California, through CDFW, concurs that this statute addresses prohibited conduct but does not provide for or prescribe affirmative measures to avoid a "taking." Notwithstanding the absence of specific affirmative measures in the statute, the DON will implement reasonable measures to ensure adequate protection of ecological*

Response to BCT Comments on the Draft Record of Decision for Parcel F, Hunters Point Naval Shipyard, California, August 2018

Comment		Response
	Pelican (Pelecanus occidentalis califomicus) and American Peregrine Falcon (Falco pergrinus anatum), both State fully protected species, are known to occur at Hunters Point and may be impacted by remedial activities (PBS&J, 2009). Other than collection for scientific research purposes for the recovery of the species, Fully Protected Species may not be "taken" or possessed at any time and CDFW is not authorized to issue a permit for their "take", including trapping. This ARAR was included In the Hunters Point Parcel E ROD (Department of the Navy [DON], 2013) and Parcel E-2 ROD (DON, 2012) as relevant and appropriate. e. Please include Fish and Game Code §3503.5 in the table (see Attachment 1 to this memorandum). The American Peregrine Falcon, Burrowing Owl (Athene cunicularia), Northern Harrier (Circus cyaneus), and Short-eared Owl (Asia flammeus) are all known to occur at Hunters Point (PBS&J, 2009) and may be impacted by remedial activities.	*receptors during response action construction following issuance of the ROD. The DON will coordinate with the State, through CDFW, prior to implementation of such reasonable measures. The DON understands that the State reserves the right to conduct periodic site visits during removal or remedial activities to confirm implementation of avoidance measures.* *d. Fish and Game Code §3511 has been included as an ARAR.* *e. In accordance with an agreement with the State, Navy does not cite this State requirement as an ARAR when the Migratory Bird Treaty Act is cited as an ARAR.*

END OF FISH AND WILDLIFE COMMENTS

**Response to BCT Comments on the Draft Record of Decision for Parcel F,
Hunters Point Naval Shipyard, California, August 2018**

The following set of comments was made by Ms. Tina Low, P.E. of the San Francisco Bay Regional Water Quality Control Board (Water Board) on 10 December 2018:

	Comment	Response
	GENERAL COMMENTS	
1.	**Background concentration of PCBs in sediment in San Francisco Bay**. The draft ROD states that the "ambient" or "background" San Francisco Bay PCBs sediment concentration is 200 ug/kg. As stated in the Water Board's May 2018 comment on the Proposed Plan, we do not consider 200 ug/kg of PCBs in sediment to be representative of background or ambient conditions in San Francisco Bay. As explained in the Water Board's 2003 letter to the Navy, 200 ug/kg represented the upper end of nearshore ambient concentrations, and sites with PCBs concentrations greater than 200 ug/kg were considered anomalies in the Bay. The Draft ROD must provide an accurate description of ambient, background PCBs sediment concentrations. Since the Parcel F Feasibility Study (where the 200 ug/kg PCBs sediment concentration was discussed), The San Francisco Bay Regional Monitoring Program has collected more data in the margins of the Bay. This study is documented in The Central Bay margins report https://www.sfei.org/documents/characterization-sediment-contamination-central-bay- margin-areas-0. The mean for PCBs in the nearshore margins was 70 ug/kg based on 208 PCBs congeners. The 95th upper confidence limit on the mean was 123 ug/kg based on 208 PCBs congeners (100 ug/kg based on 40 PCBs congeners). Please revise the Draft ROD to include this information, in order to provide an accurate characterization of the ambient or background San Francisco Bay PCB sediment concentration.	*The RAO 3 cleanup level of 200 ug/kg was recommended by the SFRWQCB in a letter dated February 18, 2003 and concurred by EPA and DTSC-HERD as documented in the 2008 FS RTCs. This concentration represents the upper end of nearshore sediment PCB data collected from within San Francisco Bay between 2000 and 2001. The proposed RAO 3 cleanup level was developed as a 95% upper threshold level (UTL) assuming a normal distribution; one statistical outlier was removed. The procedures used to develop the UTL are consistent with EPA's ProUCL Users Guide, Version 5.1 (USEPA 2015).* *The Navy evaluated sediment data collected during the 2015 Regional Monitoring Program for Water Quality in San Francisco Bay presented in the San Francisco Estuary Institute report "Characterization of Sediment Contamination in Central Bay Margin Areas" (SFEI 2017). PCB congener data represented as a sum of 40 congeners and 208 congeners were evaluated. Replicate results were eliminated from the data set to match the 40 data points referred to in the monitoring report. The data was tested for statistical outliers. Two statistical outliers with elevated PCB concentrations were identified (Samples CB-33 and CB-44) and removed from the data set. The distribution of the data set was also tested, and found to be lognormally distributed at a 5% significance level. The subsequent statistical tests conducted by the Navy assumed a lognormal data distribution versus the Water Board assumption of normal distribution. In addition, the Navy did not increase the weight of the 7 Marin County samples as did SFEI because those samples were collected from areas of reduced population and potential pollution sources, and thus skew the data set towards a lower concentration. The resulting data set (after eliminating replicate results and outliers and testing for normality) was evaluated by the Navy to estimate background threshold values (BTVs)by calculating the upper predictive limit at the 95% confidence level (UPL 95)using the procedures outlined in the ProUCL Users Guide, Version 5.1 (USEPA 2015). Upper limits such as upper percentiles, UPLs, or UTLs are used to estimate BTVs or not-to-exceed values, and is consistent to how the 200 ug/kg RAO 3 cleanup level was developed. The UPL 95 based on the sum of 40 PCB congeners was calculated to be 157 µg/kg while the UPL 95 based on the sum of 208 congeners was calculated to be 198 µg/kg. Due to the similarity of these results with the RAO 3 cleanup level of 200 µg/kg, the Navy has determined that modification of the proposed RAO 3 cleanup level is not required.*

Response to BCT Comments on the Draft Record of Decision for Parcel F, Hunters Point Naval Shipyard, California, August 2018

Comment		**Response**
		The language in the ROD describing the 200 ug/kg RAO 3 cleanup goal has been revised to add that the value represents the upper end of nearshore ambient sediment total PCB concentrations in San Francisco Bay based on language in the 2003 Water Board letter to the Navy.
2.	**Depth of bioactive layer in sediment**: Section 2.3.2 Nature and Extent of Contamination states, in Areas IX and X, the maximum PCBs concentrations are in sediments 6 inches to 2 feet below the mudline. The remedy proposes to leave a significant mass of PCBs in place. In order to prevent exposure to ecological and human health receptors, the remedy must address all COCs within the bioactive layer, which is determined by the depth limit of bioturbation or vegetation rooting. The Validation Study stated that "the presence of polychaetes in the upper 1-2 ft. of sediment in many cores from the South Basin indicates that mixing of surface and subsurface sediment to these depths should be expected." In addition, based on benthic coring work performed by USGS in the Bay, larger clams and polychaetes are likely present at a depth of 30 cm. The Draft ROD should explain how the proposed remedy will address all COCs present within the bioactive layer.	*The Navy acknowledges that evidence of worm tubes was observed within the upper 1 to 2 feet in some of the sediment cores collected from the South Basin for the Data Validation Study. The Navy also acknowledges that a deep mixing zone can extend from the redox potential discontinuity (RPD) to more than 1 meter into the sediment. However, the majority of the Parcel F benthic data and related assessments support a biologically active zone of up to 30 cm (12 inches).* *Please see response to EPA Specific Comments 1 and 6. Section 2.2.2, Ecological Setting, has been revised to include a discussion of the sediment biologically active zone historically observed at Parcel F.* *The following sentence has been revised in Section 2.10.2 for Areas IX and X:* *"<u>The minimum 1-foot removal depth will effectively remove contaminated sediment from the biologically active zone, and e</u>xcavated areas will be backfilled with clean material<u> to the same elevation as was removed.</u>"* *In addition, the following sentence has been added in Section 2.10.2 for Areas IX and X:* *"Application of the carbon-based in situ treatment amendments will rely on bioturbation to mix amendments into the sediment bed. As a result, treatment will extend to the full bioturbation depth associated with benthic organisms present within Areas IX and X. Sediment profile imaging (SPI) conducted during the pilot study demonstrated that mixing associated with physical processes and bioturbation resulted in complete incorporation of the treatment amendment into the native sediment 26 months after placement* (KCH, 2018)."
3.	**Section 1.1 Selected Remedy:** This section states that, in Areas IX and X, subtidal sediments will be cleaned up based on surface sediment PCB concentrations. Please revise the text to clarify the sediment depth interval that is considered "surface". The concentration of PCBs in sediment varies by depth. What depth interval will be used to determine the cleanup approach?	*The focused removal with backfill and in situ treatment areas will be determined based on COC concentrations in sediment from the 0 to 1-foot interval. The text in Section 1.1, Areas IX and X has been revised to be consistent with the text in Section 2.10.2, Areas IX and X.*
4.	**Section 2.8 Remedial Action Objectives:** This section states that background levels of contaminants of concern (COCs) were considered in setting remedial goals (RGs). As explained in Comment #1 above, the	*Please see response to Water Board General Comment 1.*

**Response to BCT Comments on the Draft Record of Decision for Parcel F,
Hunters Point Naval Shipyard, California, August 2018**

Comment		Response
	Water Board does not consider 200 ug/kg to be representative of ambient PCBs sediment concentrations in the nearshore margins of San Francisco Bay. An accurate representation of background conditions, along with risk-based concentrations, should be considered when setting remedial goals.	
5.	**Section 2.8 Remedial Action Objectives:** RAO 2: Why is the RAO for potential human health risks from shellfish consumption and direct contact with sediment during shellfish collection based on a cancer risk of 1 x10^{-5}, rather than 1 x 10^{-6}? Although a cancer risk of 10^{-5} is within the risk range, remedial goals at Hunters Point have typically been based on a cancer risk of 10^{-6}. Please explain why RAO 2 is based on a cancer risk of 10^{-5}, or revise the RAO to reflect a cancer risk of 10^{-6}.	*Please see response to DTSC, Human Ecological Risk Office (HERO) General Comment 1.*
6.	**Section 2.8 Remedial Action Objectives: RAO 3:** We appreciate that the Navy has calculated a range of RGs considering the uncertainties in the human health fish consumption pathway. This ROD must consider the fish consumption pathway in order to fully address the human health risks associated with the COCs. This RAO should consider the risk from the human health fish consumption pathway, and set an appropriate RG that takes into account both an accurate representation of background PCBs sediment concentrations and a risk-based concentration. Please see Comment #1 for discussion of background PCBs sediment concentrations.	*Please see response to Water Board General Comment 1.*
7.	**Section 2.10.2 Description of Selected Remedy: Area III:** This section states that sediment removal will target all contamination above the site-specific remediation goals in the focused removal area to a maximum depth of two feet. Does that mean that excavation will remove the top two feet of sediment in the nearshore area? The depth of sediment removal is an important aspect of the remedy because PCBs remaining below the excavation depth have the potential to become part of the food chain. Please revise this section to specify the excavation depth. This section also states that beyond the nearshore area, contaminated sediments in water depths less than 30 feet will be capped. It does not seem that the remedy will restore existing elevations. How will the existing habitat be restored without restoring the bathymetry? Also, the cap material must support the existing benthic community in order to prevent a loss of habitat.	*Please see response to EPA Specific Comment 1. Section 2.10.2 has been revised to clarify that all sediment contamination in water depths less than 5 feet mean lower low water (MLLW) above the RAO 1 not to exceed cleanup levels will be removed to a maximum depth of 2 feet and backfilled to the original elevation. Sediments will be capped that have COC concentrations exceeding the RAO 1 not-to-exceed cleanup levels in water depths greater than 5 feet but less than 30 feet MLLW. The cap will either be an armored sand cap with a carbon amendment or an Aquablok cap that forms a low permeability layer to restrict groundwater-surface water interaction. Capping materials that aid active benthic organism recolonization will be preferred.* *The following sentence has been added as an introductory paragraph to Section 2.10.2, Description of Selected Remedy prior to the Area III header:* *"Cleanup activities will be designed to minimize adverse impacts to aquatic habitat and resources through the use of best management practices, equipment selection and material selection."*

Response to BCT Comments on the Draft Record of Decision for Parcel F, Hunters Point Naval Shipyard, California, August 2018

Comment		Response
8.	**Section 2.10.2 Description of Selected Remedy:** Area III: The proposed remedy for Area III does not include excavation or treatment at water depths greater than 30 feet. This would leave in place contaminated sediments exceeding RAO 1 RGs. Please explain how RAOs 2 and 3 will be met without any treatment or removal at water depths greater than 30 feet.	*Please see response to EPA Specific Comment 9. Cleanup levels for RAOs 2 and 3, which are based on an area-weighted average, will be met within Area III following remedy construction. Post-RA sediment PCB concentrations within the entirety of Area III are estimated at 52 µg/kg as measured on an area weighted basis. Pre-RA sampling will be performed to confirm the remedial footprint relative to the RAO 1 cleanup level and to verify that the selected remedy will achieve the RAOs 2 and 3 on an area weighted average.*
9.	**Section 2.10.2 Description of Selected Remedy: Areas IX and X:** This section states that in situ treatment will be accomplished using carbon-based amendments. Without mechanical mixing, the amendment may not reach and treat all of the sediments within the bioactive layer (as discussed in Comment #2). What depth of treatment will be achieved by the in situ treatment? How will COCs within sediment at depths of 30 cm or 2 feet be addressed?	*Please see response to SFWQCB Comment 2.*
10.	**Section 2.10.2 Description of the Selected Remedy: Institutional Controls:** The Basin Plan designates and protects Beneficial Uses for San Francisco Bay. These Beneficial Uses include REC-1 (water contact, such as swimming) and REC-2 (non-contact, such as boating). Therefore, we do not support long-term institutional controls that would prohibit swimming, anchoring, or clamming. Such long-term prohibitions would impact the protected Beneficial Uses of San Francisco Bay.	*The selected remedy includes ICs that limit the potential for human exposure and prevent physical disturbance of the remedy including limitations on digging, or clamming within the active remediation areas (i.e., backfill, cap, and in situ) of Areas III, IX, and X only. Parcel F institutional controls in Section 2.10.2 has been revised to eliminate swimming and anchoring restrictions as ICs. However, restrictions on activities that have a greater potential to disturb the remedy such as digging have been retained to maintain the integrity of the cap, backfill, and in situ treatment areas. No limitations will be placed on boating. In addition, ICs that limit the potential for human exposure such as clamming restrictions have been retained and will be maintained until RAO 2 is achieved.*
11.	**Section 2.10.2 Description of the Selected Remedy**: Performance Monitoring: This states that long-term goal monitoring will not be conducted in the in situ treatment remediation zone. Please revise this section to provide an approach to monitoring the effectiveness of the in situ treatment. Without performance monitoring, it is not possible to confirm the reduction in bioavailability of PCBs in sediment. Performance monitoring is needed to verify that the RAOs have been achieved and that the risks have been reduced. It is not adequate to rely on the data from the pilot study to confirm the effectiveness of the full scale remedy. Pore water sampling and/or biota monitoring may be needed to demonstrate the reduction in bioavailability and success of the remedy.	*Please see response to DTSC General Comment 2.*

END OF WATER BOARD COMMENTS

**Response to BCT Comments on the Draft Record of Decision for Parcel F,
Hunters Point Naval Shipyard, California, August 2018**

The following set of comments was made by Ms. Amy D. Brownell, P.E. of the City and County of San Francisco Department of Public Health (SFDPH) on 30 November 2018:

Comment		Response
	GENERAL COMMENTS	
1.	As discussed in the Responsiveness Summary General Comment #1, by Amy Brownell dated 4 May 2018, please consider documenting in the body of the ROD that the Navy will verify that the remedial actions taken will minimize any potential for recontamination of either Yosemite Slough or South Basin and also consider timing compatibility with the Yosemite Slough cleanup. The Navy's remedy could be jeopardized if these two remedies are not carefully coordinated. We have confidence that the current Navy team understands this concern and would implement the proper procedures if they implement the remedy in this ROD. Unfortunately, we are keenly aware that a different Navy team may be in place when the remedy is implemented and if requirements, such as crucial timing with an adjacent remedy, aren't documented in the decision documents, such as the ROD, future Navy teams could overlook such a requirement and jeopardize the remedy.	*Please see response to EPA General Comment 1.*
2.	As stated in the Responsiveness Summary Comment #1, by Amy Brownell dated 4 May 2018, please add a statement to Section 2.3.2, Nature and Extent of Contamination, regarding the concentrations and distribution of lead in Area III, and IX/ X. Your last sentence in your RTC is "The ROD will clarify this point." We think Section 2.3.2 is the optimal location to clarify. Please state that there is only one location with lead that exceeds the ER-M in Area III outside the remedial footprint because it is at a depth greater than 30 feet and two locations with lead within Area IX/X that are within the proposed excavation areas.	*The following sentence has been added to Section 2.3.2 after the second paragraph:* *"The location(s) of lead concentrations exceeding the ER-M are sample PA-47 in Area III and samples TZSA-03 and SB-01in Areas IX and X (Barajas and Associates, 2008)."*
3.	Please increase the size of the figures that present data points with legends and footnotes, they are unreadable at the size they are set up to print in the electronic PDF copy. Specifically, the symbols, footnotes and legends are too small. Many of them are set to print in the PDF on only a half of an 8.5 x 11 sheet which is unreadable. Please have the electronic PDF set so the following figures to print out at 11 x 17: figures 2, 3, 8 and 9.	*The figures have been revised for improved readability as requested.*

Response to BCT Comments on the Draft Record of Decision for Parcel F, Hunters Point Naval Shipyard, California, August 2018

Comment		Response
	SPECIFIC COMMENTS	
1.	**Section 2.2.1, Hydrodynamic Setting, Second Paragraph, Page 2-3:** The erosion and deposition rate calculations, assumptions and data should consider using local weather data and include other factors such as rainfall, storm surge, climate change, and sea level rise. Several concerns were noted following a review of the references in Attachment 2: a. The erosion model relies on three measured data points: 1) hydrodynamic measurements to characterize seasonal conditions (wave and current data collected from one winter and one summer month in 2001); 2) wind measurements to determine typical storm durations and intensities (eight years of wind data from an offshore buoy located 18 miles to the west); and 3) measured sediment data taken from SedFlume cores using a one-dimensional flow model. The Navy should include a discussion on the applicability of these data points to local conditions and provide an uncertainty analysis associated with these data points. b. The Battelle study selected a typical year's storm for the erosion rate of 4.2 cm per year, but 10, 25, and 100-year events were not considered. The Navy should address the impact of these other storm events on the effectiveness of the remedy. c. The study determined sediment deposition is from the Bay and not urban stormwater runoff during extreme rain events within the Yosemite slough watershed. The deposition rate was predicted based on the modeled erosion rate. As stated above, the Navy should include a discussion on the applicability of this data to local conditions and provide an uncertainty analysis associated with this approach.	*Additional detail has been added to Section 2.2.1 to address parts a and b of this comment as follows:* *" **Updated Hydrodynamic Model for 100-year Storm Events**. A hydrodynamic model is being prepared to support remedial design activities which considers 100-year storm events, sea level rise and extreme tidal events such as king tides. The model is based on a FEMA model for San Francisco Bay and considers a 100-year storm event in conjunction with predicted sea level rise, partially and temporally variable water levels, water depths, and currents in response to coastal fluctuations associated with tides, storm surges, and offshore set-down events propagating into San Francisco Bay. In addition, a FEMA wave model will be used to consider spatially and temporally variable wave heights and wave periods in response to local wind conditions within San Francisco Bay. The results of the model will be used to develop specifications for capping, backfill and shoreline protection material that can withstand a 100-year event with consideration of sea level rise".* *Also, please see response to DTSC General Comment 3 regarding sediment deposition rates.* *Uncertainty in the hydrodynamic model will be addressed in the Remedial Design.*
2.	**Section 2.8, Remedial Action Objectives, Page 2-15, First Paragraph, Last Sentence:** Please revise the last sentence of the first paragraph to "The two detections of elevated lead that exceed the ER-M are limited to the intertidal sediments in Area IX/X, which also contain elevated concentrations of PCBs and are slated for removal."	*Section 2.8 of the ROD has been revised as requested.*
3.	**Section 2.9.1, Summary of Remedial Alternatives, ICs, page 2-16, last sentence:** Please revise this sentence to summarize the proposed ICs rather	*Section 2.9.1 of the ROD includes a general description of the remedial technologies considered during the development of the remedial alternatives. Section 2.10.2 of the*

Response to BCT Comments on the Draft Record of Decision for Parcel F, Hunters Point Naval Shipyard, California, August 2018

Comment		Response
	than including the generic phrase "land and waterway use restrictions". This phrase is an artifact from the Proposed Plan and now that the ICs are detailed in this ROD, seems overreaching and not necessary. May we suggest the following "ICs that would be applied at ~~HPNS Parcel F~~ Area III and Areas IX and X (i.e., areas requiring a remedy) include: a) limitations on anchoring, swimming, or clamming; b) restrictions on dredging, sediment disturbing activities or disturbance of the cap/containment systems; c) restrictions on removal of security features or signs; and d) periodic inspections and reporting requirements" (see also comments 9 and 10 for more details on this request).	*ROD presents a description of the selected remedy and describes the ICs at the level of detail requested in the comment. As a result, a reference to Section 2.10.2 has been included in Section 2.9.1 of the ROD. Please also see response to Water Board General Comment 10.*
4.	**Section 2.10.2, Description of Selected Remedy, Areas IX and X, Page 2-31:** The last sentence in the second paragraph states "Reuse opportunities for removed sediments will be considered during remedial design." Please expand to indicate the possible reuse options that will be contemplated.	*The following sentence has been added to Section 2.10.2, Description of Selected Remedy:* *"Potential reuse opportunities include placement at beneficial re-use sites within the San Francisco Bay such as Cullinan Ranch, Suisun Marsh, Montezuma Wetland, and Winter Island and the use of sediments as fill material to support California Department of Transportation infrastructure projects."*
5.	**Section 2.10.2, Description of Selected Remedy, Area IX and X, Page 2-31, Third Bullet**: In the third bullet, should the statement read "PCB concentrations between 200 µg/kg and less than or equal to 1,240 µg/kg = MNR"? Please see response to Specific Comment #3 by Amy Brownell dated 4 May 2018 in the Responsive Summary.	*The third bullet in Section 2.10.2, Description of Selected Remedy and Section 1.1 Areas IX and X has been revised to read:* *"PCB concentrations between 200 ug/kg and less than or equal to 1,240 ug/kg = MNR."*
6.	**Section 2.10.2, Description of Selected Remedy, Areas IX and X, Page 2-31:** Please add text and references to indicate how the additional remedial actions (summarized on page 2-10, bullets #1 and #2) along the Parcel E shoreline will be designed and integrated with the selected remedy for Areas IX and X.	*Please see response to EPA General Comment 2 and DTSC Specific Comment 4.*
7.	**Section 2.10.2, Description of Selected Remedy, Areas IX and X, Page 2-31:** The in situ treatment remedy is shown at several locations along the shoreline and within the intertidal zone on Figure 9. How will the treated sediments remain undisturbed by wave action for the full 26-month treatment period at shallow depths from 0-2 feet below the water surface?	*The depiction of in situ treatment areas was developed for FS purposes only and the sub-tidal in situ treatment footprint will be revised based on updated bathymetric surveys and pre-RA sediment characterization, prior to remedy implementation. In situ treatment amendments will not be placed in intertidal areas that are subject to wave induced erosion.*

Response to BCT Comments on the Draft Record of Decision for Parcel F, Hunters Point Naval Shipyard, California, August 2018

Comment		Response
8.	**Section 2.10.2, Description of Selected Remedy, Areas IX and X, Page 2-31:** The MNR treatment remedy is shown at several locations along the shoreline and within the intertidal zone on Figure 9. Are deposition rates the same along the shoreline and intertidal zones and determined for the subtidal zones? How will sampling confirm deposition has occurred across from the shoreline, through the intertidal zone and in the subtidal zone?	*Section 2.2.1 of the ROD has been revised to include a discussion of sediment deposition rates as follows:* ***"Evaluation of Sediment Deposition:*** *A semi-quantitative evaluation of sediment bed elevation was performed that compared the sediment bed elevations generated during a September 2003 bathymetric survey presented in the Hydrodynamic Modeling, Wave Analysis and Sedimentation Evaluation for the Yosemite Canal Wetland Restoration Project (Noble Consultants, 2005) and a February 2018 bathymetric survey presented in the Field Operation Report, Sediment Investigation and Bathymetric Survey (Appendix A of ECC-Insight and CDM Smith, 2018). The evaluation showed that 38 to 67 centimeters (cm) of sediment has accumulated in the South basin over the past 15 years representing an average sediment deposition rate of approximately 3.5 cm per year within the South Basin. The average deposition rate within the intertidal zone was estimated at 3.4 cm per year while the average deposition within the subtidal zone was estimated at 3.5 cm per year with the greatest amount of deposition observed near the entrance to the South Basin."* *In addition, the following sentence has been added at the end of the last paragraph of Section 2.10.2 under Long-Term Remedial Goal Monitoring:* *"Periodic post-RA bathymetric surveys will be conducted to confirm sediment deposition in Areas IX/X."*
9.	**Section 2.10.2, Description of Selected Remedy, Institutional Controls, second sentence and last sentence of paragraph before the bullets:** Please revise as follows: "ICs for ~~Parcel F~~ <u>these areas</u> will entail …" and "ICs to be implemented at ~~the HPNS Parcel F site~~ <u>Areas III, IX and X</u> will be developed during the land use control remedial design and may include:" See specific comment 10 for more details.	*Site-wide and area-specific ICs have been called out separately in the bullets within Section 2.10.2 for clarification. The first sentence of Section 2.10.2 has also been revised to clarify site-wide and area-specific ICs:* *"The Navy will implement ICs as a component of the selected remedy in Areas III, IX, and X to manage the site-wide potential of low-level radiological objects in Parcel F sediment."*
10.	**Section 2.10.2, Description of Selected Remedy, Institutional Controls, starting at the bottom of Page 2-31 and continuing:** The remedy for Area III includes sediment removal, capping and institutional controls (ICs) and the remedy for Area IX and X include in situ treatment, removal, monitored natural recovery and ICs. The Navy's proposed ICs are copied below with comments in italics:	*Bullet 1: Section 2.10.2 of the ROD has been revised to eliminate the first bullet under Institutional Controls as requested since this information is provided in greater detail in subsequent bullets.* *Bullets 2 and 3: A separate header for Parcel F Areas III, IX, and X has been added to distinguish site-wide and Area-specific ICs. The restricted water uses and restricted activities in accordance with Covenant(s) to Restrict Use of Property to protect the remedy from disturbance only apply to Area III and Areas IX and X since these are the only areas where active remedial measures will take place.*

Response to BCT Comments on the Draft Record of Decision for Parcel F,
Hunters Point Naval Shipyard, California, August 2018

Comment		Response
	• Land and waterway use restrictions, within Area III and Areas IX and X, to limit the potential for exposure and prevent physical disturbance of the remedy. *This bullet was included in the proposed plan because specific ICs had not yet been developed. We recommend deleting this IC since it is non-specific; the remainder of the proposed ICs will adequately cover the necessary land and waterway use restrictions. Leaving this restriction in your list gives the impression that there are other restrictions that you are going to develop in the future which we don't think is the intent. You have spelled out the framework of the ICs for Areas III and IX/X in the subsequent bullets and future documents (e.g., the remedial design and remedial action work plan) will provide more detail (see below) and be specific to Areas III and IX/X. This bullet is redundant and should be deleted.* • Restricted water uses to protect the remedy from disturbance, including limitations on anchoring, swimming, or clamming. The clamming and swimming restrictions would be implemented by posting warning signs, natural physical barriers such as marsh vegetation, or public outreach and education. Anchoring restrictions would be implemented as part of the regulated navigational area (RNA) for Area III. RNAs are formally designated through the Federal Register and would appear on NOAA navigation charts. *Please clarify that these restrictions are limited to Area III and Areas IX and X given that these are the only areas with a remedy.* • Restricted activities in accordance with the Covenant(s) to Restrict Use of Property, and quitclaim deed(s): • Sediment disturbing activity, which includes: (1) dredging of sediment or (2) any other activity that involves movement of sediment; • Alteration, disturbance, or removal of any component of a response or cleanup action (including cap/containment systems); and • Removal of or damage to security features or signs. *Please clarify that these restrictions are limited to Area III and Areas IX and*	

Response to BCT Comments on the Draft Record of Decision for Parcel F, Hunters Point Naval Shipyard, California, August 2018

Comment		Response
	X given that these are the only areas with a proposed remedy. • Procedures for segregation, proper management, and disposal of low-level radiological objects (e.g., radioluminescent dials, gauges, and deck markers) if encountered during future site activities, such as dredging. *Assuming these procedures are necessary, should the possibility of discovery of radiological objects be handled as an unexpected condition rather than a restriction? For context, Responsiveness Summary General Response 3 states, "Based on an evaluation of radionuclide risk at Parcel F and evaluation with respect to background, it was determined that remediation of radionuclides in sediment is not required at the HPNS Parcel F." An unexpected condition response plan has been approved for terrestrial parcels as a way to handle such issues. In addition, can you clarify that you are presenting this procedure for Area III and Areas IX and X only since this IC section is written for those areas?* • Periodic inspections and reporting requirements, including the CERCLA five-year review, to verify cleanup within Area III and Areas IX and X is functioning properly. No comment.	
	To summarize comments 9 and 10, please revise the introductory paragraph and the bullets for this Institutional Control section as follows: "The Navy will implement ICs as a component of the selected remedy in Areas III, IX, and X. ICs for ~~Parcel F~~ these areas will entail legal and administrative requirements and processes to limit human exposure to hazardous substances remaining on the property and to maintain the integrity of the remedial action until remedial goals have been achieved. These requirements and processes may include deed restrictions, covenants, easements, laws, and regulations. ICs to be implemented at ~~the HPNS Parcel F site~~ Areas III, IX and X will be developed during the land use control remedial design and may include: ~~• Land and waterway use restrictions, within Area III and Areas IX and X, to limit the potential for exposure and prevent physical disturbance of the remedy.~~	*Please see response to EPA General Comment 4, and responses to SFDPH Specific Comment 9 above and 11 below. The description of ICs in Section 2.10.2 has been revised for clarity.*

Response to BCT Comments on the Draft Record of Decision for Parcel F, Hunters Point Naval Shipyard, California, August 2018

Comment		**Response**
	• Restricted water uses to protect the remedy from disturbance, including limitations on anchoring, swimming, or clamming. The clamming and swimming restrictions would be implemented by posting warning signs, natural physical barriers such as marsh vegetation, or public outreach and education. Anchoring restrictions would be implemented as part of the regulated navigational area (RNA) for Area III. RNAs are formally designated through the Federal Register and would appear on NOAA navigation charts. • Restricted activities in accordance with the Covenant(s) to Restrict Use of Property, and quitclaim deed(s): • Sediment disturbing activity, which includes: (1) dredging of sediment or (2) any other activity that involves movement of sediment; • Alteration, disturbance, or removal of any component of a response or cleanup action (including cap/containment systems); and • Removal of or damage to security features or signs. ~~• Procedures for segregation, proper management, and disposal of low-level radiological objects (e.g., radioluminescent dials, gauges, and deck markers) if encountered during future site activities, such as dredging.~~ (see comment 11 for suggested revision to the document for this issue). • Periodic inspections and reporting requirements, including the CERCLA five-year review, to verify cleanup within Area III and Areas IX and X is functioning properly.	
11.	**Section 2.10.2, Description of Selected Remedy, Institutional Controls, Page 2-32, under the bullets:** To address the issue of needing procedures to manage radiological objects, if found, we suggest adding a new subheading in the Institutional Control Section and it could include these phrases copied from the Proposed Plan: "<u>Management of Unexpected Conditions during Future Dredging</u> While the Navy did not recover any radioluminescent items during their radiological characterization investigations at Parcel F, the potential remains	*Please see response to EPA General Comment 4. The selected remedy includes procedures for segregation, proper management, and disposal of low-level radiological objects (e.g., radioluminescent dials, gauges, and deck markers) if encountered during future site activities. Plans for managing any low-level radiological objects encountered in Areas III, IX and X during construction of the RA and related sampling, as well as procedures for radiological screening of material generated during construction will be developed by the RA contractor. Any material that is identified as low-level radioactive waste will be segregated and managed as appropriate.*

Response to BCT Comments on the Draft Record of Decision for Parcel F, Hunters Point Naval Shipyard, California, August 2018

Comment		Response
	for these radioluminescent items to be present in Parcel F. Therefore, the Navy plans, as part of the Institutional Controls for the site, that there will be a requirement for an Unexpected Condition Response Plan, or equivalent, and that, at a minimum, the plan will contain procedures for segregation, proper management, and disposal of low-level radiological objects (e.g., radioluminescent dials, gauges, and deck markers) if encountered during future site activities, such as dredging." Please clarify in this new subheading whether this Unexpected Condition Response Plan will apply only in Areas III, IX or X or for all of Parcel F.	*DTSC requires radiological restrictions for Hunters Point Parcel F Off-shore sediment, and will not accept an unexpected condition response plan. Please see DTSC Specific Comment 14.*
12.	**Section 2.10.2, Description of Selected Remedy, Monitoring and Maintenance, Page 2-32, Last Paragraph:** In the last paragraph under "Construction Monitoring" please consider adding the following sentence "BMPs such as silt curtains will be in place to control sediment migration during remediation activities occurring along the shoreline."	*The suggested sentence was added as requested.*
13.	**Section 2.10.2, Description of Selected Remedy, Monitoring and Maintenance, Long Term Remedial Goal Monitoring, Page 2-33, Second Paragraph:** This paragraph is confusing and seems to include some information that is already explained in the first paragraph. The second paragraph currently states "Long term remedial goal monitoring will not be conducted in Area III or in the focused removal with backfill remediation zone of Areas IX and X, because all RAO RGs will be achieved immediately after remedy implementation. Long-term remedial goal monitoring will not be conducted in the in situ treatment remediation zone either because PCBs will be left in place. However, the in situ treatment will bind the PCBs in sediment, making them unavailable for uptake by benthic organisms and subsequent bio magnification up the food chain…resulting…in the achievement of RAO 3 RG." We recommend replacing the first two sentences with these: "Long term remedial goal monitoring will not be conducted in 1) Area III where either the Modified Armored Cap or AquaBlok cap is proposed because PCBs will be left in place, and 2) in the focused removal with backfill remediation zones of Areas IX and X, because all RAO RGs will be achieved immediately after remedy implementation." In addition, please strike the third and fourth sentences: "~~However the in situ treatment will bind the PCBs in sediment, making them unavailable for uptake by benthic organisms and subsequent bio magnification up the food chain. Therefore the bioavaibility of PCBs resulting from Navy activity will~~	*The Navy prefers the current draft ROD language. Long-term remedial goal monitoring will not be conducted in Area III because all RAO RGs will be achieved immediately after remedy implementation, not because PCBs will be left in-place. Performance monitoring of the caps and backfill areas will be conducted to ensure the remedy remains in place and effective because PCBs will be left in place in those areas. See response to USEPA Specific Comment 12.* *Additionally, the Navy does not agree that the suggested sentences to be removed are repetitive with respect to the preceding paragraph.* *No changes were made to the text pursuant to this comment.*

Response to BCT Comments on the Draft Record of Decision for Parcel F, Hunters Point Naval Shipyard, California, August 2018

Comment		Response
	~~be significantly reduced, resulting in human and ecological risk reduction until MNR results in achievement of RAO RG 3.~~" These sentences are applicable to the long term remedial goal monitoring for the in situ and MNR remediation zones in Area IX and X that are already extensively discussed in the previous paragraph. Therefore these two sentences are redundant and should be deleted.	
14.	**Figure 9, Footprint of Cleanup Alternative 7, Areas IX and X:** Portions of Areas IX and X are cut-off in the figure and the full extent of the proposed remedial footprint cannot be ascertained. Please revise the figure as necessary.	*Figure 9 of the ROD has been revised as requested to show all of Areas IX and X to depict the full extent of MNR in these areas.*
15.	**Figure 9, Footprint of Cleanup Alternative 7, Areas IX and X:** Please show the additional remedial actions (summarized on page 2-10, bullets #1 and #2) along the Parcel E shoreline. This would be helpful for the reader to understand how they will be placed adjacent to the selected remedy for Areas IX and X.	*Figure 9 of the ROD has been revised as requested.*
	MINOR COMMENTS	
1.	**Second Page after the Title Page:** This page is left blank. Please insert "This page intentionally left blank."	*The ROD has been revised as requested.*
2.	**Acronyms and Abbreviations, Page V:** Please revise "Unrestricted Use/Unrestricted Exposure" from "UU/EE" to "UU/UE."	*The Acronyms and Abbreviations section has been corrected as requested.*
3.	**Section 1.3, Data Certification Checklist, Page 1-2:** After the fifth bullet, please insert "Basis for Response Action (Section 2.6)."	*The Data Certification Checklist, Section 1.3, has been revised as requested.*
4.	**Section 2.9.1, Summary of Remedial Alternatives, Page 2-15:** The sentence starting at the bottom of page 2-15 states "The six alternatives evaluated for Area III are shown in Table 6 and the nine alternatives evaluated for Areas IX and X are shown in Table 7. The capital costs, O&M costs and total present value cost for each alternative are presented in Table 8." Please fix the hyperlink to Tables 6 and 7.	*The hyperlink to Tables 6 and 7 will be updated in the Final PDF version of the ROD.*
5.	**Table 8, Remedial Alternative Cost Summary, Page 2-19:** Please add an additional note "Costs presented in the table are in Millions of Dollars."	*Table 8 of the ROD has been revised to include a footnote (1) for the Capital Costs column with the following added footnote: "[1] Costs are presented in millions of dollars."*

END OF SFDPH COMMENTS

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ATTACHMENT 5
PART 2:
SUPPLEMENTAL BCT COMMENTS ON THE DRAFT ROD AND REVISED DRAFT FINAL ROD

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Response to Supplemental BCT Comments on the Draft Record of Decision (ROD) for Parcel F, Hunters Point Naval Shipyard, California

The following supplemental comments were made in review of the Response to BCT Comments on the Draft ROD for Parcel F by Ms. Judy C. Huang, P.E. of the United States Environmental Protection Agency (EPA) dated 20 March 2019:

	Comment	Response
	New Comment	
1.	**Total PCBs Definition:** Historically, at HPNS, the term "Total PCBs" when referring to sediment concentration has been defined as either the sum of the concentrations of 40 PCB congeners or the sum of the concentrations of 45 PCB congeners in the sediment. Recently, the concept of Total PCBs defined as the sum of concentrations of 208 congeners was introduced. To properly determine cleanup progress, a consistent definition for Total PCBs sediment concentration is necessary. Please revise the Draft ROD to define Total PCBs to be consistent with how the final sediment cleanup goals (the sum of concentrations of 40 congeners vs. the sum of concentrations of 208 congeners) are derived and modify future sampling and reporting programs accordingly.	*The following footnote has been added to Table 5:* *"The RG will be met by analyzing for all 208 PCB congeners."*
	Evaluation of Response to EPA Comments	
1.	**Response to General Comment 1:** The response partially addresses the comment. Please further revise the proposed sentence to state: "The Navy will, to the maximum extent practicable, ensure that the selected remedy for Areas IX and X and the Yosemite Slough site will be compatible with respect to timing and constructability to ensure that the cleanups are compatible and to minimize any potential for recontamination of either area."	*The referenced sentence in Section 2.10.1 has been revised as requested:* *"The Navy will, to the maximum extent practicable, ensure that the selected remedy for Areas IX and X and the Yosemite Slough site will be compatible with respect to timing and constructability to ensure that the cleanups are compatible and to minimize any potential for recontamination of either area."*
2.	**Response to General Comment 3:** The response partially addresses the comment. While the response indicates that the 2017 costs were updated based on the same escalation factor of 2.1% which was utilized in the Final Feasibility Study for Parcel F, Hunters Point Shipyard, San Francisco, California, April 30, 2008 (FS) and was developed based on the Remedial Action Cost Engineering and Requirements System (RACER) Cost Database Software, Version 8.1.0, it is unclear why an escalation factor from an outdated version of RACER Cost Database Software and a 2008 document is appropriate for the 2017 costs presented in Figures 6 (Area III Alternative Evaluation Summary) and 7 (Areas IX and X Alternatives Evaluation Summary). Please revise Figures 6 and 7 and the text to clarify why an escalation factor of 2.1% is appropriate for the 2017 costs.	*The escalation costs of 2.1% was used to be consistent with previous costing presented in the FS and was documented in the Final Technical Memorandum, Optimized Remedial Alternative for Parcel F (ECC-Insight and CDM Smith, 2017). Please note that FS costs are not absolute, but are estimates intended for a general comparison between alternatives as documented in the EPA Guidance 'A Guide to Developing and Documenting Cost Estimates During the Feasibility Study EPA 540-R-00-002 OSWER 9355.0-75, 2000' (available at: https://semspub.epa.gov/work/HQ/174890.pdf), where the following accuracy is expected from FS costs:* *"Expected accuracy range of the cost estimate (e.g., –30 to +50 percent for detailed analysis of alternatives)".*

Response to Supplemental BCT Comments on the Draft Record of Decision (ROD) for Parcel F, Hunters Point Naval Shipyard, California

Comment		Response
		No additional changes were made to the ROD.
3.	**Response to Specific Comment 3:** The response partially addresses the comment. However, the roles of EPA, DTSC, and the Water Board have not been included in the revision. Please revise the response to include the roles of EPA, DTSC, and the Water Board.	*The agency roles have been included in the first paragraph of Section 1 as follows:* *"The U.S. Department of the Navy (Navy), the lead agency for site activities, and EPA, the support agency, jointly selected the remedy for Parcel F. The California Department of Toxic Substances Control (DTSC) and the San Francisco Bay Regional Water Quality Control Board (Water Board), also support agencies, concur on the remedy for Parcel F. The Navy, as the lead federal agency, provides funding under the Base Realignment and Closure (BRAC) program for site cleanups at HPNS. The Federal Facility Agreement (FFA) for HPNS documents how the Navy intends to meet and implement CERCLA in partnership with EPA, DTSC, and the Water Board."*
4.	**Response to Specific Comment 4:** The response addresses the comment; however, Figure 10 was not provided to ensure the location where Institutional Controls will be implemented in Parcel F are included. Please ensure Figure 10 is provided for review and that it includes the location where Institutional Controls will be implemented in Parcel F.	*Figure 10 will be included in the Draft Final ROD compiled PDF for BCT review.*
5.	**Response to Specific Comment 6:** The response partially addresses the comment. The response indicates that since the distribution of lead concentrations follows the distribution of polychlorinated biphenyls (PCBs), achieving the remedial goals (RGs) for PCBs via removal will also reduce the risks associated with lead; however, without confirmation sampling for lead, it is unclear how it will be confirmed that achieving the RGs for PCBs will also reduce the risks associated with lead. Typically, confirmation samples are not collected for contaminants that do not have RGs, but for these areas, confirmation sampling for lead should be required. Please revise the text to require collection of confirmation samples for lead analysis to confirm that the risks associated with lead have also been reduced.	*The following sentence has been added to the end of the Construction Monitoring paragraph of the Monitoring and Maintenance section of Section 2.10.2:* *"<u>Post-excavation, sediment confirmation samples will be collected for all COCs (copper, lead, mercury, and PCBs)</u>."*
6.	**Response to Specific Comment 7:** The response partially addresses the comment. While Sections 2.9.4 (Area III) and 2.9.5 (Areas IX and X) were revised to include estimated timeframes to achieve remedial action objectives (RAOs), the estimated timeframes included in Section 2.9.4 is not quantitative. For example, Section 2.9.4 text states that "RAOs would be achieved immediately after implementation of the remedy." Please revise Section 2.9.4 to provide a quantitative timeframe for each alternative.	*The following are estimated quantitative time frames added to Sections 2.9.4 and 2.9.5.* ***Section 2.9.4 (Area III)** – under Short-Term Effectiveness, the following changes are shown as underlined:* *"Under Alternative 1 …. <u>RAOs would not be achieved in a reasonable timeframe (greater than 30 years)</u>."*

Response to Supplemental BCT Comments on the Draft Record of Decision (ROD) for Parcel F, Hunters Point Naval Shipyard, California

	Comment	Response
		"Alternative 2 … RAOs would be achieved immediately after implementation of the remedy (0 years)." *"Alternatives 3 and 3A … RAOs would be achieved in water depths less than 30 feet immediately after implementation of the remedy (0 years)."* *"Alternatives 4 and 4A … RAOs would be achieved in water depths less than 30 feet immediately after implementation of the remedy (0 years)."* ***Section 2.9.5 (Areas IX and X)*** *under Short-Term Effectiveness, the following changes are shown as underlined:* *"The no-action alternative (Alternative 1) … RAOs would not be achieved in a reasonable timeframe (greater than 30 years).* *"Alternative 2 … RAOs would be achieved immediately after implementation of the remedy (0 years)."* *"Alternative 3 … RAOs are estimated to be achieved in approximately 14 years after implementation of the remedy from SEDCAM modeling (ECC-Insight and CDM Smith, 2017)."* *"Alternative 4 (MNR) … RAOs would not be achieved in a reasonable timeframe (greater than 30 years)."* *"Alternative 7 and Alternative 6/6A best meet the criterion for short-term effectiveness, with Alternative 5/5A rated slightly lower. Under Alternatives 5/5A and 6/6A, RAOs are estimated to be achieved in approximately 20 years. Under Alternative 7, RAOs are estimated to be achieved in approximately 8 years, as estimated from SEDCAM modeling (ECC-Insight and CDM Smith, 2017)."…*
7.	**Response to Specific Comment 9:** The response partially addresses the comment. While additional information was provided regarding why the surf scoter applies to other fish-eating birds, the text was not revised to clarify how baseline and hydrodynamic modeling will be used to ensure the design of the cap resists erosion from tidal currents and wave actions as well as re-contamination potential from the deeper Area III sediments. Please revise the text to discuss how baseline and hydrodynamic modeling will be used to ensure the design of the cap resists erosion from tidal currents and wave actions as well as re-contamination potential from the deeper Area III sediments.	*Details on the baseline and hydrodynamic modeling and the effects on the cap design will be included in the remedial design.*

Response to Supplemental BCT Comments on the Draft Record of Decision (ROD) for Parcel F, Hunters Point Naval Shipyard, California

Comment		Response
8.	**Response to Specific Comment 10:** The response partially addresses the comment. While the text was revised to provide the maximum concentration addressed during the pilot study and clarifies that it is assumed that the in situ treatment will achieve similar results to the pilot study, it remains unclear if the in situ treatment can address concentrations up to 12,400 micrograms per kilogram (µg/kg), which is approximately an order of magnitude higher than the maximum concentration treated during the pilot study (i.e., 1,410 µg/kg). Please revise the text to provide information to substantiate that in situ treatment can address PCB concentrations up to 12,400 µg/kg.	*The Navy agrees that the pilot study did not address PCB concentrations as high as 12,400 ug/kg. Performance monitoring will be conducted after remedy implementation as described in Response to DTSC General Comment 2 in order to ensure the remedy is as effective as documented in the pilot study.*
9.	**Response to Specific Comment 11:** The language proposed by EPA is required to be in all RODs. Please revised the Draft ROD to include the language as proposed. In addition, if there are uncertainties related to when the Navy can submit the LUC RD, please replace the phase “within 90 days of ROD signature” with “as specified in the FFA Schedule”.	*The referenced sentences have been replaced with the following in Section 2.10.2, Institutional Controls:* *“The Navy will prepare a LUC RD as the land use component of the Remedial Design as specified in the FFA schedule. The Navy shall prepare and submit to EPA, DTSC, and the Water Board for review and approval, a LUC RD that shall contain implementation and maintenance actions, including periodic inspections.”*

End of EPA Comments

Response to Supplemental BCT Comments on the Draft Record of Decision (ROD) for Parcel F, Hunters Point Naval Shipyard, California

The following supplemental comments were made in review of the Response to BCT Comments on the Draft ROD for Parcel F by Ms. Nina Bacey of Site Mitigation and Restoration Program-California Department of Toxic Substances Control (DTSC) via email dated 20 March 2019:

Comment		Response
	GENERAL COMMENTS	
1.	No further comment	*Response acknowledged.*
2.	The response does not address the comment. The response refers to EPA Specific Comment 12. That comment discusses the monitoring of backfill and cap remediation to ensure the remediation stays in place. My comment refers to monitoring to ensure that the cap is working and there is a reduced impact/exposure to the bioata. So that part of the Navy response is not relevant. The response also indicates that a revision was made to the draft final ROD, "The five-year review process will include sediment sampling and Areas IX/X in situ treatment area bioavailability monitoring, such as pore water or biota analysis and carbon amendment mixing zone depth, to ensure that the remedy continues to perform as designed." Providing sediment sampling data within the five-year review is not sufficient. Performance monitoring is required for PCBs in groundwater. DTSC requests further revision to this work plan. Please include within the text of the final ROD that performance and long-term effectiveness monitoring for PCBs in groundwater, such as pore water or biota analysis will be conducted. This can be included in a post-RA monitoring plan as is being done for the backfill and cap remediation.	*The text in the Draft Final ROD has been changed to ensure clarity that performance monitoring will be conducted annually in years 1 through 5 post-construction for both the in situ treatment (Areas IX and X) and the capping/backfill (Areas III and IX/X) remedies to verify that the remedy performs as intended.* *The following sentence has been added within Monitoring and Maintenance, Performance Monitoring of Section 2.10.2:* *"Bioavailability monitoring, such as porewater or biota analysis and carbon amendment mixing zone depth, will also be conducted annually in years 1 through 5 post-construction, and then at 5-year intervals during the five-year review process thereafter."*
3.	No further comment	*Response acknowledged.*
	SPECIFIC COMMENTS	
1.	• Comments 1 through 15 - No further comments • Comment #16 – See DTSC follow-up comment #2 above. • Comment #17 – The response does not address the comment. See #2 above. • Comments 18 through 27 - No further comments Comment 28 – The Navy indicated that the requested ARAR was added to the ROD, but the revision made was not correct. The revision was as follows: San Francisco Bay Plan at Cal. Code Regs.	*Response acknowledged. See Response to DTSC General Comment 2 above.* *Sections 10110 through 11990 were changed to Sections 66600 through 66682 under the CCR Title 14 San Francisco Bay Plan ARAR.*

Response to Supplemental BCT Comments on the Draft Record of Decision (ROD) for Parcel F, Hunters Point Naval Shipyard, California

Comment		Response
	• tit. 14, §§ 10110 through 11990 (McAteer-Petris Act). The Sections 10110 – 11990 refer to Suisun Marsh Protections. DTSC requested Sections 66600 through 66682 be included because they refer to Public Access, Climate Change, Shoreline Protection, Tidal Marshes and Tidal Flats, Subtidal Areas and Dredging, as indicated in the Bay Plan developed under the authority of the McAteer-Petris Act. Please revise.	

End of DTSC-Site Mitigation and Restoration Program Comments

**Response to Supplemental BCT Comments on the Draft Record of Decision (ROD) for Parcel F,
Hunters Point Naval Shipyard, California**

The following supplemental comments were made in review of the Response to BCT Comments on the Draft ROD for Parcel F by Ms. Kimberly C. Gettmann, Ph.D. of the DTSC, Human and Ecological Risk Office (HERO) on 20 March 2019:

	Comment	Response
	GENERAL COMMENTS	
1.	Response to General Comments 1a and 1b. Remediation Goals (RGs) a) Response to Comment 1a. HERO has previously commented that we do not concur with the proposed PCBs RG of 1,350 µg/kg, a 1 x 10^{-5} risk, for RAO 2. In response to our comment, the Navy has stated that a 1 x 10^{-6} PCB cleanup level would be below the PCB background level of 200 µg/kg. HERO cannot adequately respond to the Navy's response, given the ongoing discussions with the San Francisco Bay Regional Water Quality Control Board regarding whether 200 µg/kg is an appropriate background level for PCBs in sediment at this site. HERO will re-visit the Navy's response pending the Water Board's decision on the PCB background level in sediment. b) Response to Comment 1b. HERO concurs with the Navy's response to our General Comment 1b and we appreciate the additional text added to Section 2.8 to describe the methodology for estimating area weighted average (AWA) polygons. HERO recommends that the Navy and regulatory agencies have a detailed discussion prior to calculating the AWA polygons for PCBs. Specifically, the discussion should center on how the AWA polygons are drawn and divided among the sampling locations to ensure that the calculated AWA does not mask any potential PCB hot spots.	*1a. Comment acknowledged. The Navy reiterates that the chosen cleanup goal for RAO 2 of 1,350 ug/kg is based on a risk level of 10^{-5} which is in the NCP acceptable risk management range of 10^{-4} and 10^{-6}. Furthermore, the RAO 2 RG is not the final PCB remediation goal at Parcel F. The final, long-term PCB remediation goal is 200 ug/kg, which will be achieved immediately post-construction within Area III, and following active remediation and a period of MNR within Areas IX and X.* *1b. Response acknowledged. Additional details will be incorporated in the Remedial Design and submitted to the BCT for review.*
2.	HERO concurs with the Navy's response to our General Comment 2 and appreciates the additional text in Section 2.8. HERO has no additional comments.	*Response Acknowledged.*

End of DTSC HERO Comments

**Response to Supplemental BCT Comments on the Draft Record of Decision (ROD) for Parcel F,
Hunters Point Naval Shipyard, California**

The following supplemental comments were made in review of the Response to BCT Comments on the Draft ROD for Parcel F by Ms. Tami LaBonty of the California Department of Fish and Wildlife on 19 March 2019:

	Comment	Response
	SPECIFIC COMMENTS	
1.	Response to Specific Comment 1. The Navy responded, "Section 2.2.2 has been revised to include information regarding the species that occupy the various habitats at the site in the section titled Intertidal Wetlands and Bay Mudflats Habitat..." The Navy has provided information on common fish and invertebrate species within these habitats, but does not include information on bird and mammal species, or special status species present or potentially present in these areas. Such species include State fully protected California Brown Pelican and American Peregrine Falcon, State species of special concern Burrowing Owl, Northern Harrier, and Short-eared Owl, and State threatened longfin smelt. Please include this information in this section.	*Comment noted. The Navy will comply with the relevant State ARARs listed in Attachment 4 that apply to special status species. A biological avoidance and mitigation plan will be prepared as part of the remedial action work plan to ensure all remedial activities are protective of plant and wildlife species, and will include a biological survey conducted by a qualified biologist prior to the start of remediation work.* *No changes were made to the ROD in response to this additional comment.*
2.	Response to Specific Comment 2. The Navy responded, "Cost estimates for biological avoidance, minimization, and mitigation were not developed in the FS and, as a result, cost estimates for biological avoidance, minimization, and mitigation measures will not be included in the cost estimates presented in the ROD." If there are no cost estimates in the ROD for biological avoidance, minimization, and mitigation measures, please explain how the Navy plans to budget for and implement these types of measures to adequately protect special status species and habitats during remedial activities and comply with natural resource ARARs.	*The FS costs are estimates loosely translated to actual remedial costs and are intended for a general comparison between remedial alternatives. Per EPA Guidance 'A Guide to Developing and Documenting Cost Estimates During the Feasibility Study EPA 540-R-00-002 OSWER 9355.0-75, 2000' (available at: https://semspub.epa.gov/work/HQ/174890.pdf), the following accuracy is expected from FS Costs:* *"Expected accuracy range of the cost estimate (e.g., –30 to +50 percent for detailed analysis of alternatives)".* *Hence, the biological avoidance, minimization and mitigation activities fall within the -30 to +50 percent of the presented costs. Biological avoidance, minimization, and mitigation measures will be implemented pursuant to the biological avoidance and mitigation plan prepared as part of the remedial action work plan described in the response to the previous comment.* *No additional changes were made to the ROD.*

End of Fish and Wildlife Comments

Response to Supplemental BCT Comments on the Draft Record of Decision (ROD) for Parcel F, Hunters Point Naval Shipyard, California

The following supplemental comments were made in review of the Response to BCT Comments on the Draft ROD for Parcel F by Ms. Tina Low of the Regional Water Quality Control Board (Water Board) via email dated 20 March 2019

Comment		Response
	GENERAL COMMENTS	
1.	Thank you for providing the Responses to Comments (RTCs) to the Draft Parcel F ROD. We received these RTCs on March 5, and the Navy requested comments by March 20. As I communicated to the Navy on March 12 (via email request for an extension of the review period to April 18) and March 14 (at the BCT meeting), a two-week review period does not provide the Water Board sufficient time to evaluate the Navy's responses to our substantive comments. Specifically, the response to the Water Board's comment No. 1 regarding the nearshore ambient concentration of PCBs in sediment in San Francisco Bay requires further evaluation and discussion. Therefore, we cannot concur with the Navy's responses to our comments at this time.	*Comment Acknowledged.*

End of Water Board Comment

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Response to BCT Comments on
REVISED DRAFT FINALRECORD OF DECISION FOR PARCEL F
Hunters Point Naval Shipyard, San Francisco, California
Dated August 2022

The following comments were made Ms. Nina Bacey, Project Manager/Sr. Environmental Scientist with Department of Toxic Substances Control (DTSC), Site Mitigation & Restoration Program, via email on 23 September 2022:

Comment		**Response**
	GENERAL COMMENTS	
	DTSC has reviewed the revised draft final ROD for Parcel F and we have one outstanding comment that requires revision. Our toxicologist Kimberly Gettmann provided a comment back in 2019. We believe the Navy's response needs to be updated to reflect the new PCB RG of 148 ug/kg. See below comment and response. In addition, Table 5 and RAO 2 (Section 2.8) in the revised draft final were not updated to reflect the new RG. The lifetime cancer risk of 10-5 was determined based on a goal of 1,350 ug/kg. Therefore the 10-5 risk is no longer applicable. See below. Our other comments have been addressed.	Comment acknowledged. Please see response to Comment 1 below.
1.	Response to General Comments 1a and 1b. Remediation Goals (RGs) a) Response to Comment 1a. HERO has previously commented that we do not concur with the proposed PCBs RG of 1,350 µg/kg, a 1 x 10-5 risk, for RAO 2. In response to our comment, the Navy has stated that a 1 x 10-6 PCB cleanup level would be below the PCB background level of 200 µg/kg. HERO cannot adequately respond to the Navy's response, given the ongoing discussions with the San Francisco Bay Regional Water Quality Control Board regarding whether 200 µg/kg is an appropriate background level for PCBs in sediment at this site. HERO will re-visit the Navy's response pending the Water Board's decision on the PCB background level in sediment. Navy Response: *1a. Comment acknowledged. The Navy reiterates that the chosen cleanup goal for RAO 2 of 1,350 ug/kg is based on a risk level of 10-5 which is in the NCP acceptable risk management range of 10-4 and 10-6. Furthermore, the RAO 2 RG is not the final PCB remediation goal at Parcel F. The final, long-term PCB remediation goal* ***is 200 ug/kg****, which will be achieved immediately post-construction within Area III, and following active remediation and a period of MNR within Areas IX and X.*	Comment acknowledged. The response to this comment supersedes the 2019 response as follows: The Remedial Action Objective (RAO) 2 RG, using a risk level of 1 x 10-5, was calculated during the Feasibility Study (FS). RAO 2 and RAO 3 are independent of each other. The RAO 2 RG was calculated using the fish consumption assumptions indicated in the FS and is not related to the updated background level of 148 µg/kg; Incidentally, the RAO 2 RG at a 1 x 10-6 risk level (135 µg/kg) would be below the updated background level. As identified in the Revised Draft Final ROD dated August 2022, 148 µg/kg is the final long-term (RAO 3) PCB RG, which will be achieved immediately post-construction within Area III and along the subtidal areas of Areas IX and X, and otherwise following active remediation and a period of MNR throughout Areas IX and X.

Response to BCT Comments on
REVISED DRAFT FINALRECORD OF DECISION FOR PARCEL F
Hunters Point Naval Shipyard, San Francisco, California
Dated August 2022

<table>
<tr><th colspan="2">Comment</th><th>Response</th></tr>
<tr><td></td><td>
Table 5: Remediation Goals for Parcel F Surface Sediment COCs
<table>
<tr><th>RAO</th><th>COC</th><th>Remediation Goal</th><th>Basis</th></tr>
<tr><td rowspan="4">RAO 1</td><td>Copper</td><td>271 mg/kg</td><td rowspan="4">Not to exceed threshold</td></tr>
<tr><td>Lead</td><td>Not Established</td></tr>
<tr><td>Mercury</td><td>1.87 mg/kg</td></tr>
<tr><td>PCBs</td><td>1,240 μg/kg[1]</td></tr>
<tr><td>RAO 2</td><td>PCBs</td><td>1,350 μg/kg[1]</td><td rowspan="2">Area-weighted average</td></tr>
<tr><td>RAO 3</td><td>PCBs</td><td>148 μg/kg[1,2]</td></tr>
</table>
[1] This Remediation Goal will be met by analyzing for all 208 PCB congeners.
[2] 148 μg/kg represents the ambient sediment total PCB concentrations in San Francisco Bay which is based on a non-parametric 95^{th} percentile of the 2015 San Francisco Estuary Institute Regional Monitoring Program (SFEI RMP) ambient concentration dataset after removing data from Marin County and a visually high sample result in the vicinity of known impacted properties.
</td><td></td></tr>
<tr><td>2.</td><td>Section 2.8
• RAO 2: Potential human health risks from shellfish consumption and direct contact with sediment during shellfish collection were evaluated using Macoma nasuta tissue data from the laboratory bioaccumulation test to develop the second RAO. Future residents were assumed to harvest and consume shellfish from the intertidal areas of Parcel F and be incidentally exposed to sediment during harvesting. The PCB RG was</td><td>Section 2.8 was revised to refer to the FS risk study. The last 2 sentences of this paragraph describing RAO 2 were changed as follows, with changes shown as underlined:

"The RAO 2 RG risk was evaluated during the FS using the assumption of a shellfish consumption rate of 2.13 grams per day (g/day), and an assumption</td></tr>
</table>

Response to BCT Comments on
REVISED DRAFT FINALRECORD OF DECISION FOR PARCEL F
Hunters Point Naval Shipyard, San Francisco, California
Dated August 2022

Comment		Response
	developed based on a lifetime cancer risk of 1 x 10^{-5}, a shellfish consumption rate of 2.13 grams per day (g/day), and an assumption that 10 percent of the clams ingested are obtained from Parcel F. RAO 2 will be applied as AWA.	that 10 percent of the clams ingested are obtained from Parcel F. **RAO 2** will be applied as an AWA post-RA. This is not the final RG since the RAO 3 background level is 148 µg/kg." The **RAO 2** blue bolded font text will link to the section of the FS that describes RAOs.
3.	Hi Derek, One more thing. David at the Water Board pointed out to me that there is an agency signoff sheet in the ROD. The following information for DTSC's signoff should be revised. ~~Mark Malinowski, CEA, Northern California Cleanup Division, Site~~ Julie Pettijohn, Branch Chief Mitigation and Restoration Program Berkeley Office Department of Toxic Substances Control	The DTSC signoff has been revised accordingly.

END OF Ms. BACEY'S COMMENTS

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ATTACHMENT 5
PART 3:
FINAL TECHNICAL MEMORANDUM
REVISION TO TOTAL POLYCHLORINATED BIPHENYL BACKGROUND CONCENTRATION AND REMEDIAL ACTION OBJECTIVE 3 REMEDIATION GOAL
(DCN: INEC-2004-0014-0009)

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Naval Facilities Engineering Systems Command Southwest
BRAC PMO West
San Diego, California

FINAL

TECHNICAL MEMORANDUM

Revision to Total Polychlorinated Biphenyl Background Concentration and Remedial Action Objective 3 Remediation Goal, Parcel F Remedy

Hunters Point Naval Shipyard, San Francisco, California

June 2022

DCN: INEC-2004-0014-0009

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Naval Facilities Engineering Systems Command Southwest
BRAC PMO West
San Diego, California

FINAL

TECHNICAL MEMORANDUM

Revision to Total Polychlorinated Biphenyl Background Concentration and Remedial Action Objective 3 Remediation Goal, Parcel F Remedy

Hunters Point Naval Shipyard, San Francisco, California

June 2022

DCN: INEC-2004-0014-0009

Prepared for:
Department of the Navy
Naval Facilities Engineering Systems Command Southwest
BRAC PMO West
33000 Nixie Way, Bldg. 50
San Diego, CA 92147

Prepared by:
ECC-Insight
2749 Saturn Street
Brea, CA 92821

Contract Number: N62473-12-D-2004, Task Order: 0014

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FINAL TECHNICAL MEMORANDUM
Revision to Total Polychlorinated Biphenyl Background Concentration and Remedial Action Objective 3 Remediation Goal, Parcel F Remedy, Hunters Point Naval Shipyard, San Francisco, California

Date: June 21, 2022

To: Base Realignment and Closure Cleanup Team (BCT)

From: Sharon Ohannessian, Remedial Project Manager
Department of the Navy
Base Realignment and Closure (BRAC) Program Management Office (PMO) West, San Diego, California

Subject: Impacts of Revision to Total Polychlorinated Biphenyl Background Concentration and Remedial Action Objective 3 Remediation Goal, Parcel F Remedy, Hunters Point Naval Shipyard, San Francisco, California

Section 1 Introduction and Site Background

During the review and preparation of the Draft Final Record of Decision (ROD) for Parcel F, Hunters Point Naval Shipyard (HPNS) (Navy, 2019), the San Francisco Bay Regional Water Quality Control Board (Water Board), through a series of correspondence, requested a revision to the total polychlorinated biphenyl (PCB) background concentration from 200 micrograms per kilogram (µg/kg) to 148 µg/kg. This request also led to further BCT discussion on cleanup goals for both HPNS Parcel F and Yosemite Slough (Yosemite Slough being one of the sources of potential PCBs to HPNS Parcel F). The United States Environmental Protection Agency (EPA), the lead agency for the cleanup of Yosemite Slough, prepared a Technical Memorandum to evaluate the impacts of the revision to the PCB background concentration to the Yosemite Slough remedy (EA EST and EPA, 2021).

This Technical Memorandum documents the Navy's qualitative and quantitative evaluations of the revised total PCB sediment background concentration, which relates to the remedial action objective (RAO) 3 for the total PCB remediation goal (RG) for Parcel F from 200 µg/kg to 148 µg/kg on an area-weighted average (AWA) basis. A sensitivity analysis and identification of technical and cost implications for the Parcel F remedy are presented. This work was performed by ECC-Insight LLC (ECC-Insight) and CDM Smith for Naval Facilities Engineering Systems Command Southwest under Contract No. N62473-12-D-2004, Task Order No. 0014.

This Technical Memorandum consists of the following:

Section 1 – Introduction and Site Background – provides a Summary of the Objectives of this Technical Memorandum and site background.

Section 2 – Parcel F Remedy – provides a summary of the Parcel F Remedy, the three RAOs, and the preliminary RGs.

Section 3 – Total PCB Background Concentration – provides a summary of the development of the total PCB background concentration for Parcel F.

Section 4 – Technical Impacts of a Revised Total PCB Background Concentration on Parcel F Selected Remedy – summarizes the technical impacts of the Parcel F remedy that would arise from adopting 148 µg/kg as the total PCB background concentration.

Section 5 - Cost Impacts of Revised Total PCB Background Concentration on Parcel F Selected Remedy – summarizes the anticipated cost impacts to the Parcel F selected remedy that would arise from adopting a revised 148 µg/kg total PCB background concentration.

Section 6 – Conclusion and Path Forward – summarizes the potential impacts of revising the total PCB background concentration from 200 µg/kg to 148 µg/kg.

Section 7 – References – presents the references for this Technical Memorandum.

Attachment 1 – SEDCAM (Sediment Contamination Assessment Model) Sensitivity Analysis – presents the results of the SEDCAM sensitivity analysis.

Attachment 2 – Revised Areas IX/X Remedy Cost Estimate – presents the cost impacts of the revised total PCB background concentration on the Parcel F remedy.

Attachment 3 – Response to BCT Comments – presents the Navy responses to BCT comments on the Draft Technical Memorandum.

1.1 Hunters Point Naval Shipyard

HPNS is a former naval shipyard facility located on a peninsula in southeast San Francisco, California that extends into San Francisco Bay (Figure 1). The peninsula is bounded to the north, east, and south by San Francisco Bay; and to the west by the Bayview Hunters Point district. HPNS has a current acreage of 934 acres (491 acres of land and 443 acres offshore).

1.2 Parcel F Site Background

Past shipyard operations left hazardous materials and chemicals on site. These chemicals migrated to San Francisco Bay through groundwater discharge, storm and surface water runoff, and soil erosion. Some releases occurred directly to San Francisco Bay from overwater activities at HPNS. These releases resulted in sediment contamination in some areas of the 443-acre Parcel F.

Figure 1. HPNS Location.

Parcel F was initially subdivided into 11 subareas (Areas I through XI) because of its size and complexity. Early site investigations identified Areas I, III, VIII, IX, and X for further evaluation (Figure 2). Subsequent studies refined this list to Areas III, IX, and X requiring management decisions to address potentially unacceptable levels of environmental contamination.

Area III is an open water area within San Francisco Bay offshore of Point Avisadero. Area III is adjacent to navigation areas in the bay and is characterized by water depths up to 70 feet. A shelf of sediments exists in the northern and western portion of Area III in the vicinity of a drainage tunnel outfall on Point Avisadero (Barajas and Associates et al., 2007). This shelf and the armored banks of Point Avisadero both slope steeply to the northeast.

Areas IX and X are within a shallow embayment (the South Basin) located to the south of HPNS, between HPNS and Candlestick Point, with water depths ranging from 6 inches to less than 2 feet (Battelle et al., 2005). Circulation in the South Basin is restricted, and tidal currents are weak. The South Basin is a net depositional environment subject to infrequent resuspension events. The most significant sediment resuspension occurs from storm waves generated from southeast winds during the winter. Yosemite Slough enters the South Basin from the west; this slough is characterized as a shallow, tidally influenced channel with no permanent flow.

Information related to sediment transport in the South Basin is available from the Parcel F validation study (Battelle et al., 2005), the Parcel F Feasibility Study (FS) data gaps investigation (Battelle et al., 2007), and a hydrodynamic modeling, wave analysis and sedimentation evaluation for Yosemite Slough (Noble, 2005). Multiple lines of evidence contained within these documents indicate:

- The South Basin sediment bed is stable, based on the preservation of well-defined, consistent PCB profiles in sediment cores throughout the basin.
- Tidal circulation in the South Basin is weak and variable, with a low potential of sediment re-suspension, and the basin is a net depositional environment.
- The general stability of the sediments and PCB distributions in the South Basin illustrate that there is negligible lateral transport within Areas IX/X, or from HPNS Parcels E and E-2 source areas or Areas IX/X into Yosemite Slough. Therefore, any sediments that are re-suspended due to tidal or wave action are expected to be re-deposited locally to the sediment bed.

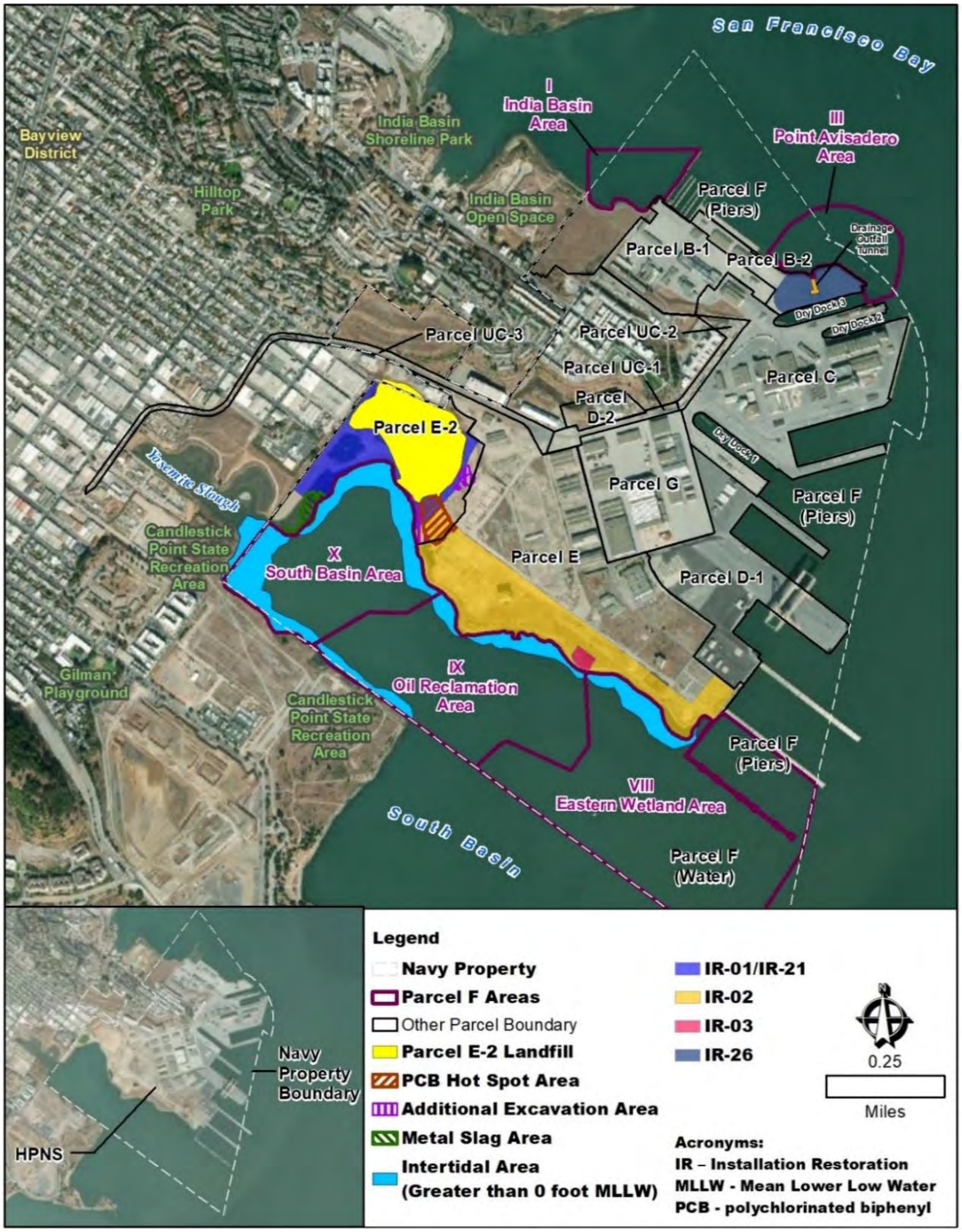

Figure 2. HPNS Parcels and Parcel F Areas

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Section 2 Parcel F Remedy

The 2008 Parcel F FS (Barajas and Associates, 2008) proposed RAOs and preliminary RGs for chemicals of concern (COCs), evaluated potential cleanup alternatives and associated costs for contaminated sediments.

The three RAOs proposed for Parcel F in the 2008 FS were:

- RAO 1: Reduce to acceptable levels the risk to birds, including surf scoters, from benthic feeding and fish-eating exposure to copper, lead, mercury, and total PCBs through eating of contaminated prey and incidental ingestion of sediments.
- RAO 2: Limit or reduce the potential risk to human health from eating shellfish from Parcel F.
- RAO 3: Limit or reduce the potential biomagnification of total PCBs at higher trophic levels in the food chain to reduce the potential risk to human health from eating sport fish.

In April 2018, the Navy released a Proposed Plan (Navy, 2018) for cleanup of contaminated sediments at HPNS Parcel F. The Proposed Plan summarizes the cleanup alternatives developed through the 2008 Parcel F FS, 2017 FS addendum (KCH, 2017), and 2017 remedy optimization study (ECC-Insight, LLC and CDM Smith, 2017), and documents the preferred alternatives for addressing contaminated sediments at Areas III and IX/X. The Navy's preferred alternatives received BCT concurrence.

The Navy's proposed cleanup plan for Parcel F sediments, as documented in the Proposed Plan, included the following:

- Area III: Capping to prevent contact with metals (copper, lead, and mercury) or PCBs in sediments in water depths less than 30 feet, with focused removal of nearshore sediments.
- Areas IX/X: Treating sediments in deeper water using carbon-based amendments, with focused removal of sediments in shallow water areas or where very high concentrations of PCBs are present, and monitored natural recovery (MNR) of sediments where levels of PCBs are lower but exceed the background concentration [200 µg/kg] established for nearshore sediments within San Francisco Bay.
- Parcel F-Wide: Institutional controls (ICs) to limit public exposure and maintain the integrity of the remedy.

2.1 Final Remedial Action Objectives and Remediation Goals

The RAOs in the Proposed Plan and draft final Parcel F ROD are the same as the RAOs from the 2008 Parcel F FS. The RGs presented in the Proposed Plan and draft final ROD, summarized in Table 1, are preliminary.

Background concentrations for copper, lead, and mercury were estimated at 68.1 milligrams per kilogram (mg/kg), 43.2 mg/kg, and 0.43 mg/kg, respectively. The RG for PCBs of 200 µg/kg was selected to represent the upper end of nearshore ambient sediment total PCB concentrations in San Francisco Bay. This background concentration was based on the Water Board (2003) evaluation of background data under Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) statute and Navy policy, where RGs are not set at concentrations below natural or ambient background levels. The RAO 3 PCBs RG has been modified from 200 µg/kg to 148 µg/kg to reflect the updated background concentration after the issuance of the Draft Final ROD.

Table 1. Remediation Goals for Parcel F Remedy (Proposed Plan and Draft Final ROD– Navy, 2018 and 2019)

RAO	COC	RG	Basis
RAO 1[(1)]	Copper	271 mg/kg	Not to exceed thresholds
	Lead	NE	
	Mercury	1.87 mg/kg	
	PCBs	1,240 µg/kg[(2)]	
RAO 2[(3)]	PCBs	1,350 µg/kg[(2)]	AWA threshold
RAO 3	PCBs	200 µg/kg[(2,4)]	AWA threshold

Notes:

AWA = area-weighted average
mg/kg = milligrams per kilogram (or parts per million)
NE = none established
µg/kg = micrograms per kilogram (or parts per billion)
(1) RGs for RAO 1 were developed using data from collocated sediment and laboratory-exposed clam tissue concentrations in a food chain model based on risk to the surf scoter.
(2) Based on analysis of PCB congeners.
(3) The RG for RAO 2 was developed based on clam tissue data from laboratory bioaccumulation testing and potential incidental exposure to sediments during shellfish harvesting.
(4) A numerical RG of 200 µg/kg was selected to represent the upper end of nearshore ambient total PCB concentrations in sediments in San Francisco Bay. The RAO 3 PCBs RG has been modified from 200 µg/kg to 148 µg/kg to reflect the updated background concentration after the issuance of the Draft Final ROD.

2.2 Selected Remedy for Parcel F

The selected remedy for Parcel F is as follows:

- Area III: Focused removal and backfill, off-site disposal, capping, and ICs to maintain the integrity of the remedy.
- Areas IX/X: Focused removal and backfill, in situ treatment, off-site disposal, MNR, and ICs to maintain the integrity of the remedy.

- Parcel F-Wide: ICs implemented to require proper management of low-level radiological objects that may be encountered in sediment during future site activities.

The following two sub-sections provide additional detail related to the selected remedy in Areas III and IX/X.

Area III

The selected remedy for Area III is a combination of focused sediment removal and backfill, capping, and ICs. Characterization will be required prior to remedy construction to refine the remedial footprint, accurately establish sediment removal volumes, assess geotechnical characteristics, and inform decisions for the management and disposal of contaminated sediments and water generated during implementation.

The selected remedy will achieve the RAO 1 RGs in Area III sediments in water depths less than 30 feet immediately after remedial construction is complete. Based on currently available information, the selected remedy will achieve the RGs for RAOs 2 and 3 for total PCBs immediately following remedy construction, with an estimated post-construction total PCB AWA concentration of 52.4 µg/kg.

Areas IX/X

The selected remedy for Areas IX/X is a combination of focused removal and backfill, in situ treatment, MNR, and ICs. Characterization will be required prior to remedy construction to refine the remedial footprint, accurately establish removal volumes, assess geotechnical characteristics, and inform decisions for the management and disposal of contaminated sediments and water generated during construction. Coordination will be required with HPNS Parcels E and E-2 shoreline and Yosemite Slough remedial activities. sediments will be addressed based on PCB concentration, with higher concentrations addressed by removal or in situ treatment, and lower concentrations addressed by MNR. Sediments to be removed include intertidal and subtidal sediments with metal concentrations above the RAO 1 RGs. In situ treatment with carbon-based amendments will be used to treat PCBs. Application of the carbon-based in situ treatment amendments will rely on bioturbation to mix amendments into the sediment bed. Based on the in situ treatment pilot study results (KCH, 2018), the effective (i.e., bioavailable) PCB concentrations will be reduced by 90% in the treatment zone.

Based on currently available information, at the completion of construction this multi-component remedial strategy will result in an estimated AWA total PCB concentration of approximately 260 µg/kg for Area IX, and 330 µg/kg for Area X. These post-construction total PCB AWA concentrations achieve the RAO 2 RGs. As a long-term RG, the remedy will rely on MNR to achieve the RAO 3 RG for total PCBs.

Institutional Controls

ICs to be implemented for Areas III and IX/X include:

- Restricting water uses, including limitations on digging or clamming, to limit the potential for human exposure and protect the remedy from disturbance. The clamming and digging restrictions would be implemented by posting warning signs and/or through public outreach and education.
- Restricting activities, including: sediment disturbance; alteration, disturbance, or removal of any component of the remedy (including cap/containment systems); and removal of, or damage to security features or signs.

Parcel F-wide ICs to be implemented include:

- Procedures for the proper assessment of sediments and the segregation, proper management, and disposal of low-level radiological objects (e.g., radioluminescent dials, gauges, and deck markers) if encountered during future site redevelopment or other sediment disturbing activities.

Monitoring and Maintenance

The selected remedies for Areas III and IX/X include monitoring and maintenance activities that will be performed as long as necessary to achieve the RAOs and to comply with the substantive provisions of pertinent state and federal applicable or relevant and appropriate requirements (ARARs).

Monitoring activities will include the following:

- Baseline Monitoring: Baseline monitoring will be performed before RA implementation to characterize pre-RA conditions prior to construction. Baseline monitoring may include sediment sampling as well as hydrodynamic modeling within Areas III and IX/X. Baseline monitoring results will be used to refine the various remediation zones, sediment removal depths, cap requirements, backfill requirements, and in situ amendment requirements.
- Construction Monitoring: Monitoring will be implemented during remedial activities for construction quality control and to minimize offsite impacts. Care will be taken during construction to not affect adjacent sediment sites. Construction monitoring may include: water quality monitoring; confirmation sampling; and as prescribed in the remedial design, bathymetric surveying to ensure sediments are removed to required depths, backfill and cap materials are placed to required elevations, and in situ treatment materials are placed appropriately.
- Performance Monitoring: After the remedy is implemented, performance monitoring will be conducted to verify that the remedy is performing as intended and offsite impacts are minimized. Data will be collected to ensure that backfill, capping, and in situ treatment continue to meet design specifications and perform as intended. Routine physical inspections (e.g., for erosion) will be conducted of the removal and backfill and cap remediation zones in Area III, and the removal with backfill and in situ remediation zones in Areas IX/X. Inspections, monitoring,

and repairs, as necessary, will be conducted of the backfill and cap zones of Areas III and IX/X and the Areas IX/X in situ treatment area after high intensity storms. If it is determined that the remedy is not performing as intended, contingency measures will be evaluated and implemented, as necessary.

- Long-Term RG Monitoring: Long-term monitoring of surface sediments will be conducted in Areas IX/X to monitor progress towards achieving the RAO 3 total PCB RGs on an AWA basis, and minimize offsite impacts. Long-term RG monitoring will not be conducted in Area III, because all RGs will be achieved immediately after remedy implementation.

In addition, the selected remedies will be subject to statutory reviews every 5 years pursuant to CERCLA to ensure that they remain protective of human health and the environment. The five-year review process will include sediment sampling, surveying to ensure backfill and cap areas remain protective, and Areas IX/X in situ treatment area bioavailability monitoring to ensure that the remedy continues to perform as designed. IC implementation, maintenance, and enforcement will also be monitored. Information associated with performance, long-term RGs, and ICs monitoring will be incorporated into the five-year reviews.

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Section 3 Total PCB Background Concentration

The total PCB background concentration was previously estimated at 200 µg/kg (Barajas and Associates, 2008; Navy, 2018 and 2019). This value was selected to represent the upper end of nearshore ambient sediment total PCB concentrations in San Francisco Bay.

Under CERCLA statute and Navy policy, RGs are not set at concentrations below natural or ambient background levels. Therefore, RAO 3 was qualitatively evaluated in the FS (Barajas and Associates, 2008), to assess whether achieving the RGs developed for ecological exposures addressed human health risks. Specifically, it was determined that consideration would be given to achieving an AWA total PCB concentration that is consistent with the total PCBs upper-bound nearshore ambient concentration in San Francisco Bay.

3.1 Proposed Revision for Total PCB Background Concentration

In 2019, the Water Board proposed a revision of the total PCB background concentration from 200 to 148 µg/kg, which is based on a non-parametric 95th percentile of the 2015 San Francisco Estuary Institute Regional Monitoring Program (SFEI RMP) dataset after removing data from Marin County and a visually high sample result in the vicinity of known impacted properties. The Navy agreed to evaluate this proposed revision to the total PCB background concentration and its impact on the Parcel F remedy. The EPA also agreed to evaluate the same revision to the total PCB background concentration (i.e., 148 µg/kg) for the Yosemite Slough remediation that EPA is performing separately. A technical memorandum was prepared for the Yosemite Slough site in February 2021 documenting the 148 µg/kg proposed background concentration and the technical and cost implications to the Yosemite Slough remediation program (EA EST and EPA, 2021). That technical memorandum updated the alternative selected in EPA's Yosemite Slough Action Memorandum to incorporate newer data, and further evaluated the updated alternative based on the use of enhanced MNR as a remedy component. The EPA technical memorandum also evaluated an alternative comprised of sediment removal and capping for Yosemite Slough. The EPA plans to update the Action Memorandum for Yosemite Slough in conjunction with the proposed change to the Parcel F ROD.

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Section 4 Technical Impacts of Revised Total PCB Background Concentration on Parcel F Selected Remedy

The following sections describe the anticipated technical impacts to the Parcel F remedy that would arise from adopting the proposed 148 µg/kg total PCB background concentration.

4.1 Technical Impacts to Area III Remedy

The selected remedy for Area III will achieve the RAO 1 RGs in water depths less than 30 feet, immediately after remedial construction is complete. Based on currently available information, the selected remedy will also achieve a post-construction total PCB AWA concentration of 52.4 µg/kg. This post-construction total PCB AWA concentration is well below the RAO 2 AWA-based RG of 1,350 µg/kg and below a total PCB background concentration (i.e., the basis of the RAO 3 AWA-based RG) of either 200 µg/kg or 148 µg/kg.

Based on information currently available, there would be no necessary change to the Area III remedy resulting from adopting 148 µg/kg as the total PCB background concentration. However, Area III characterization will still be required prior to RA to confirm the planned remedial footprint, accurately establish removal volumes, assess geotechnical characteristics, and inform decision-making for the management and disposal of contaminated sediments and water generated during construction. This pre-RA characterization would delineate COC impacts and could update the currently estimated capping and sediment removal footprints (and sediment removal depths) based on delineated COC impacts.

4.2 Technical Impacts to Areas IX/X Remedy

Sediments in Areas IX/X with metal concentrations above the RAO 1 RGs are confined to areas of intertidal or subtidal sediments that will be removed based on total PCB concentrations. This includes intertidal sediments with PCB concentrations exceeding the RAO 1 total PCB RG of 1,240 µg/kg and subtidal sediments with PCB concentrations exceeding 12,400 µg/kg. Therefore, exceedances of RAO 1 RGs for PCBs will be remediated through sediment removal in the intertidal zone, and exceedances of RAO 1 RGs for metals will be remediated through sediment removal regardless of tidal zone.

In situ treatment with carbon-based amendments will be used to treat PCBs in subtidal sediments where concentrations are between 1,240 µg/kg and 12,400 µg/kg. Based on prior pilot study activities, it is expected that PCB concentrations will be reduced by 90% in the treatment zone (e.g., from 12,400 µg/kg to the RAO 1 RG of 1,240 µg/kg).

At the completion of construction, based on currently available information, the multi-component remedial strategy will result in AWA total PCB concentrations of approximately 260 µg/kg for Area IX, and 330 µg/kg for Area X. These post-construction total PCB AWA concentrations are well below the RAO 2 AWA-based RG of 1,350 µg/kg, but exceed a total PCB background concentration (i.e., the basis of the RAO 3 AWA-based RG) of either 200 µg/kg or 148 µg/kg. The remedy will rely on MNR to achieve the RAO 3 AWA-based, long-term RG for total PCBs.

To support the Parcel F remedy decision-making process, natural recovery modeling was performed using the SEDCAM model to evaluate the amount of time needed for surface sediments within Areas IX and X to reach the RAO 3 AWA-based RG of 200 µg/kg (ECC-Insight, LLC and CDM Smith, 2017; Table 2).

Table 2. SEDCAM Model Parameters

Parameter	Value	Basis
Sedimentation Rate	0.5 cm/year	The sedimentation rate of 0.5 cm/year is a conservative value based on evaluation of South Basin radioisotope core data (Barajas and Associates et al., 2008) and observed (very low) sedimentation in Yosemite Slough; higher rates of sedimentation have been documented for the South Basin based on sediment trap data in Areas IX/X (i.e., 1 cm/year) or estimated from sediment profile imaging (SPI) during the carbon amendment pilot study (i.e., 3 cm/year or more) (KCH, 2018) and from bathymetric surveying in the South Basin (i.e., 3.4 to 3.5 cm/year) (Navy, 2019).
Incoming Sediment Total PCB Concentration	121 µg/kg	The incoming sediment concentration of 121 µg/kg was based on sediment trap data at the mouth of the South Basin averaged over three deployments (Battelle et al., 2005).
Mixed Layer Thickness	4 cm	The mixed layer thickness of 4 cm is based on SPI completed during the carbon amendment pilot study (KCH, 2018); other SPI and sediment coring observations suggest a biologically active zone that extends 10 to 15 cm, or perhaps as deep as 30 cm (Navy, 2019).
PCB Decay Rate	0	PCBs are conservatively assumed to undergo no degradation.

Notes: cm = centimeter(s)

SEDCAM (Jacobs et al., 1988) is a one-dimensional mass balance box model that predicts sediment concentrations given source loading and rates of sedimentation, sediment mixing, chemical transformation, dispersion, and diffusion over time. The model incorporates steady-state sedimentation and contaminant loading rates, and includes a decay rate for non-conservative constituents, though this term can also be used to account for other processes such as in-sediment diffusion. The mass balance components of SEDCAM require information on sedimentation rates and contamination concentrations in incoming sediment. SEDCAM simulates a simplified sediment surface with constant inputs over time. Information regarding sediment characteristics, such as the thickness of the surface mixed layer in the sediment bed based on previous studies at HPNS, are summarized in Table 2.

The SEDCAM modeling incorporates the following equation:

$$C(t) = C(p) \times (1 - e^{-t(ML/Rs}) + C(0) \times e^{-t/(\frac{ML}{Rs})}$$

Where:

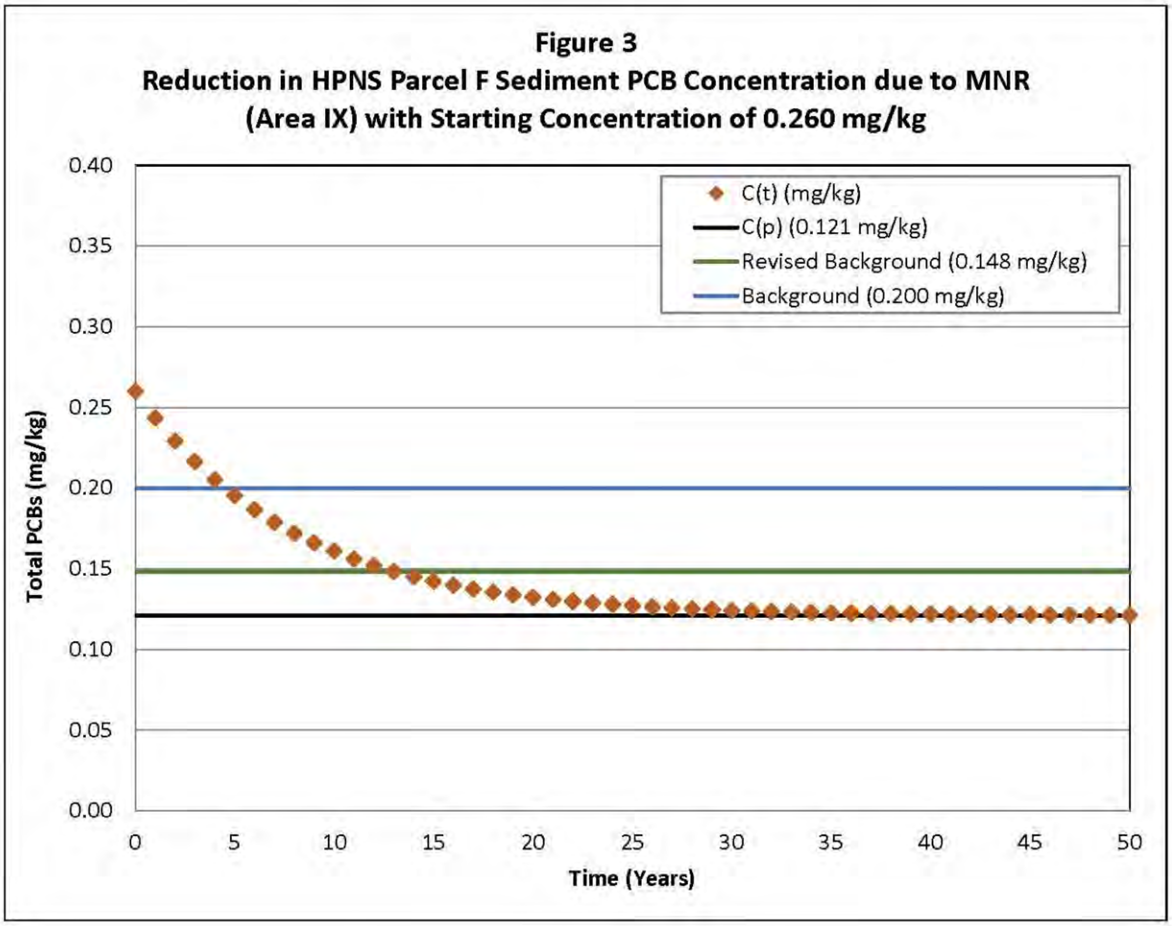
- C(t) is the surface sediment concentration at time t
- C(p) is the incoming sediment concentration
- ML is the mixing depth
- Rs is the sedimentation rate
- C(0) is the initial surface sediment concentration (i.e., the post-RA AWA)

The equation can be solved to predict the surface sediment concentration at particular future time steps or the future time at which a specific surface sediment concentration would be observed. SEDCAM results tend to show convergence over time to a steady state surface sediment contaminant concentration.

Based on the SEDCAM modeling, it was concluded in the Proposed Plan and draft final Parcel F ROD that the RAO 3 AWA-based RG of 200 µg/kg total PCBs would be reached through MNR within 5 years for Area IX and within 8 years for Area X (Navy, 2018 and 2019).

The post-construction AWA total PCB concentrations for Areas IX (260 µg/kg) and X (330 µg/kg) are generally consistent with the overall distribution of data that make up the 2015 SFEI RMP dataset. The proposed total PCB background concentration of 148 µg/kg is based on the 2015 SFEI RMP dataset. Specifically, there are individual data points within the 2015 background dataset with total PCB concentrations up to approximately 345 µg/kg after removal of the one visually high concentration in the vicinity of known contaminated properties. In addition, there is no required timeframe for achieving cleanup to the RAO 3 background-based RG under any project ARARs.

Accordingly, the remedial approach documented in the Proposed Plan and draft final Parcel F ROD for Areas IX/X remains valid. However, implementing the remedial approach documented in the Proposed Plan and draft final ROD and achieving post-construction AWA total PCB concentrations of 260 µg/kg in Area IX, and 330 µg/kg in Area X would require longer MNR timeframes to attain the RAO 3 RG if that RG were revised to 148 µg/kg. To evaluate the additional time needed to attain the RAO 3 RG AWA for total PCBs of 148 µg/kg, the SEDCAM model was revisited. The same input parameters summarized in Table 2 were applied, and future annual concentrations were predicted and assessed to determine the time at which the 148 µg/kg level would be attained. For Area IX, an AWA total PCB concentration of 148 µg/kg would be reached through MNR within approximately 13 years. For Area X, an AWA total PCB concentration of 148 µg/kg would be reached through MNR within approximately 17 years (Figures 3 and 4).



Notes
Post-Construction Surface Sediment Total PCB Concentration = 0.260 mg/kg
Sediment Deposition Rate = 0.5 cm/yr
Sediment Mixing Depth = 4 cm
Time to Revised Background is approximately 13 years

Acronyms/Abbreviations
C(p) - concentration of total PCBs in incoming sediment
cm/yr - centimeter(s) per year
C(t) - concentration of total PCBs at time t
HPNS - Hunters Point Naval Shipyard
mg/kg - milligram(s) per kilogram
MNR - monitored natural recovery
PCB - polychlorinated biphenyl

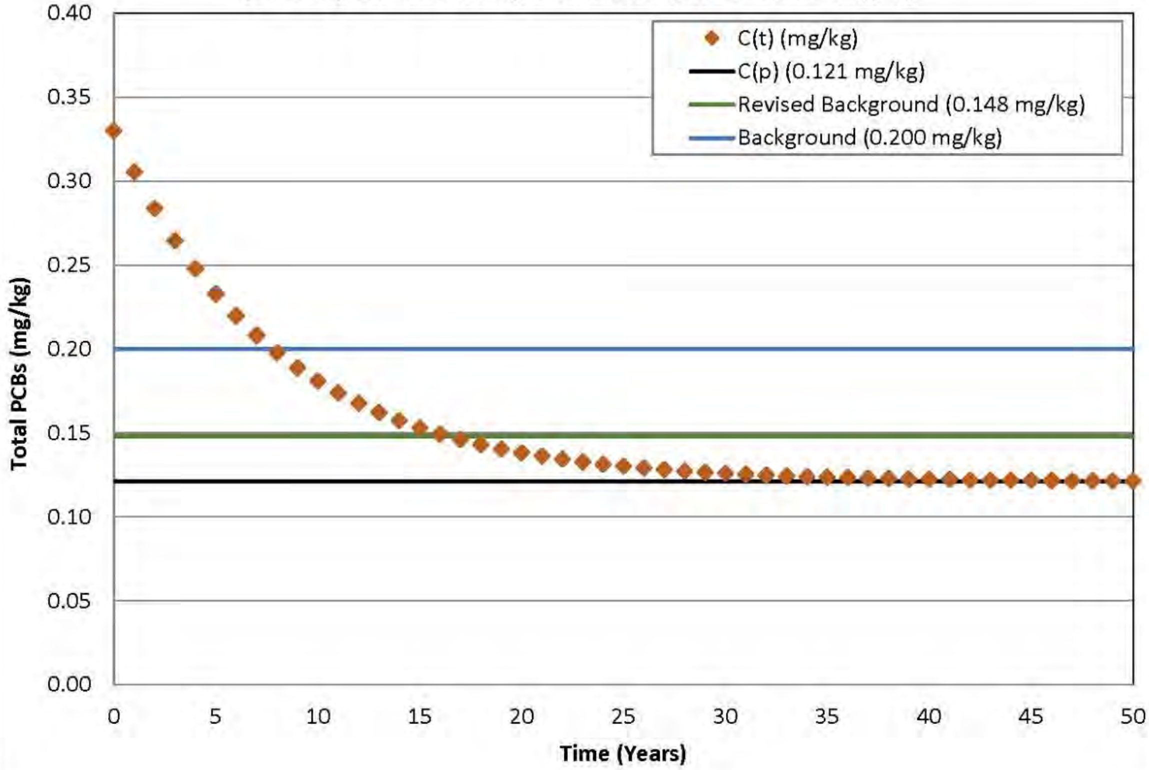
Along with longer MNR timeframes to attain an AWA total PCB concentration of 148 µg/kg, timeframes over which particular ICs are in place, monitored, and enforced would be extended, and timeframes over which long-term monitoring of sediment PCB concentrations, required to verify attainment of the RAO 3 RG in Areas IX/X, would also be extended.

The Navy also evaluated a modified remedy, identified as Alternative 7 Modified, for Areas IX/X relative to the remedy described in the Proposed Plan. The purpose of Alternative 7 Modified is to mitigate the longer MNR timeframes needed to attain a lower total PCB background level. The modified remedy is comprised of the same technology assemblage as described in the Proposed Plan, but applies a greater degree of active remediation in the vicinity of Yosemite Slough, thereby achieving a lower post-construction AWA total PCB concentration for Area X. By applying a greater degree of active remediation in the vicinity of Yosemite Slough, MNR is accelerated to attain the lower total PCB background level in a timeframe consistent with the original Proposed Plan remedy MNR timeframe. The modification to the Areas IX/X remedy relative to the Proposed Plan is reflected in Figure 5.

As noted on Figure 5, under Alternative 7 Modified the Area IX remedy continues to be largely MNR with a limited amount of removal and backfill, unchanged from the Area IX remedy as described in the Proposed Plan. Based on currently available information, at the completion of construction this remedial strategy will result in an estimated AWA total PCB concentration of approximately 260 µg/kg for Area IX, unchanged from the conclusions of the Proposed Plan. Under Alternative 7 Modified, the Area X remedy would be characterized by approximately 220,000 square feet (approximately 5 acres) of sediments being revised from in situ treatment to removal and backfill, compared to the Area X remedy as described in the Proposed Plan. The areas where in situ treatment is revised to be removal and backfill are contiguous areas in proximity to Yosemite Slough. Based on currently available information, at the completion of construction this revised remedial strategy will result in an estimated AWA total PCB concentration of approximately 193 µg/kg for Area X, compared to 330 µg/kg for Area X when applying the Area X remedy as described in the Proposed Plan.

The SEDCAM model was revisited to evaluate the time needed to attain the total PCB background level of 148 µg/kg, after implementing Alternative 7 Modified for Areas IX/X as described by Figure 5. The same input parameters summarized in Table 2 were applied, and future annual concentrations were predicted and assessed to determine the time at which the 148 µg/kg total PCB background level would be attained. For Alternative 7 Modified in Area IX, an AWA total PCB concentration of 148 µg/kg would be reached through MNR within approximately 13 years, compared to approximately 5 years to reach 200 µg/kg background in the Proposed Plan.

Figure 4
Reduction in HPNS Parcel F Sediment PCB Concentration due to MNR (Area X) with Starting Concentration of 0.330 mg/kg



Notes
Post-Construction Surface Sediment Total PCB Concentration = 0.330 mg/kg
Sediment Deposition Rate = 0.5 cm/yr
Sediment Mixing Depth = 4 cm
Time to Revised Background is approximately 17 years

Acronyms/Abbreviations
C(p) - concentration of total PCBs in incoming sediment
cm/yr - centimeter(s) per year
C(t) - concentration of total PCBs at time t
HPNS - Hunters Point Naval Shipyard
mg/kg - milligram(s) per kilogram
MNR - monitored natural recovery
PCB - polychlorinated biphenyl

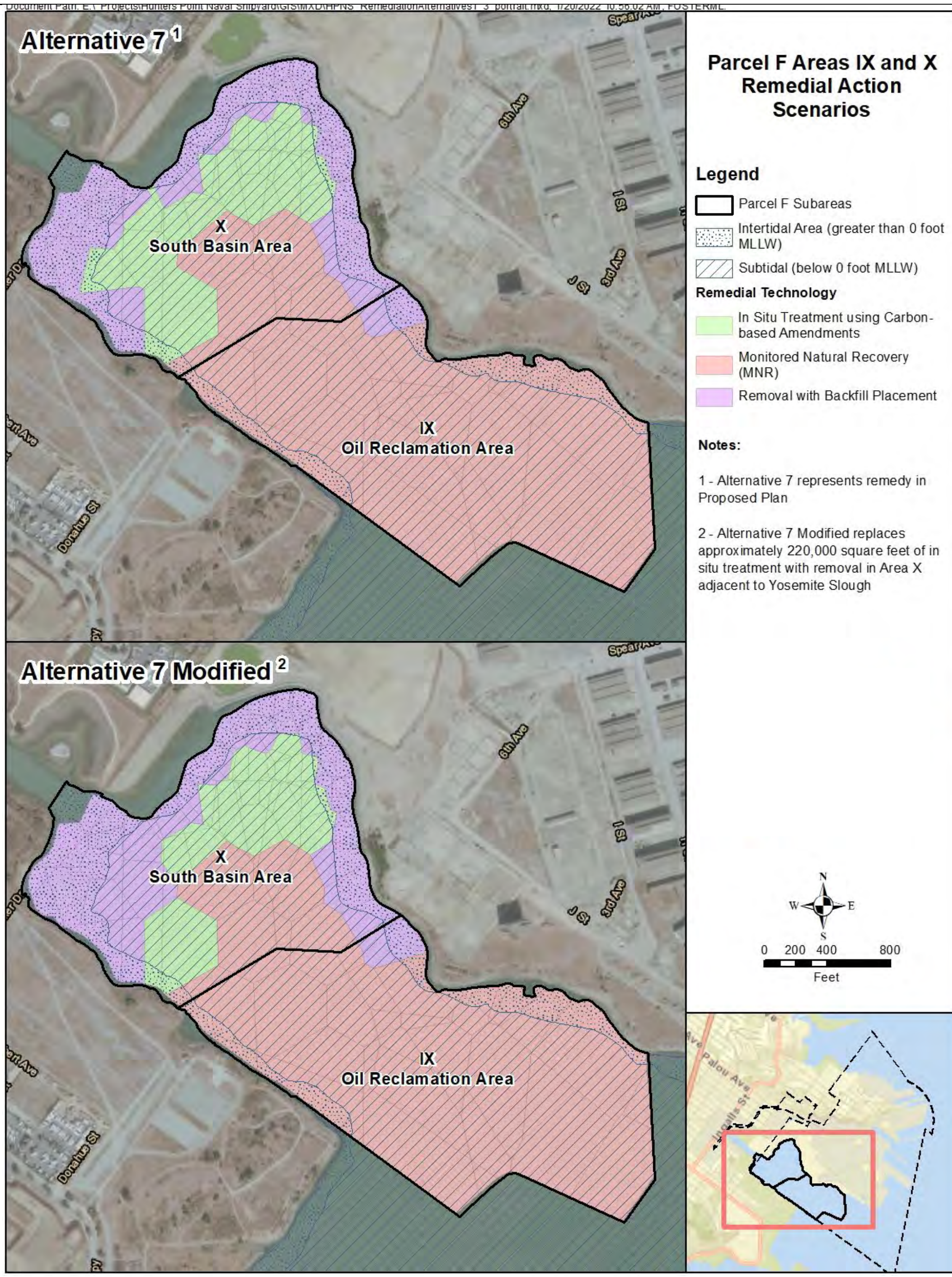


Figure 5. Alternative 7 Modified for Areas IX/X.

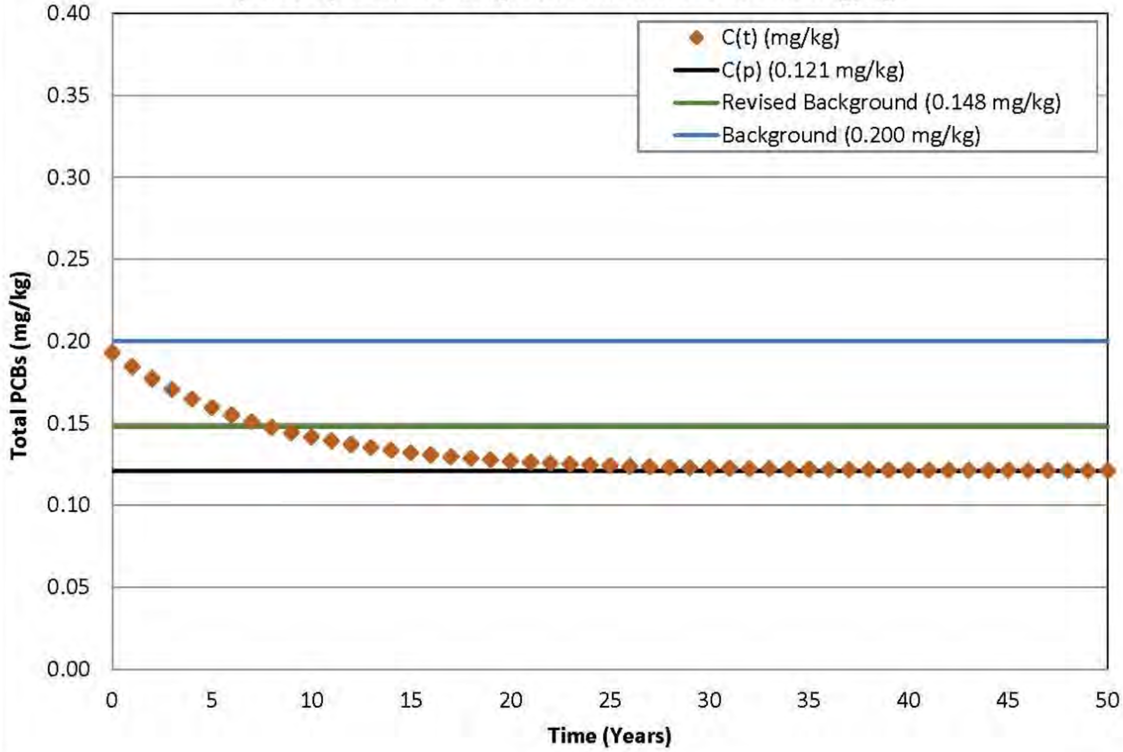
For Alternative 7 Modified in Area X, an AWA total PCB concentration of 148 µg/kg would be reached through MNR within approximately 8 years from a post-construction total PCB AWA concentration of 193 µg/kg (Figure 6), the same MNR timeframe as reflected for Area X in the Proposed Plan.

Similar to Area III, characterization will be required in Areas IX/X prior to RA to refine the remedial footprint, accurately establish removal volumes, assess geotechnical characteristics, and inform the management and disposal of contaminated sediments and water generated during construction. This pre-RA characterization would delineate COC impacts and could update sediment removal footprints and removal depths, and the in situ treatment area based on delineated COC impacts. Based on results of the pre-RA characterization, additional sediment removal and/or treatment may be necessary, greater than what is currently documented in the draft final Parcel F ROD.

Attachment 1 provides a sensitivity analysis for the SEDCAM model results, predicated on varying the sedimentation rate (from 0.5 cm/year to 1.5 cm/year), and the mixed layer thickness (from 4 cm to 15 cm) based on a degree of uncertainty in these parameters.

A 10 to 15 cm biologically active zone has been inferred for Parcel F sediments during assessment of site benthos (Germano & Associates, Inc., 2004) and is common for nearshore sediment environments (EPA, 2015). Moreover, a 10 cm biologically active zone is consistent with information incorporated into a prior PCB flux model applied during the 2008 Parcel F FS (Barajas and Associates, 2008), and with assumptions from SEDCAM modeling incorporated into the Yosemite Slough revised background technical memorandum (EA EST and EPA, 2021). General implications of the SEDCAM sensitivity evaluation are shorter recovery timeframes with increased levels of sedimentation and longer recovery timeframes with deeper mixing depths. Attachment 1 provides additional detail, and Section 6 summarizes the Navy’s position with respect to the sensitivity evaluation and the underlying uncertainty in specific Parcel F conditions that influence recovery expectations.

Figure 6
Reduction in HPNS Parcel F Sediment PCB Concentration due to MNR (Area X) with Starting Concentration of 0.193 mg/kg



Notes
Post-Construction Surface Sediment Total PCB Concentration = 0.193 mg/kg
Sediment Deposition Rate = 0.5 cm/yr
Sediment Mixing Depth = 4 cm
Time to Revised Background is approximately 8 years

Acronyms/Abbreviations
C(p) - concentration of total PCBs in incoming sediment
cm/yr - centimeter(s) per year
C(t) - concentration of total PCBs at time t
HPNS - Hunters Point Naval Shipyard
mg/kg - milligram(s) per kilogram
MNR - monitored natural recovery
PCB - polychlorinated biphenyl

Section 5 Cost Impacts of Revised Total PCB Background Concentration on Parcel F Selected Remedy

The following sub-sections describe the anticipated cost impacts to the Parcel F remedy that would arise from adopting the Water Board’s proposed 148 µg/kg total PCB background concentration.

5.1 Cost Impacts to Area III Remedy

As described in Section 4.1, based on information currently available there would be no change to the Area III remedy resulting from adopting 148 µg/kg as the total PCB background concentration.

The Navy considers the cost estimate provided in the Proposed Plan and draft final ROD, between $7.24 million and $9.12 million in 2017 dollars, depending on cap material type, to remain valid and reasonable for expected remediation costs.

5.2 Cost Impacts to Areas IX/X Remedy

Starting from post-construction estimated AWA total PCB concentrations of 260 µg/kg in Area IX and 330 µg/kg in Area X, longer MNR timeframes are expected in order to attain the proposed new RAO 3 RG of 148 µg/kg compared to 200 µg/kg. Evaluating the SEDCAM model with the same underlying assumptions and inputs used to assess the MNR duration to reach a 200 µg/kg total PCB background concentration, the Navy concluded that an AWA total PCB concentration of 148 µg/kg would be reached through MNR within approximately 13 years for Area IX and within approximately 17 years for Area X, compared to 5 years (Area IX) and 8 years (Area X) to reach an AWA total PCB concentration of 200 ug/kg.

With longer MNR timeframes to attain an AWA total PCB concentration of 148 µg/kg, timeframes over which particular ICs are in place, monitored, and enforced would be extended, and timeframes over which long-term monitoring of sediment PCB concentrations will be required to verify attainment of the RAO 3 RG in Areas IX/X would also be extended.

To evaluate the cost impacts of extending the duration of these remedy components, the Navy revisited the cost estimates developed for Alternative 7 in the 2017 Parcel F remedy optimization study (ECC-Insight, LLC and CDM Smith, 2017). Specifically, the costs associated with administrative land use control, planning, implementation, and termination were further scaled upward to reflect the need to plan, implement, and monitor particular ICs over a longer duration. Also, additional years of monitoring were included to account for more long-term monitoring necessary to demonstrate attainment of a revised RAO 3 background-based RG.

The revised cost estimate for Areas IX/X remedy is $24.18 million (value in 2017 dollars to maintain consistency with the cost estimates for Area III), which is an increase of $1.14 million relative to the cost estimate provided in the remedy optimization study and the Proposed Plan and draft final ROD.

For Alternative 7 Modified, post-construction estimated AWA total PCB concentrations are 260 µg/kg in Area IX (unchanged from the Proposed Plan and draft final ROD) and 193 µg/kg in Area X (lower than the 330 µg/kg AWA reflected in the Proposed Plan and draft final ROD). Evaluating the SEDCAM model with the same underlying assumptions and inputs used to assess the MNR duration for Alternative 7, the Navy concluded that an AWA total PCB concentration of 148 µg/kg would be reached through MNR within approximately 13 years for Area IX and within approximately 8 years for Area X. Alternative 7 Modified does not alter the remedy for Area IX compared to Alternative 7 as described in the Proposed Plan, therefore the estimated MNR timeframe to attain the lower 148 µg/kg total PCB background level remains the same as described above (i.e., 13 years). Additional active remediation for Area X under Alternative 7 Modified would lead to an estimated MNR timeframe of 8 years to reach 148 µg/kg that is the same as the MNR timeframe for Alternative 7 to reach 200 µg/kg as presented in the Proposed Plan.

The Navy assessed the cost implications of the lower 148 µg/kg total PCB background level for Alternative 7 Modified in a similar manner as presented above for Alternative 7 as presented in the Proposed Plan. In addition to scaling the Alternative 7 costs from the 2017 Parcel F remedy optimization tech memo to reflect the longer MNR timeframe (e.g., administrative land use control, planning, implementation) for Area IX, the Navy also scaled the costs to account for shifting areas from in situ remediation to sediment removal with backfill in Area X.

The cost estimate for Alternative 7 Modified is $23.3 million (value in 2017 dollars to maintain consistency with the other cost estimates), which is an increase of $0.3 million relative to the cost estimate for Alternative 7 provided in the 2017 Parcel F remedy optimization study and the Proposed Plan.

Attachment 2 provides the cost backup for both scenarios (Alternative 7 costs updated to reflect longer MNR timeframes, and Alternative 7 Modified) in the same format used in the 2017 remedy optimization study, highlighting the revisions.

While the pre-RA characterization results could indicate that more sediment removal and/or treatment may be necessary than currently documented in the Proposed Plan and draft final Parcel F ROD, the estimates presented are based on currently available data. As such, the Navy did not update any other costs for Areas IX/X remedy beyond those described above.

Table 3 summarizes the estimated cost impacts analysis for Areas III and IX/X.

Table 3. Estimated Cost Impacts Summary

Alternative	2017 Present Value Cost	Estimated Cost Increase ($)	Estimated Cost increase (%)
Area III – Alternative 4 (with Modified Armored Cap)	$7.24 million	--	--
Area III – Alternative 4A (with Modified Reactive Cap)	$9.12 million	--	--
Areas IX/X – Alternative 7	$24.18 million	$1.14 million	5%
Areas IX/X – Alternative 7 Modified	$23.3 million	$0.3 million	1.3%

-- not applicable

Section 6 Conclusion and Path Forward

Assessing the potential impacts of revising the total PCB background concentration from 200 µg/kg to 148 µg/kg, the Navy concluded that no technical or cost revisions are needed for the selected Area III remedy to achieve the RAOs.

For Areas IX/X, the Navy evaluated two scenarios: one where the remedy as described in the Proposed Plan (Alternative 7) is not altered but the MNR timeframes are extended to attain the lower 148 µg/kg background concentration; and another where a modified remedial alternative (Alternative 7 Modified) is implemented with additional active remediation in Area X reducing the MNR timeframes to attain the lower 148 µg/kg background concentration.

For the first scenario, the Navy concluded that it is not necessary to alter the Proposed Plan remedy to address contaminated sediments, but that the durations of specific remedy elements, such as ICs and long-term monitoring to verify attainment of RAO 3 would be extended. Whereas prior SEDCAM modeling projections demonstrated that the 200 µg/kg background concentration would be reached within 5 years for Area IX and 8 years for Area X following remedial construction, modeling projections using the same model inputs and assumptions indicate that a 148 µg/kg background concentration would be achieved within approximately 13 years for Area IX, and 17 years for Area X from the completion of remedial construction. The Navy anticipates that these extended timeframes would result in a cost increase of $1.14 million for the Areas IX/X remedy, for a revised total remedy cost of $24.18 million (value in 2017 dollars).

For the second scenario, the Navy developed a modified remedial approach for Areas IX/X (Alternative 7 Modified) wherein specific areas of in situ remediation under Alternative 7 in proximity to Yosemite Slough would instead be subject to sediment removal and backfill, lowering the post-construction total PCB AWA concentration compared to Alternative 7 as described in the Proposed Plan. SEDCAM modeling projections for Alternative 7 Modified using the same model inputs and assumptions as applied for Alternative 7 in the Proposed Plan demonstrate that the 148 µg/kg total PCB background concentration would be achieved within approximately 13 years for Area IX, and 8 years for Area X from the completion of remedial construction. Alternative 7 Modified, when taking into consideration the overall extended MNR timeframe and the relative difference in cost between removal with backfill and in situ treatment, would have a total remedy cost of $23.3 million (value in 2017 dollars), which is a cost increase of $300,000 over Alternative 7 as presented in the Proposed Plan.

The sensitivity analysis in Attachment 1 summarizes MNR timeframes in the context of uncertainty in critical parameters such as mixing depth and sedimentation rate that influence recovery predictions. As demonstrated generally in Attachment 1, higher sedimentation rates would lead to shorter recovery timeframes, while deeper depths of mixing would lead to longer recovery timeframes. Based on the totality of available information for Parcel F, the site-specific sedimentation rate greater than 0.5 cm/year may be more representative of actual conditions. In addition, a mixing depth greater than 4 cm may be more representative of actual conditions based on observations of biological activity and general guidance.

The Navy's cost estimate for Alternative 7 Modified described in this Technical Memorandum and presented in Attachment 2 is a reasonable basis for understanding the cost impacts of revising the total PCB background value to 148 µg/kg. Implementation of Alternative 7 Modified will result in MNR timeframes similar to those presented in the Proposed Plan and a low potential for off-site PCB recontamination (see Section 1). Alternative 7 Modified applies a greater degree of active remediation in the vicinity of Yosemite Slough, resulting in a zone of clean backfill material (with non-detect PCB concentrations) in closest proximity to the slough. The physical processes and existing data studied by the Navy and the Yosemite Slough parties indicate negligible lateral transport of sediments within South Basin or from South Basin to the slough, and therefore negligible potential for recontamination of a South Basin or Yosemite Slough remedy. The application of removal and clean backfill in proximity to the slough further mitigates concerns regarding potential recontamination of the Yosemite Slough remedy.

To document a revision to the total PCB background concentration and the associated impacts, the Navy would incorporate this technical memorandum's analyses and results, including the sensitivity assessment, into the final Parcel F ROD and Remedial Design, including the land use control Remedial Design.

Section 7 References

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ATTACHMENT 1

SEDCAM SENSITIVITY ANALYSIS

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A1 Introduction

The Department of the Navy (Navy) previously used Sediment Contamination Assessment Model (SEDCAM) modeling during feasibility evaluation of remedial alternatives to identify a preferred remedial alternative, and to develop draft and draft final versions of the Parcel F Record of Decision (ROD). Specifically, SEDCAM modeling was used to project the time required to reach the total polychlorinated biphenyl (PCB) background concentration-based remediation goal (RG) for remedial action objective (RAO) 3 in Areas IX and X using monitored natural recovery (MNR), and after implementing active remedy elements, including sediment removal (and backfill) and in situ treatment. Prior SEDCAM modeling was performed to evaluate reaching a total PCB concentration of 200 micrograms per kilogram (µg/kg) on an area-weighted average (AWA) basis. The 200 µg/kg total PCB background value was selected as representative of the upper end of nearshore ambient total PCB concentrations in San Francisco Bay sediments based on information provided by the San Francisco Regional Water Quality Control Board (Water Board) in 2003.

In support of the current technical memorandum, SEDCAM modeling was performed to evaluate the additional time needed to attain the RAO 3 RG of 148 µg/kg through MNR after implementing active remedy elements for Areas IX and X, both for the Areas IX/X remedy as described in the Proposed Plan and for a modification to that remedial approach the Navy is referring to as Alternative 7 Modified (the selected remedy). The 148 µg/kg value is a revised total PCB background concentration proposed by the Water Board and is based on more current data from San Francisco Bay. The input parameters used in the current SEDCAM modeling are the same as those used during prior modeling; future annual concentrations were predicted. The predicted future concentrations were assessed to determine when the 148 µg/kg level would be attained.

This attachment provides a sensitivity analysis for the current SEDCAM model results, predicated on varying two critical model input parameters based on uncertainty in these parameters.

A2 Methods and Discussion

The SEDCAM modeling incorporates the following equation:

$$C(t) = C(p) \times (1 - e^{-t(ML/Rs}) + C(0) \times e^{-t/(\frac{ML}{Rs})}$$

Where:

- C(t) is the surface sediment concentration at time t,
- C(p) is the incoming sediment concentration,
- ML is the mixing depth,
- Rs is the sedimentation rate, and

- C(0) is the initial surface sediment concentration (i.e., the post-remedial action AWA).

The equation can be solved to predict the surface sediment concentration at particular future time steps or future times at which specific surface sediment concentrations would be observed.

Based on currently available information, the multi-component remedial strategy for Areas IX and X will result in estimated AWA total PCB concentrations of approximately 260 µg/kg for Area IX and 330 µg/kg for Area X at the completion of construction. For Alternative 7 Modified (the selected remedy), the estimated post-construction AWA total PCB concentrations will be approximately 260 µg/kg for Area IX (unchanged in comparison to the Proposed Plan because the Area IX remedy would remain the same) and 193 µg/kg for Area X (lower compared to the Proposed Plan because the Area X remedy would be characterized by an increased amount of sediment removal and a corresponding decrease in the amount of in situ treatment in the vicinity of Yosemite Slough). RAO 1 RGs will be met on a not-to-exceed basis through either remedy and the post-construction total PCB AWA concentrations are well below the RAO 2 RG (1,350 µg/kg total PCBs). Either remedy will rely on MNR to achieve the RAO 3 long-term RG for total PCBs.

The prior SEDCAM modeling indicated that reaching a total PCB concentration of 200 µg/kg on an AWA basis through MNR, following active remediation as described by the Proposed Plan, would require 5 years for Area IX and 8 years for Area X. The prior modeling incorporated the following critical input parameters:

- C(p) = 121 µg/kg
- ML = 4 centimeters (cm)
- Rs = 0.5 cm/year
- C(0) = 260 µg/kg for Area IX and 330 µg/kg for Area X

The incoming sediment concentration, C(p), was established at 121 µg/kg based on analysis of sediments accumulated in sediment traps at the mouth of the South Basin, averaged over three deployments during the 2000 Parcel F validation study. The mixing layer, ML, was established at 4 cm based on sediment profile imaging (SPI) completed during the 2015 to 2017 Parcel F carbon amendment pilot study. The sedimentation rate, Rs, was established at 0.5 cm/year based on evaluation of radioisotope core data collected during the 2003 Parcel F feasibility study (FS) data gaps investigation and in consideration of a gradient of sedimentation from Yosemite Slough (very little sedimentation) towards the mouth of South Basin. The Navy presented these model input parameters to the Water Board and other regulatory stakeholders, including the United States Environmental Protection Agency (EPA) and California DTSC. These inputs were the basis of remedy evaluations in the 2017 Parcel F remedy optimization study, the Parcel F Proposed Plan, and the draft and draft final versions of the Parcel F ROD. These model inputs for incoming sediment concentration and sedimentation rate are also consistent with inputs to the PCB flux model incorporated into the 2008 Parcel F FS.

The current SEDCAM modeling, using the input assumptions used for prior SEDCAM modeling, and as summarized above, demonstrates that an AWA total PCB concentration of 148 µg/kg would be reached through MNR within approximately 13 years for Area IX, while an AWA total PCB concentration of 148 µg/kg would be reached through MNR within approximately 17 years for Area X. For Alternative 7 Modified/selected remedy, SEDCAM modeling, using the input assumptions used for prior SEDCAM modeling, demonstrates that an AWA total PCB concentration of 148 µg/kg would still be reached through MNR within approximately 13 years for Area IX (identical to the results of the assessment of the Proposed Plan remedy attaining the revised 148 µg/kg background value because Alternative 7 Modified would not alter the Area IX remedy), while an AWA total PCB concentration of 148 µg/kg would be reached through MNR within approximately 8 years for Area X (i.e., the same MNR timeframe as presented in the Proposed Plan).

Given its basis in direct laboratory measurement, there is relative confidence in the incoming sediment concentration of 121 µg/kg. However, two of the critical input parameters that are characterized by a greater degree of uncertainty were varied to evaluate the sensitivity of the SEDCAM model for both remediation scenarios (maintaining the Proposed Plan remedy for Areas IX/X and applying Alternative 7 Modified/selected remedy). Specifically, while the sedimentation rate of 0.5 cm/year is based on site-specific observations and was used in prior SEDCAM modeling and the prior PCB flux model to assess Parcel F conditions, higher rates of sedimentation have been inferred from other site-specific information. A net sedimentation rate of 1 cm/year was inferred for the South Basin based on historical coring data and sediment trap data. Even higher sedimentation rates (i.e., 3 cm/year or more) were inferred for Parcel F based on SPI observations during the carbon amendment pilot study and based on relative differences between temporally spaced bathymetric surveys. Notably, bathymetric differencing can be an imprecise method for determining sedimentation rates given the bathymetry data resolution and accuracy of data interpretation, but rates of sedimentation similar to those observed via the bathymetric survey data are supported by other evaluation methods. Also, while the mixing depth of 4 cm is based on site-specific observations and was used in prior SEDCAM modeling, a 10 to 15 cm biologically active zone was inferred for Parcel F sediments based on SPI data during a study of benthic macrofauna activity (KCH 2018), is consistent with the model framework for the prior PCB flux model (which described a 10 cm biologically active zone), and is common for nearshore sediment environments. Moreover, the SEDCAM modeling performed in support of evaluating a revised total PCB background value for the Yosemite Slough remediation project defined 10 cm as the input assumption for the biologically active zone (while citing a range of 5 cm to 22 cm as defining the lower and upper boundaries for depth of biological activity, and performing sensitivity evaluation using values of 10 cm, 15 cm, and 22 cm). Depths of biological activity can be found deeper (i.e., up to 30 cm, or beyond for certain species), and is possible in nearshore aquatic systems. SPI data from Parcel F do indicate some degree of biological activity to 30 cm; however, the density of the indicators of biological activity were lower at greater depths in Parcel F sediments. A 10 to 15 cm bioturbation depth is also consistent with guidance for contaminated sediment sites, with exposure intervals that form the basis for certain institutional controls (i.e., exposures in the surface sediment interval, typically defined as the upper 6 inches of the sediment bed), and with typical monitoring approaches for evaluating surface sediment concentrations over time (e.g., sediment coring to obtain the upper 6-inch sediment interval as a surface sediment sample). Consistent with the design of the SEDCAM model, the depth of biological activity is a controlling mechanism for the natural recovery of sediments through vertical mixing of depositing cleaner solids.

Table 1-1. SEDCAM Sensitivity Analysis Output

Sedimentation Rate (cm/year)	Mixed Layer Thickness (cm)	Projected MNR Timeframe (years)	Figure
Area IX Alternative 7 in Proposed Plan			
0.5	4	13	1-1
1	4	7	1-2
1.5	4	5	1-3
0.5	10	33	1-4
1	10	17	1-5
1.5	10	11	1-6
0.5	15	49	1-7
1	15	25	1-8
1.5	15	17	1-9
Area X Alternative 7 in Proposed Plan			
0.5	4	17	1-10
1	4	9	1-11
1.5	4	6	1-12
0.5	10	42	1-13
1	10	21	1-14
1.5	10	14	1-15
0.5	15	61	1-16
1	15	31	1-17
1.5	15	21	1-18
Area X (Alternative 7 Modified)			
0.5	4	8	1-19
1	4	4	1-20
1.5	4	3	1-21
0.5	10	20	1-22
1	10	10	1-23
1.5	10	7	1-24
0.5	15	30	1-25

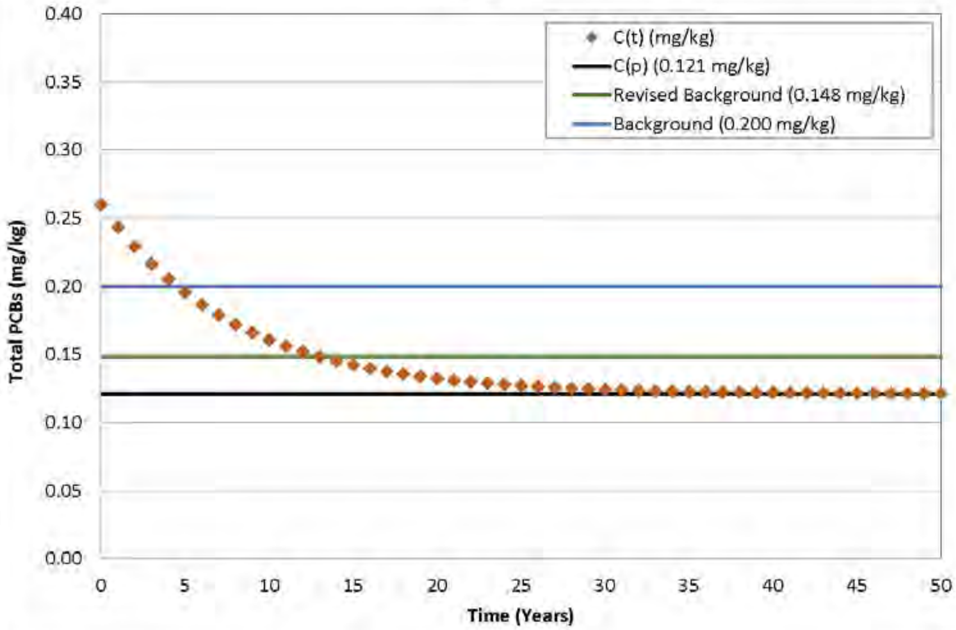
Sedimentation Rate (cm/year)	Mixed Layer Thickness (cm)	Projected MNR Timeframe (years)	Figure
1	15	15	1-26
1.5	15	10	1-27

Table 1-1 summarizes the sensitivity evaluation based on varying the sedimentation rate (0.5 cm/year, 1 cm/year, and 1.5 cm/year, with 0.5 cm/year representing the prior conservative assumption based on radioisotope core data and Yosemite Slough information, 1 cm/year representing the net sedimentation rate for the South Basin based on coring and sediment trap data, and 1.5 cm/year representing a higher boundary rate of sedimentation in consideration of SPI observations during the carbon amendment pilot study and historical bathymetry) and the mixing depth (4 cm, 10 cm, and 15 cm, with 4 cm representing the prior assumption based on SPI observations during the carbon amendment pilot study, and 10 cm and 15 cm representing inferred depths of biological activity from SPI data and being consistent with the prior PCB flux model for Parcel F, assumptions documented for Yosemite Slough [10 cm is the mixing depth in the Yosemite Slough recovery modeling], and typical observations at nearshore sediment sites).

The sensitivity evaluation is also demonstrated by Figures 1-1 through 1-27. Figure 1-1 represents the previous input assumptions for Area IX (identical to Figure 3 in the current technical memorandum), with Figures 1-2 through 1-9 representing varying input assumptions. Figure 1-10 represents the previous input assumptions for Area X. Alternative 7 as presented in the Proposed Plan (identical to Figure 4 in the current technical memorandum), with Figures 1-11 through 1-18 representing varying input assumptions. Figures 1-19 through 1-27 represent varied input assumptions for Alternative 7 Modified for Area X (identical to Figure 6 in the current technical memorandum). As demonstrated by Table 1-1 and Figures 1-1 through 1-27, increasing the sedimentation rate reduces the projected recovery timeframe, while increasing the mixing depth extends the projected recovery timeframe.

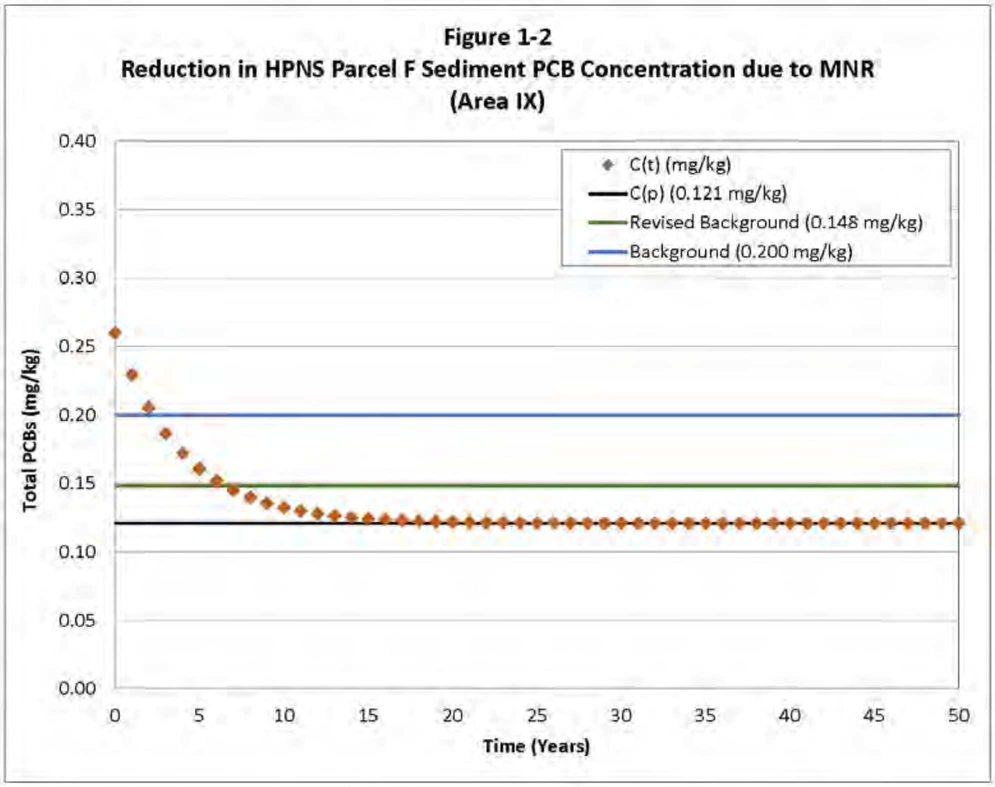
Based on the totality of available information for Parcel F, a sedimentation rate higher than 0.5 cm/year may be more representative of actual conditions, and a mixing depth greater than 4 cm may be more representative of actual conditions.

Figure 1-1
Reduction in HPNS Parcel F Sediment PCB Concentration due to MNR (Area IX)



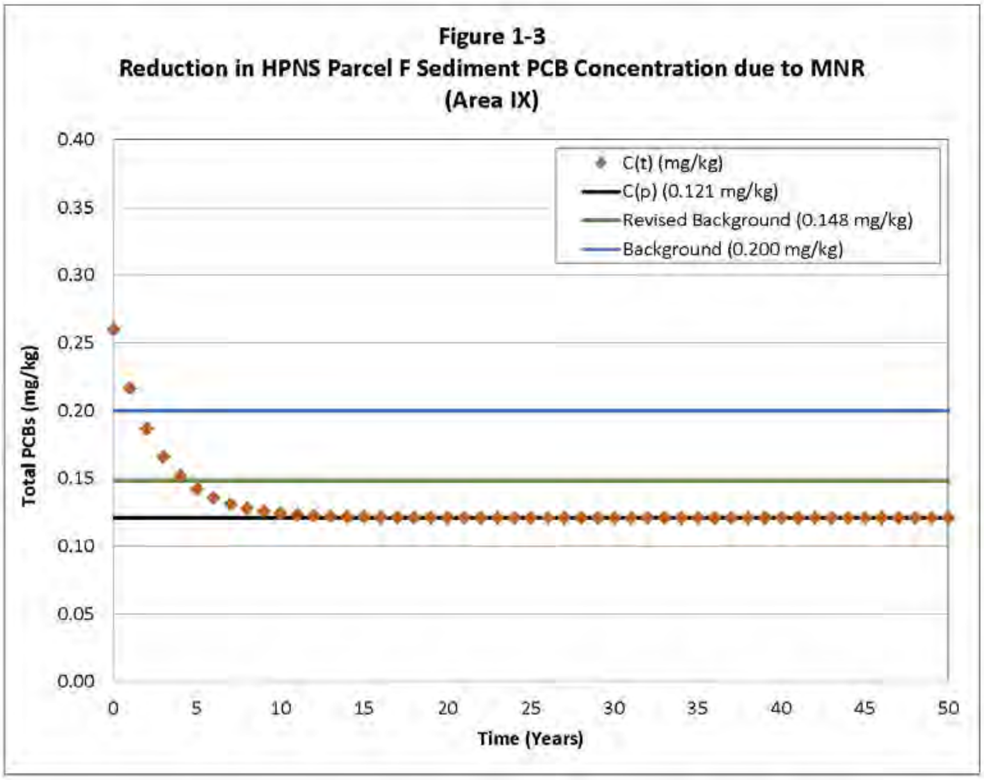
Notes
Post-Construction Surface Sediment Total PCB Concentration = 0.260 mg/kg
Sediment Deposition Rate = 0.5 cm/yr
Sediment Mixing Depth = 4 cm
Time to Revised Background is approximately 13 years

Acronyms/Abbreviations
C(p) - concentration of total PCBs in incoming sediment
cm/yr - centimeter(s) per year
C(t) - concentration of total PCBs at time t
HPNS - Hunters Point Naval Shipyard
mg/kg - milligram(s) per kilogram
MNR - monitored natural recovery
PCB - polychlorinated biphenyl



Notes
Post-Construction Surface Sediment Total PCB Concentration = 0.260 mg/kg
Sediment Deposition Rate = 1 cm/yr
Sediment Mixing Depth = 4 cm
Time to Revised Background is approximately 7 years

Acronyms/Abbreviations
C(p) - concentration of total PCBs in incoming sediment
cm/yr - centimeter(s) per year
C(t) - concentration of total PCBs at time t
HPNS - Hunters Point Naval Shipyard
mg/kg - milligram(s) per kilogram
MNR - monitored natural recovery
PCB - polychlorinated biphenyl



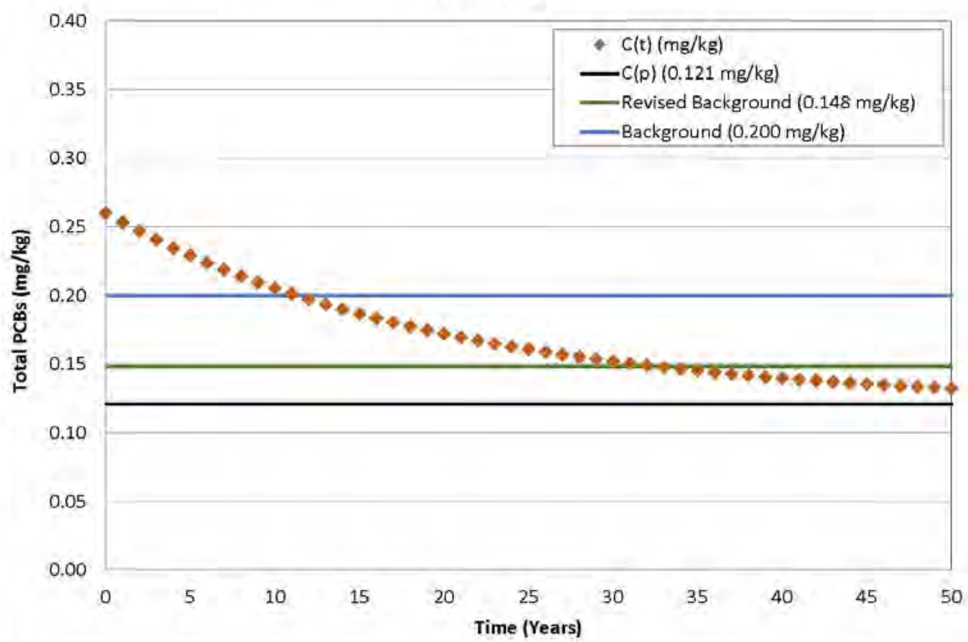
<u>Notes</u>

Post-Construction Surface Sediment Total PCB Concentration = 0.260 mg/kg
Sediment Deposition Rate = 1.5 cm/yr
Sediment Mixing Depth = 4 cm
Time to Revised Background is approximately 5 years

<u>Acronyms/Abbreviations</u>

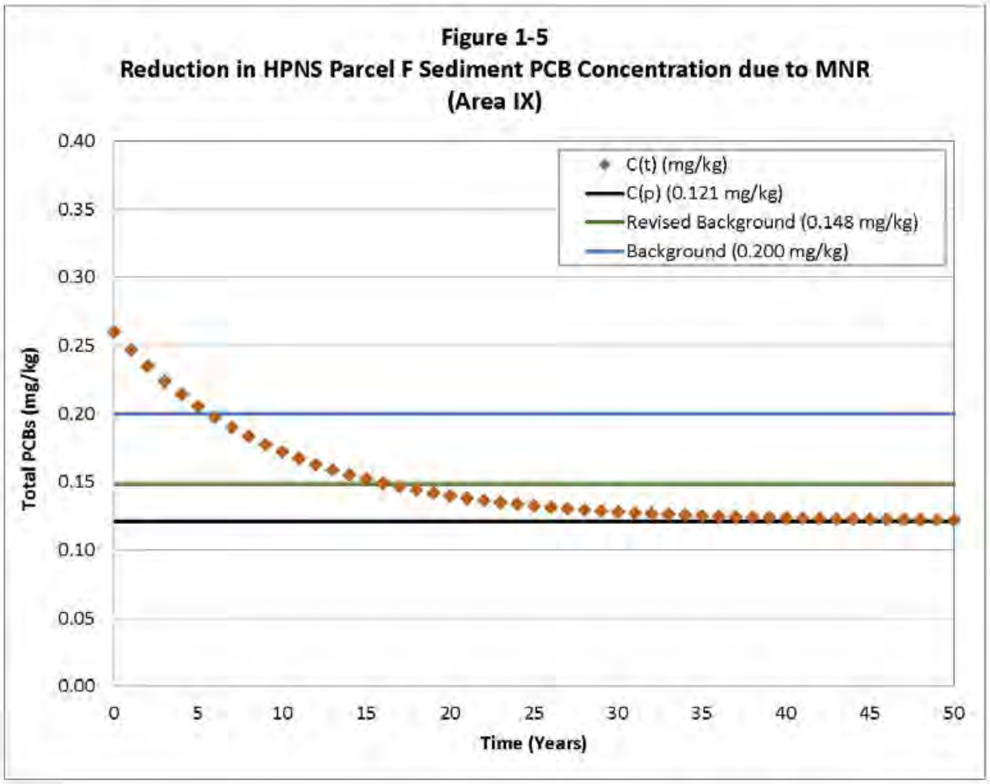
C(p) - concentration of total PCBs in incoming sediment
cm/yr - centimeter(s) per year
C(t) - concentration of total PCBs at time t
HPNS - Hunters Point Naval Shipyard
mg/kg - milligram(s) per kilogram
MNR - monitored natural recovery
PCB - polychlorinated biphenyl

Figure 1-4
Reduction in HPNS Parcel F Sediment PCB Concentration due to MNR (Area IX)



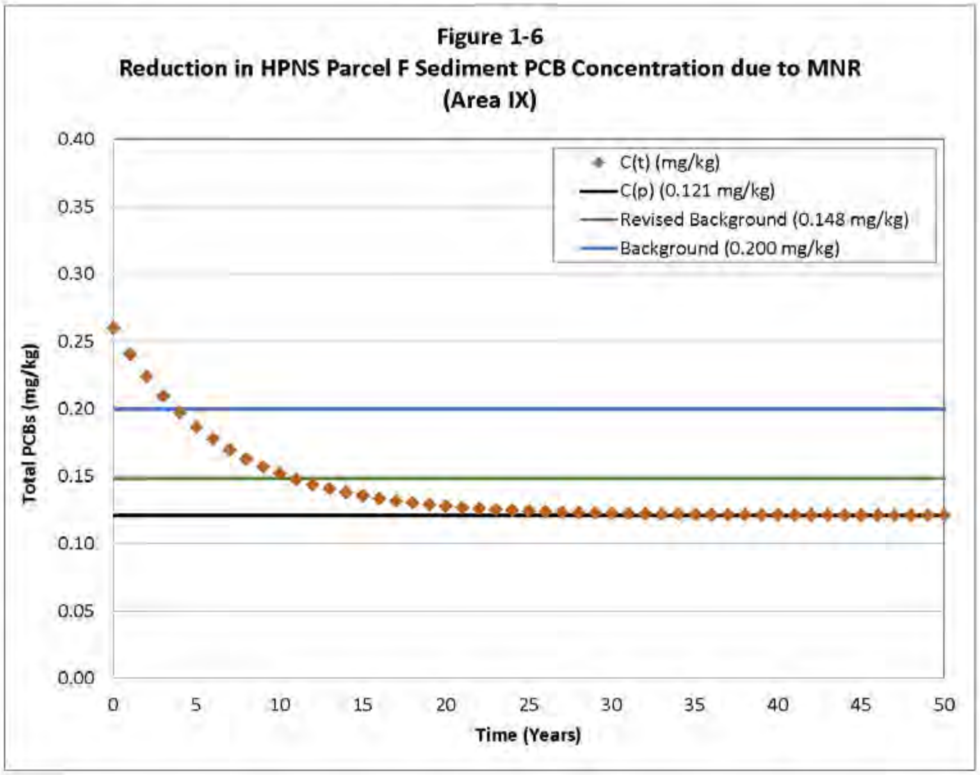
<u>Notes</u>
Post-Construction Surface Sediment Total PCB Concentration = 0.260 mg/kg
Sediment Deposition Rate = 0.5 cm/yr
Sediment Mixing Depth = 10 cm
Time to Revised Background is approximately 33 years

<u>Acronyms/Abbreviations</u>
C(p) - concentration of total PCBs in incoming sediment
cm/yr - centimeter(s) per year
C(t) - concentration of total PCBs at time t
HPNS - Hunters Point Naval Shipyard
mg/kg - milligram(s) per kilogram
MNR - monitored natural recovery
PCB - polychlorinated biphenyl



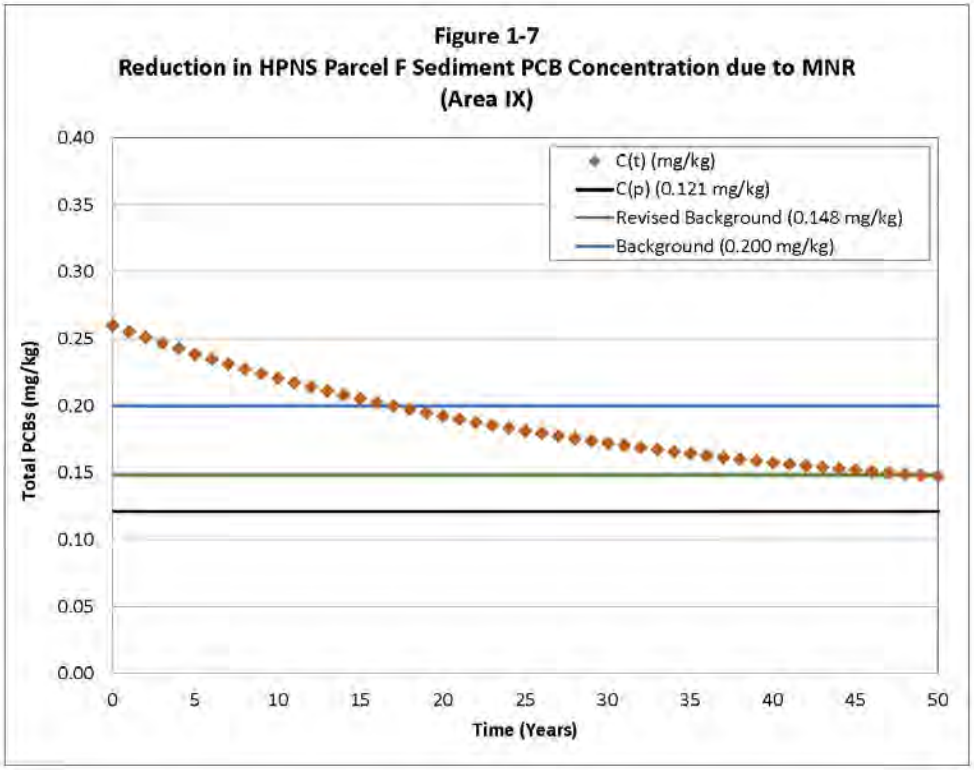
<u>Notes</u>
Post-Construction Surface Sediment Total PCB Concentration = 0.260 mg/kg
Sediment Deposition Rate = 1 cm/yr
Sediment Mixing Depth = 10 cm
Time to Revised Background is approximately 17 years

<u>Acronyms/Abbreviations</u>
C(p) - concentration of total PCBs in incoming sediment
cm/yr - centimeter(s) per year
C(t) - concentration of total PCBs at time t
HPNS - Hunters Point Naval Shipyard
mg/kg - milligram(s) per kilogram
MNR - monitored natural recovery
PCB - polychlorinated biphenyl



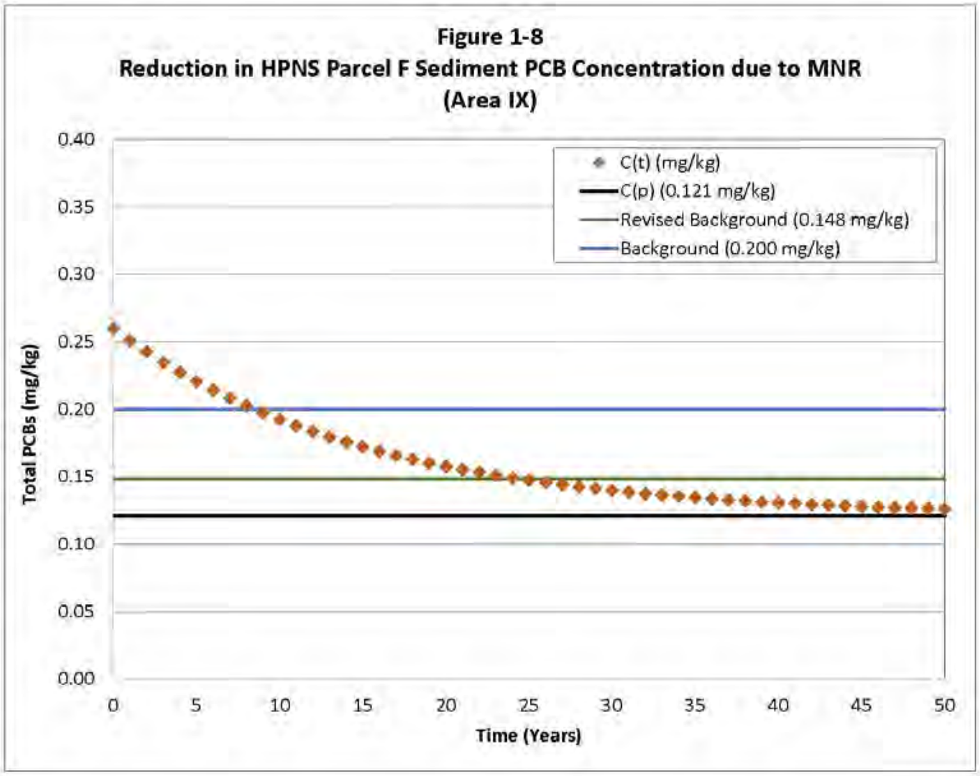
Notes
Post-Construction Surface Sediment Total PCB Concentration = 0.260 mg/kg
Sediment Deposition Rate = 1.5 cm/yr
Sediment Mixing Depth = 10 cm
Time to Revised Background is approximately 11 years

Acronyms/Abbreviations
C(p) - concentration of total PCBs in incoming sediment
cm/yr - centimeter(s) per year
C(t) - concentration of total PCBs at time t
HPNS - Hunters Point Naval Shipyard
mg/kg - milligram(s) per kilogram
MNR - monitored natural recovery
PCB - polychlorinated biphenyl



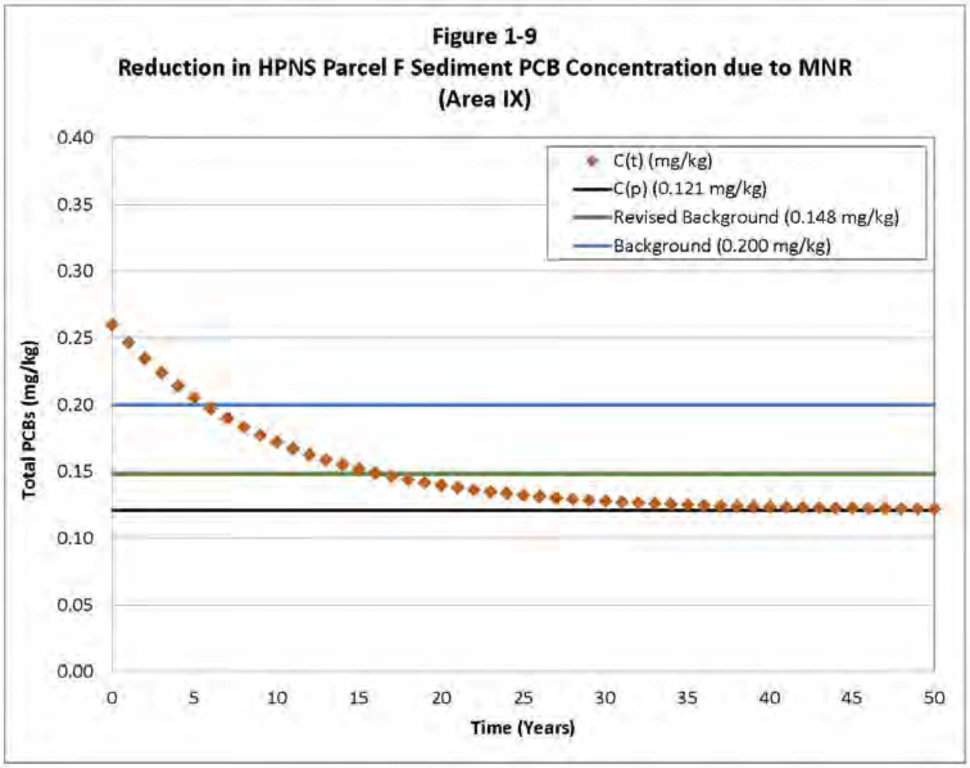
Notes
Post-Construction Surface Sediment Total PCB Concentration = 0.260 mg/kg
Sediment Deposition Rate = 0.5 cm/yr
Sediment Mixing Depth = 15 cm
Time to Revised Background is approximately 49 years

Acronyms/Abbreviations
C(p) - concentration of total PCBs in incoming sediment
cm/yr - centimeter(s) per year
C(t) - concentration of total PCBs at time t
HPNS - Hunters Point Naval Shipyard
mg/kg - milligram(s) per kilogram
MNR - monitored natural recovery
PCB - polychlorinated biphenyl



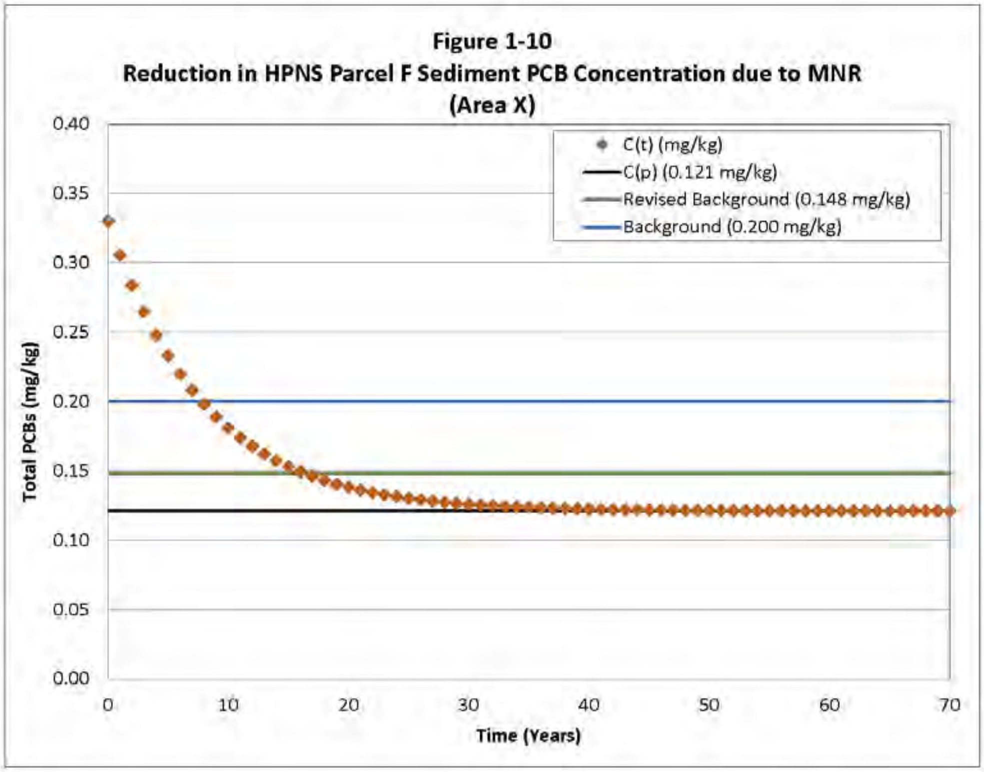
Notes
Post-Construction Surface Sediment Total PCB Concentration = 0.260 mg/kg
Sediment Deposition Rate = 1 cm/yr
Sediment Mixing Depth = 15 cm
Time to Revised Background is approximately 25 years

Acronyms/Abbreviations
C(p) - concentration of total PCBs in incoming sediment
cm/yr - centimeter(s) per year
C(t) - concentration of total PCBs at time t
HPNS - Hunters Point Naval Shipyard
mg/kg - milligram(s) per kilogram
MNR - monitored natural recovery
PCB - polychlorinated biphenyl



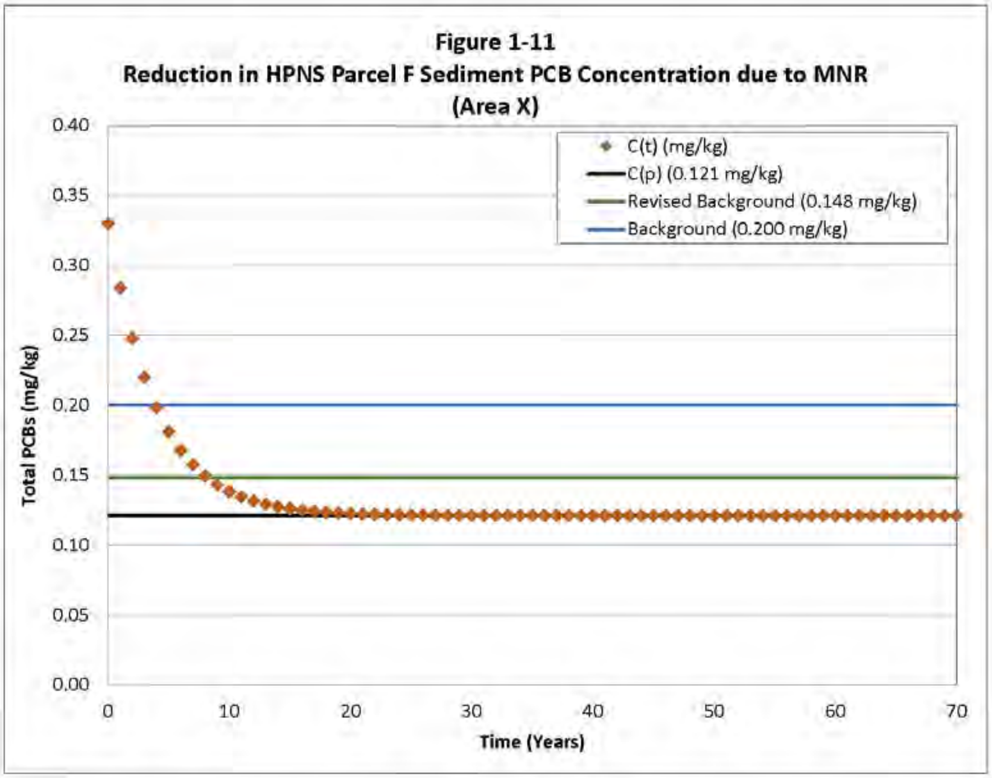
Notes
Post-Construction Surface Sediment Total PCB Concentration = 0.260 mg/kg
Sediment Deposition Rate = 1.5 cm/yr
Sediment Mixing Depth = 15 cm
Time to Revised Background is approximately 17 years

Acronyms/Abbreviations
C(p) - concentration of total PCBs in incoming sediment
cm/yr - centimeter(s) per year
C(t) - concentration of total PCBs at time t
HPNS - Hunters Point Naval Shipyard
mg/kg - milligram(s) per kilogram
MNR - monitored natural recovery
PCB - polychlorinated biphenyl



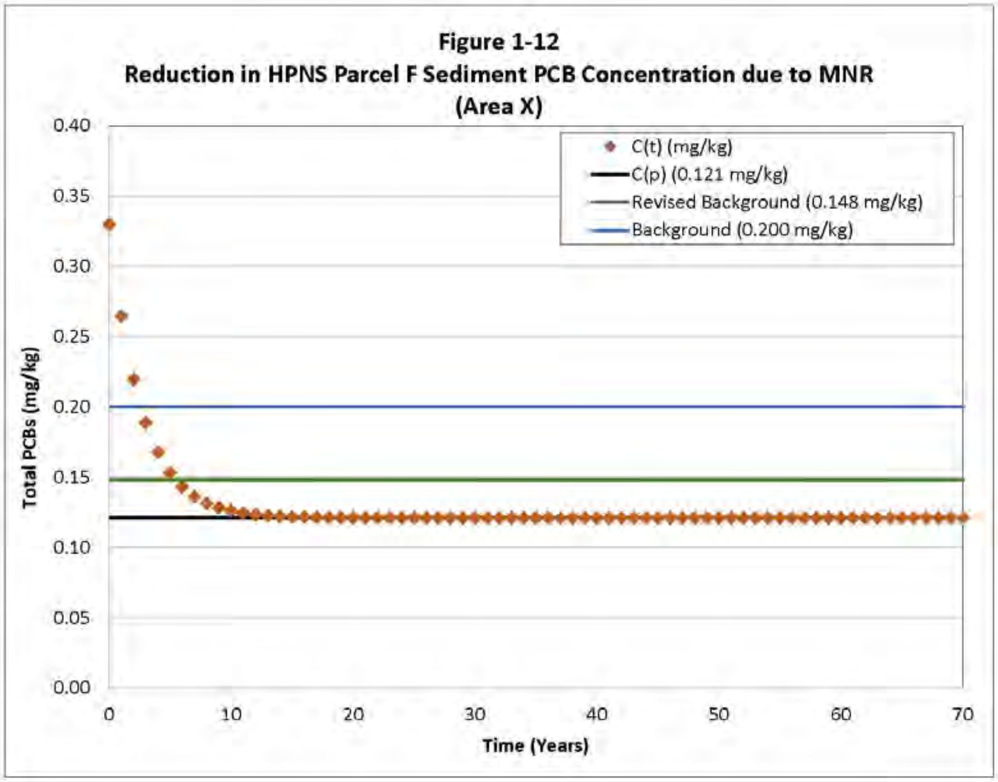
Notes
Post-Construction Surface Sediment Total PCB Concentration = 0.330 mg/kg
Sediment Deposition Rate = 0.5 cm/yr
Sediment Mixing Depth = 4 cm
Time to Revised Background is approximately 17 years

Acronyms/Abbreviations
C(p) - concentration of total PCBs in incoming sediment
cm/yr - centimeter(s) per year
C(t) - concentration of total PCBs at time t
HPNS - Hunters Point Naval Shipyard
mg/kg - milligram(s) per kilogram
MNR - monitored natural recovery
PCB - polychlorinated biphenyl



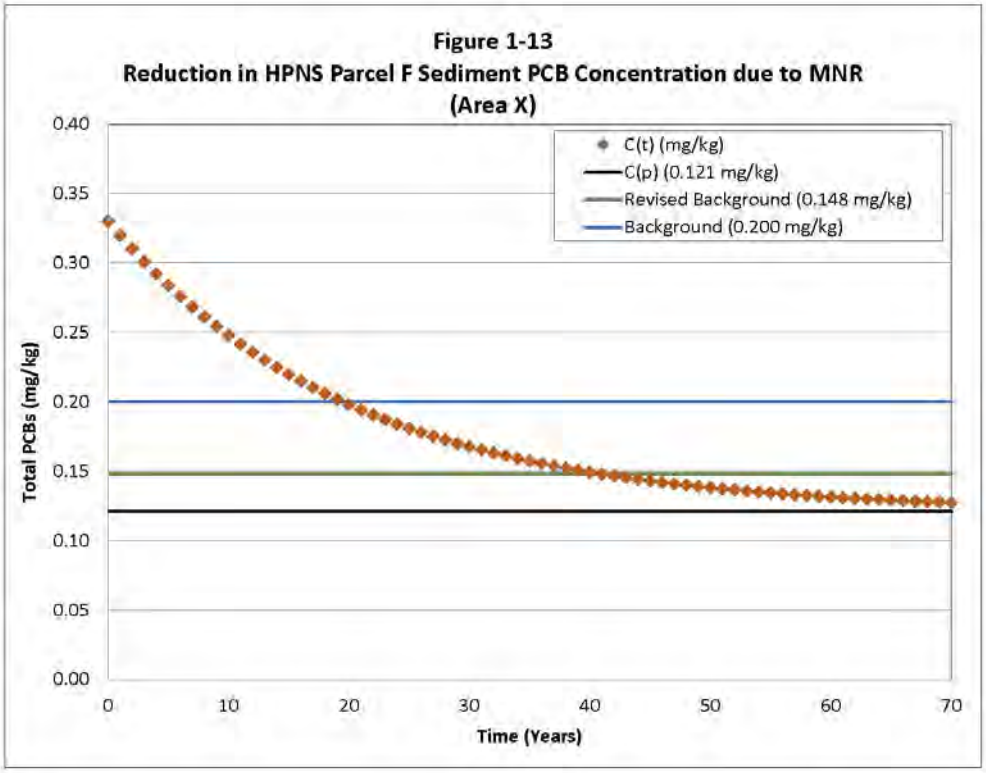
Notes
Post-Construction Surface Sediment Total PCB Concentration = 0.330 mg/kg
Sediment Deposition Rate = 1 cm/yr
Sediment Mixing Depth = 4 cm
Time to Revised Background is approximately 9 years

Acronyms/Abbreviations
C(p) - concentration of total PCBs in incoming sediment
cm/yr - centimeter(s) per year
C(t) - concentration of total PCBs at time t
HPNS - Hunters Point Naval Shipyard
mg/kg - milligram(s) per kilogram
MNR - monitored natural recovery
PCB - polychlorinated biphenyl



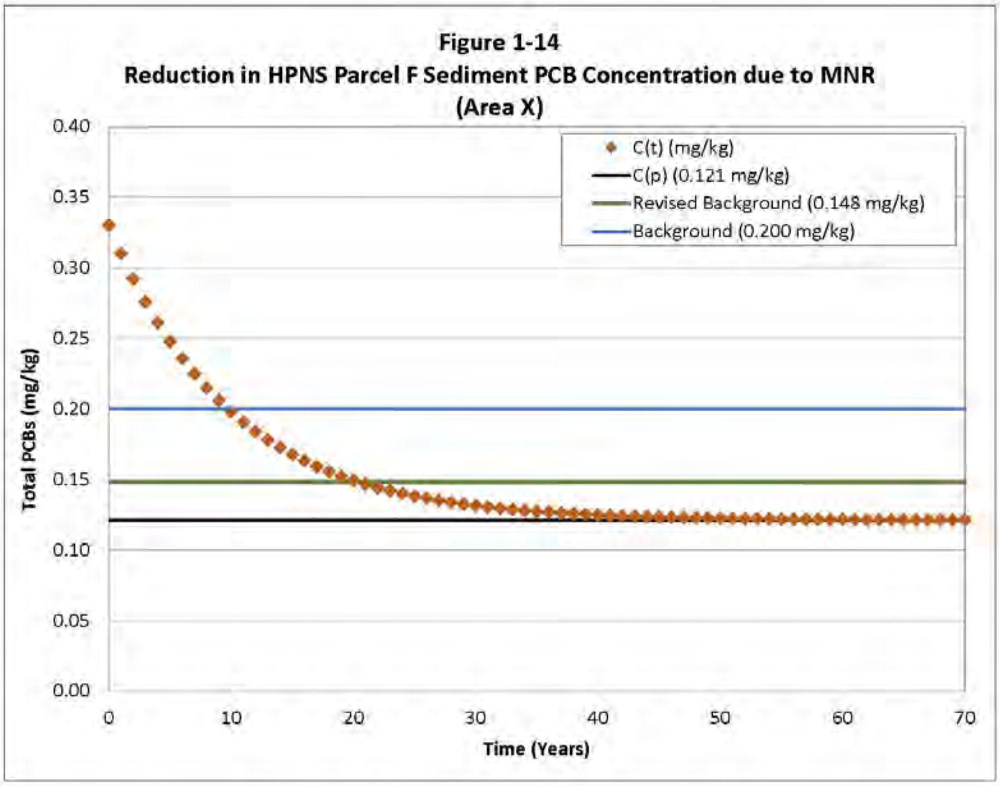
Notes
Post-Construction Surface Sediment Total PCB Concentration = 0.330 mg/kg
Sediment Deposition Rate = 1.5 cm/yr
Sediment Mixing Depth = 4 cm
Time to Revised Background is approximately 6 years

Acronyms/Abbreviations
C(p) - concentration of total PCBs in incoming sediment
cm/yr - centimeter(s) per year
C(t) - concentration of total PCBs at time t
HPNS - Hunters Point Naval Shipyard
mg/kg - milligram(s) per kilogram
MNR - monitored natural recovery
PCB - polychlorinated biphenyl



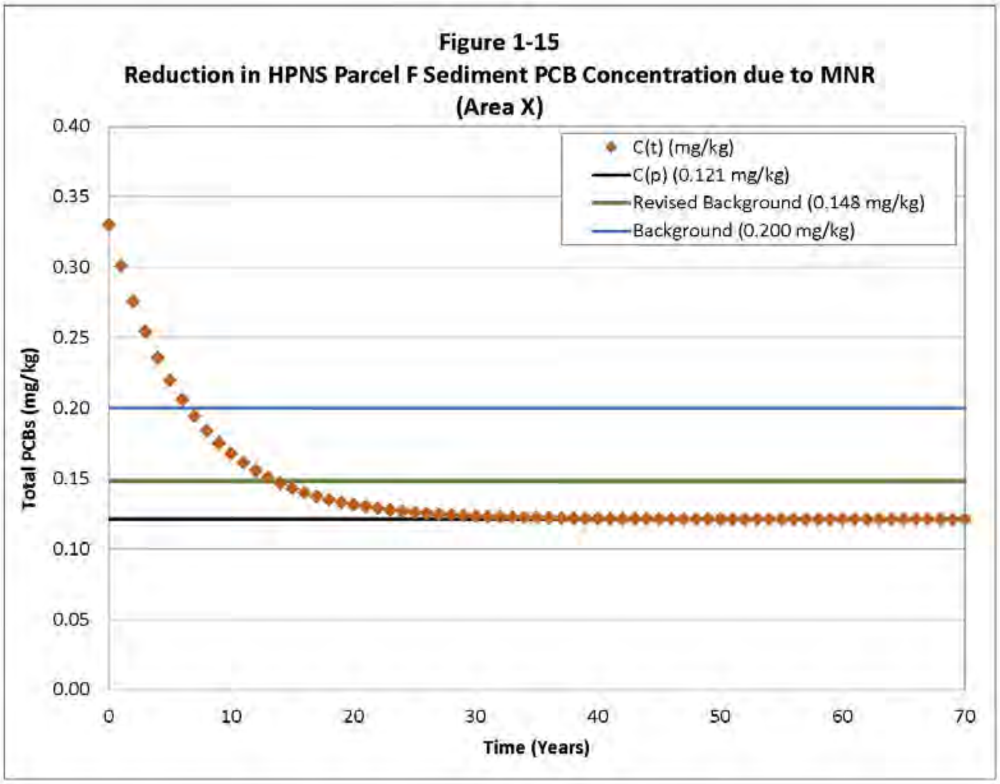
<u>Notes</u>
Post-Construction Surface Sediment Total PCB Concentration = 0.330 mg/kg
Sediment Deposition Rate = 0.5 cm/yr
Sediment Mixing Depth = 10 cm
Time to Revised Background is approximately 42 years

<u>Acronyms/Abbreviations</u>
C(p) - concentration of total PCBs in incoming sediment
cm/yr - centimeter(s) per year
C(t) - concentration of total PCBs at time t
HPNS - Hunters Point Naval Shipyard
mg/kg - milligram(s) per kilogram
MNR - monitored natural recovery
PCB - polychlorinated biphenyl



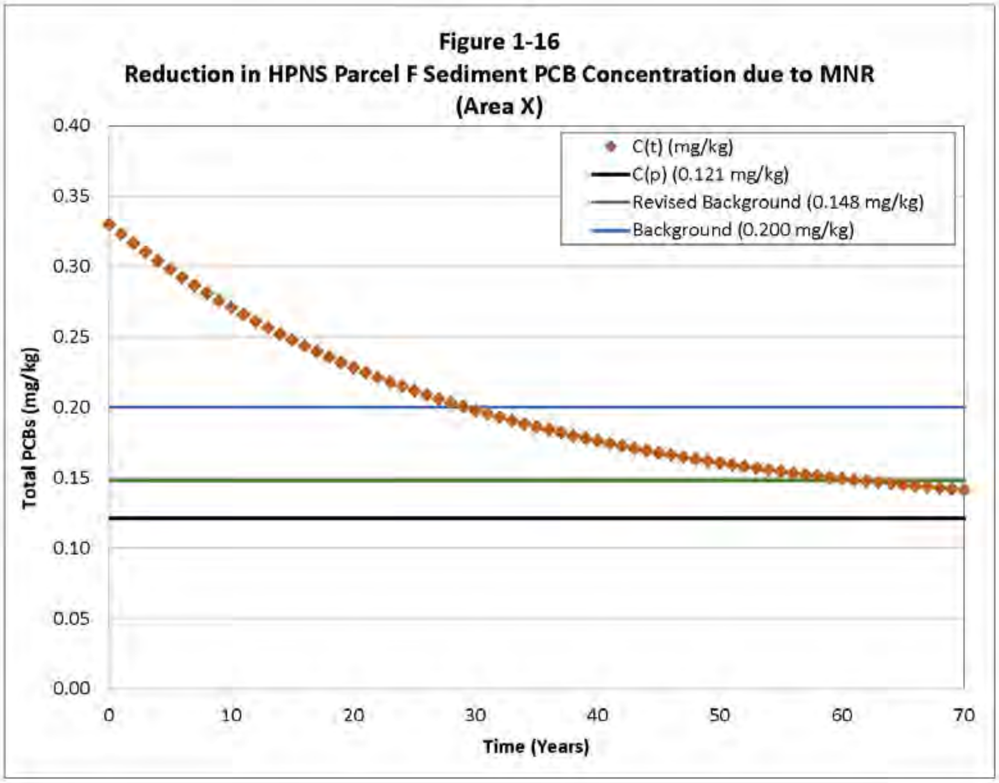
Notes
Post-Construction Surface Sediment Total PCB Concentration = 0.330 mg/kg
Sediment Deposition Rate = 1 cm/yr
Sediment Mixing Depth = 10 cm
Time to Revised Background is approximately 21 years

Acronyms/Abbreviations
C(p) - concentration of total PCBs in incoming sediment
cm/yr - centimeter(s) per year
C(t) - concentration of total PCBs at time t
HPNS - Hunters Point Naval Shipyard
mg/kg - milligram(s) per kilogram
MNR - monitored natural recovery
PCB - polychlorinated biphenyl



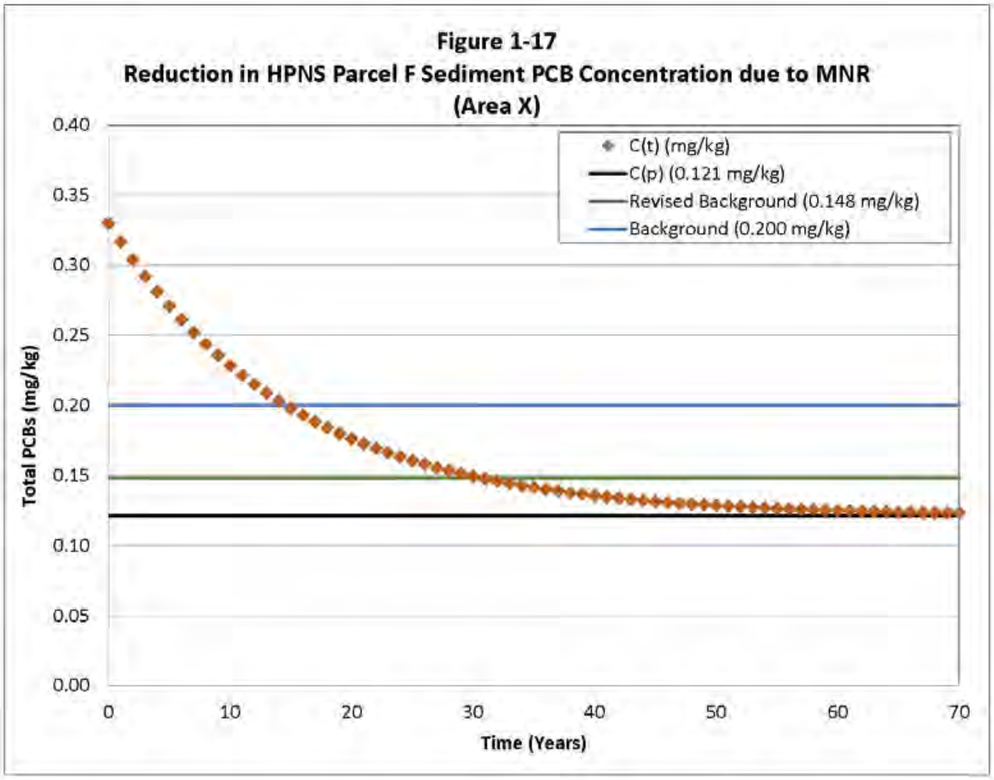
Notes
Post-Construction Surface Sediment Total PCB Concentration = 0.330 mg/kg
Sediment Deposition Rate = 1.5 cm/yr
Sediment Mixing Depth = 10 cm
Time to Revised Background is approximately 14 years

Acronyms/Abbreviations
C(p) - concentration of total PCBs in incoming sediment
cm/yr - centimeter(s) per year
C(t) - concentration of total PCBs at time t
HPNS - Hunters Point Naval Shipyard
mg/kg - milligram(s) per kilogram
MNR - monitored natural recovery
PCB - polychlorinated biphenyl



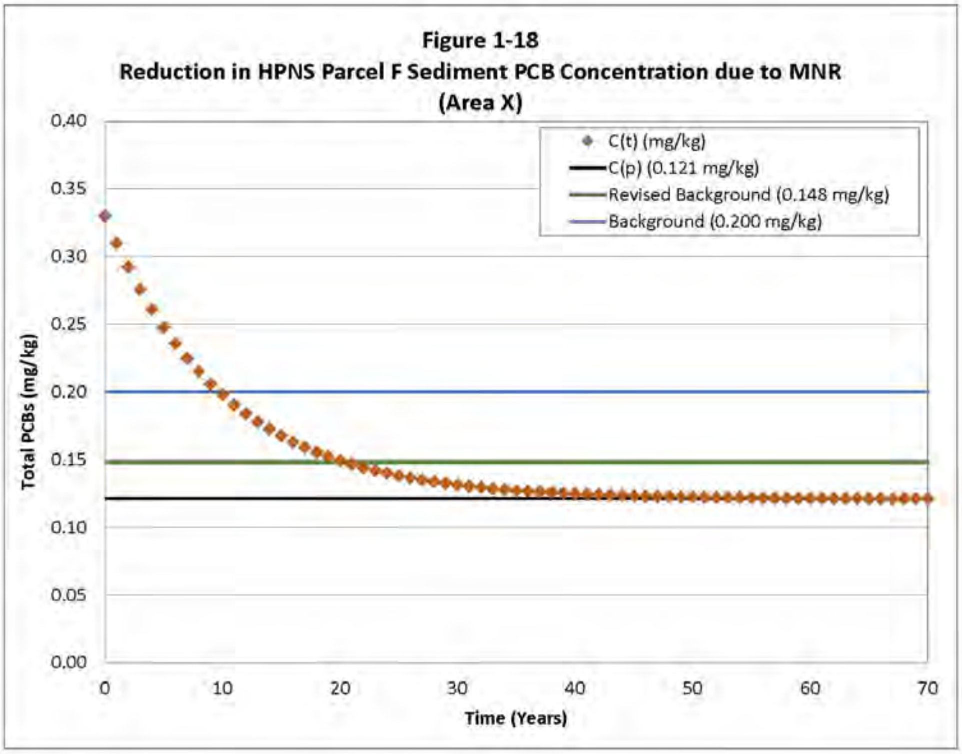
<u>Notes</u>
Post-Construction Surface Sediment Total PCB Concentration = 0.330 mg/kg
Sediment Deposition Rate = 0.5 cm/yr
Sediment Mixing Depth = 15 cm
Time to Revised Background is approximately 61 years

<u>Acronyms/Abbreviations</u>
C(p) - concentration of total PCBs in incoming sediment
cm/yr - centimeter(s) per year
C(t) - concentration of total PCBs at time t
HPNS - Hunters Point Naval Shipyard
mg/kg - milligram(s) per kilogram
MNR - monitored natural recovery
PCB - polychlorinated biphenyl



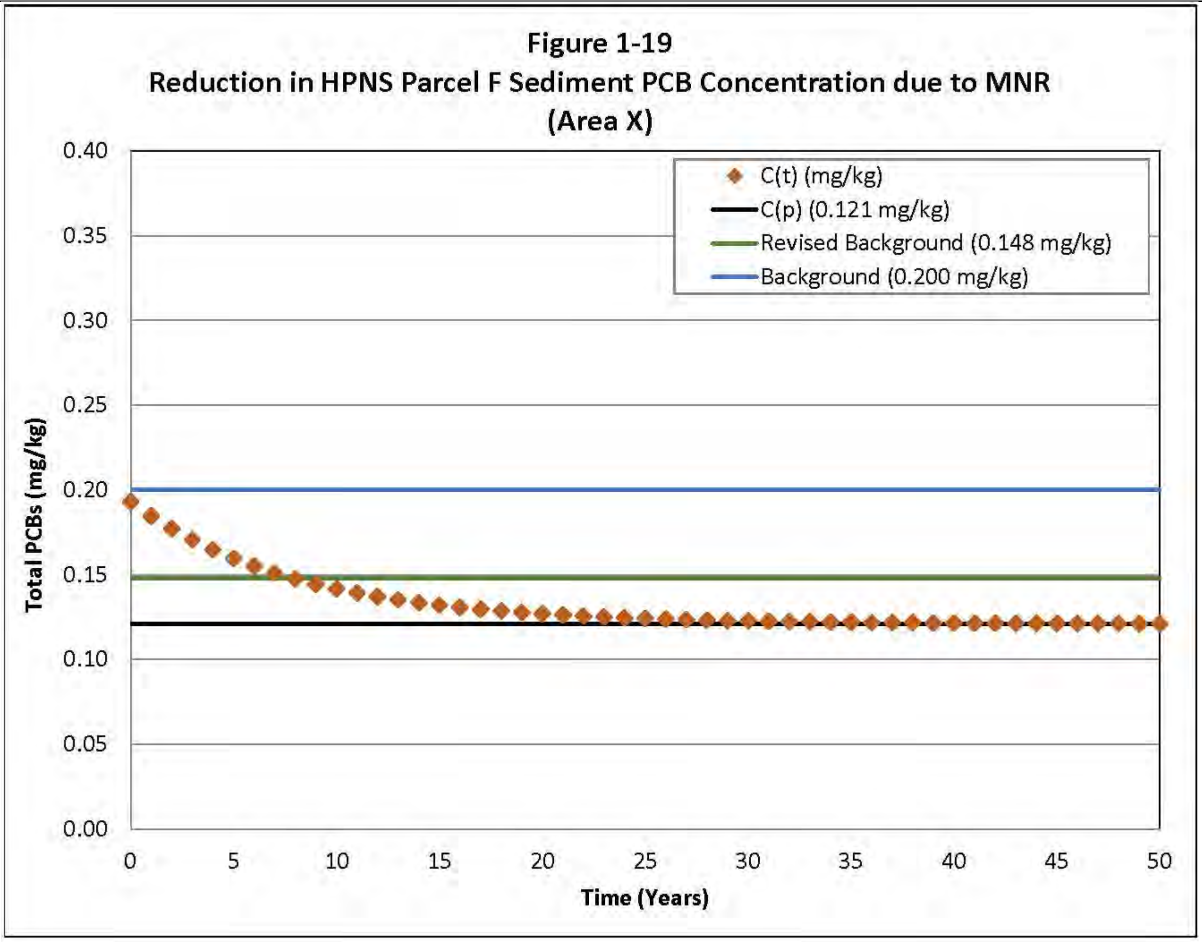
Notes
Post-Construction Surface Sediment Total PCB Concentration = 0.330 mg/kg
Sediment Deposition Rate = 1 cm/yr
Sediment Mixing Depth = 15 cm
Time to Revised Background is approximately 31 years

Acronyms/Abbreviations
C(p) - concentration of total PCBs in incoming sediment
cm/yr - centimeter(s) per year
C(t) - concentration of total PCBs at time t
HPNS - Hunters Point Naval Shipyard
mg/kg - milligram(s) per kilogram
MNR - monitored natural recovery
PCB - polychlorinated biphenyl



Notes
Post-Construction Surface Sediment Total PCB Concentration = 0.330 mg/kg
Sediment Deposition Rate = 1.5 cm/yr
Sediment Mixing Depth = 15 cm
Time to Revised Background is approximately 21 years

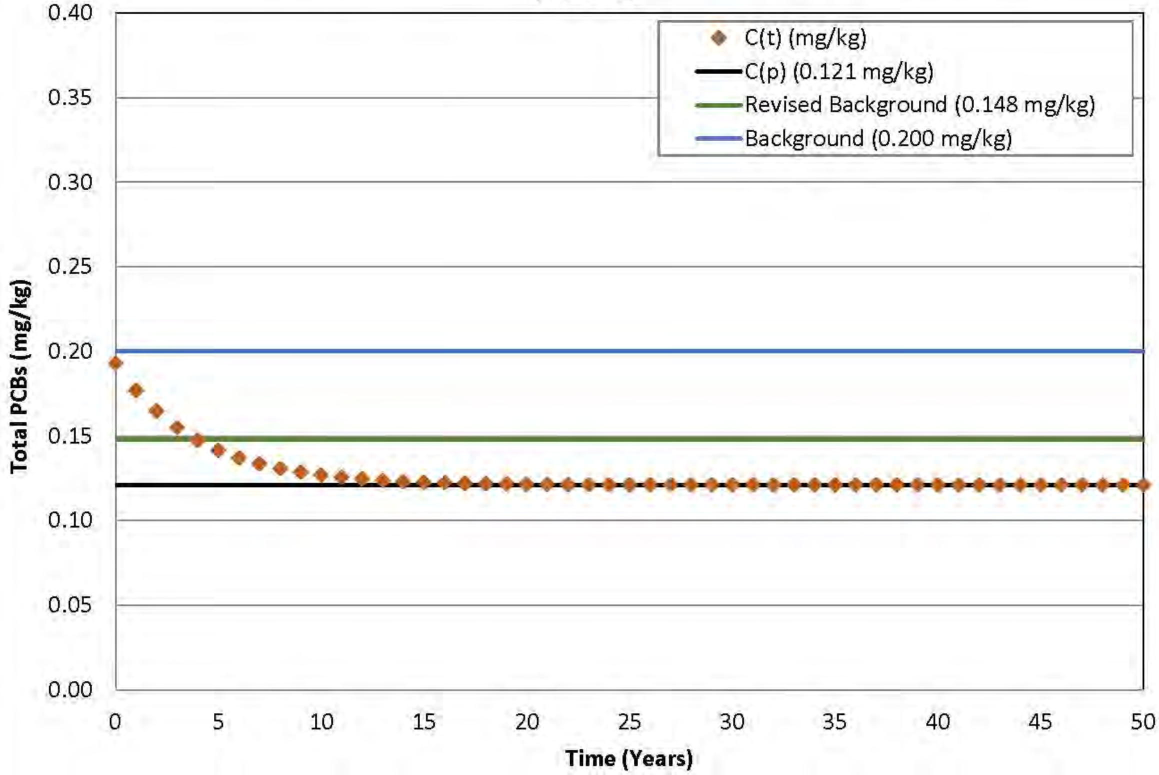
Acronyms/Abbreviations
C(p) - concentration of total PCBs in incoming sediment
cm/yr - centimeter(s) per year
C(t) - concentration of total PCBs at time t
HPNS - Hunters Point Naval Shipyard
mg/kg - milligram(s) per kilogram
MNR - monitored natural recovery
PCB - polychlorinated biphenyl



Notes
Post-Construction Surface Sediment Total PCB Concentration = 0.193 mg/kg
Sediment Deposition Rate = 0.5 cm/yr
Sediment Mixing Depth = 4 cm
Time to Revised Background is approximately 8 years

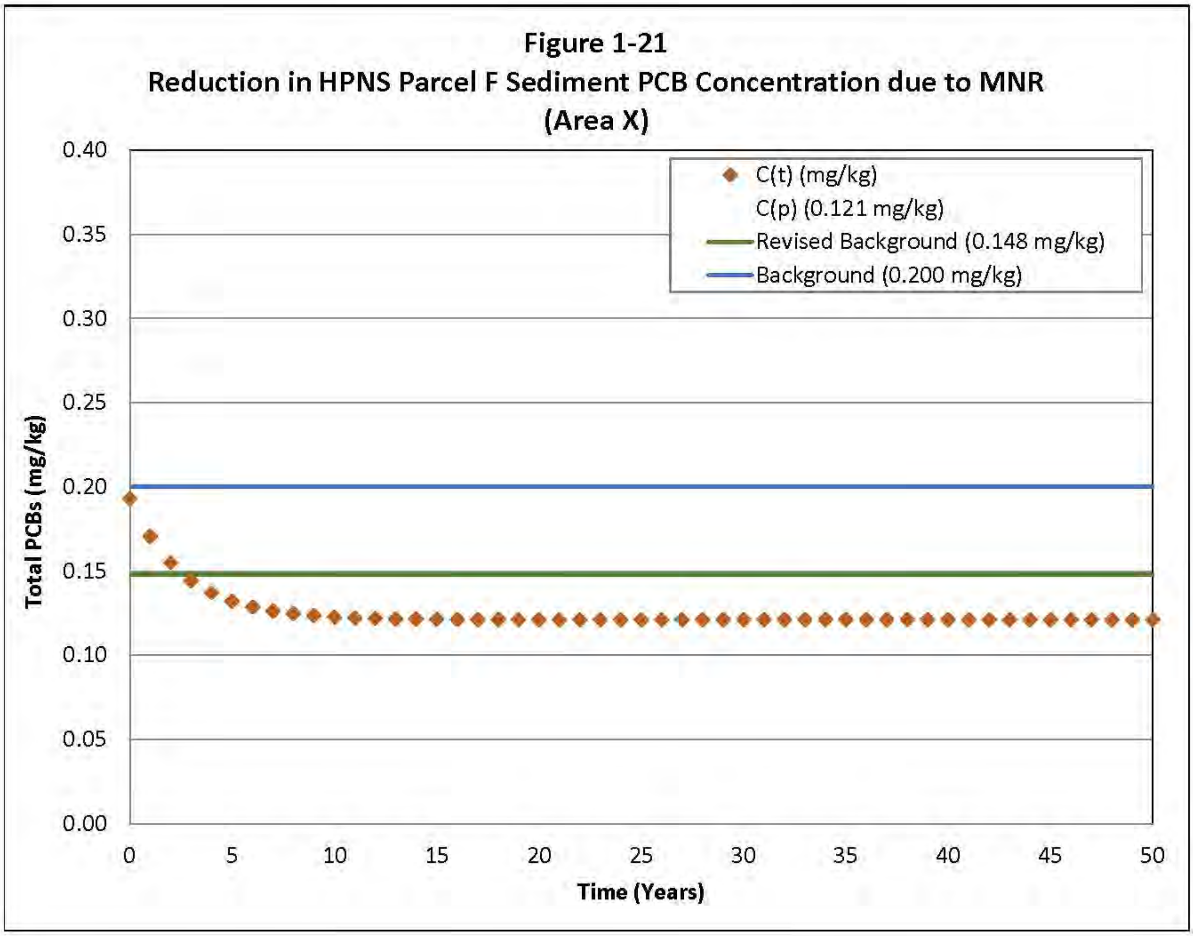
Acronyms/Abbreviations
C(p) - concentration of total PCBs in incoming sediment
cm/yr - centimeter(s) per year
C(t) - concentration of total PCBs at time t
HPNS - Hunters Point Naval Shipyard
mg/kg - milligram(s) per kilogram
MNR - monitored natural recovery
PCB - polychlorinated biphenyl

Figure 1-20
Reduction in HPNS Parcel F Sediment PCB Concentration due to MNR (Area X)



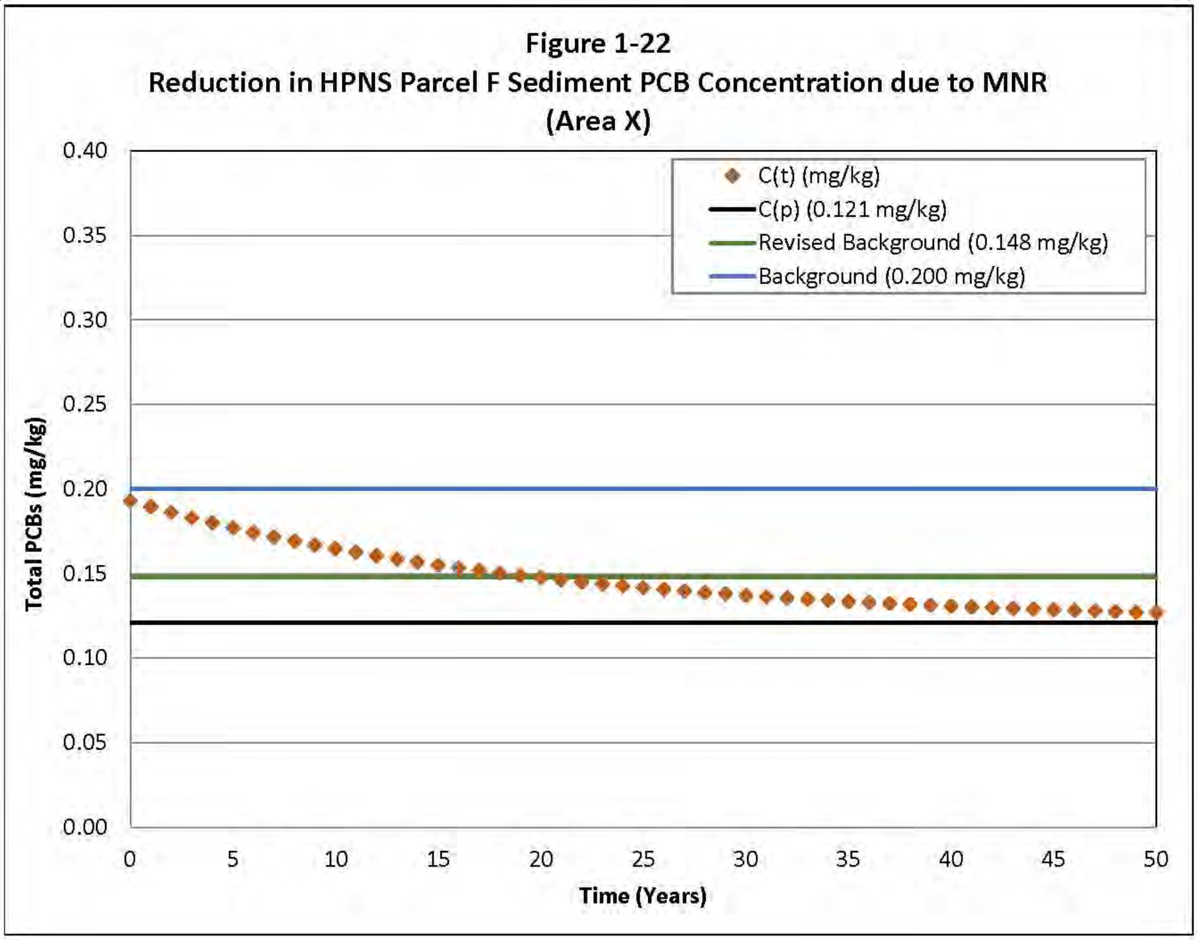
Notes
Post-Construction Surface Sediment Total PCB Concentration = 0.193 mg/kg
Sediment Deposition Rate = 1 cm/yr
Sediment Mixing Depth = 4 cm
Time to Revised Background is approximately 4 years

Acronyms/Abbreviations
C(p) - concentration of total PCBs in incoming sediment
cm/yr - centimeter(s) per year
C(t) - concentration of total PCBs at time t
HPNS - Hunters Point Naval Shipyard
mg/kg - milligram(s) per kilogram
MNR - monitored natural recovery
PCB - polychlorinated biphenyl



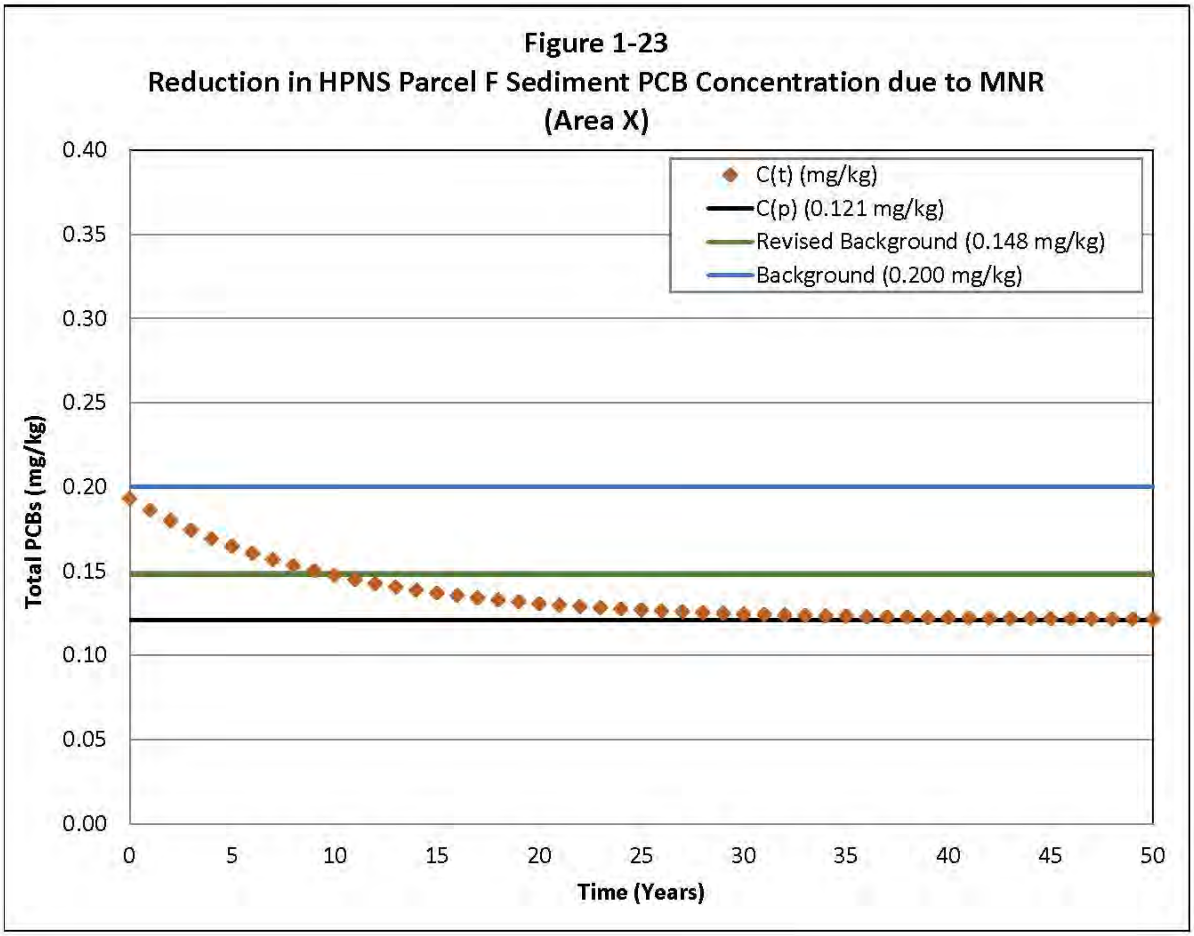
Notes
Post-Construction Surface Sediment Total PCB Concentration = 0.193 mg/kg
Sediment Deposition Rate = 1.5 cm/yr
Sediment Mixing Depth = 4 cm
Time to Revised Background is approximately 3 years

Acronyms/Abbreviations
C(p) - concentration of total PCBs in incoming sediment
cm/yr - centimeter(s) per year
C(t) - concentration of total PCBs at time t
HPNS - Hunters Point Naval Shipyard
mg/kg - milligram(s) per kilogram
MNR - monitored natural recovery
PCB - polychlorinated biphenyl



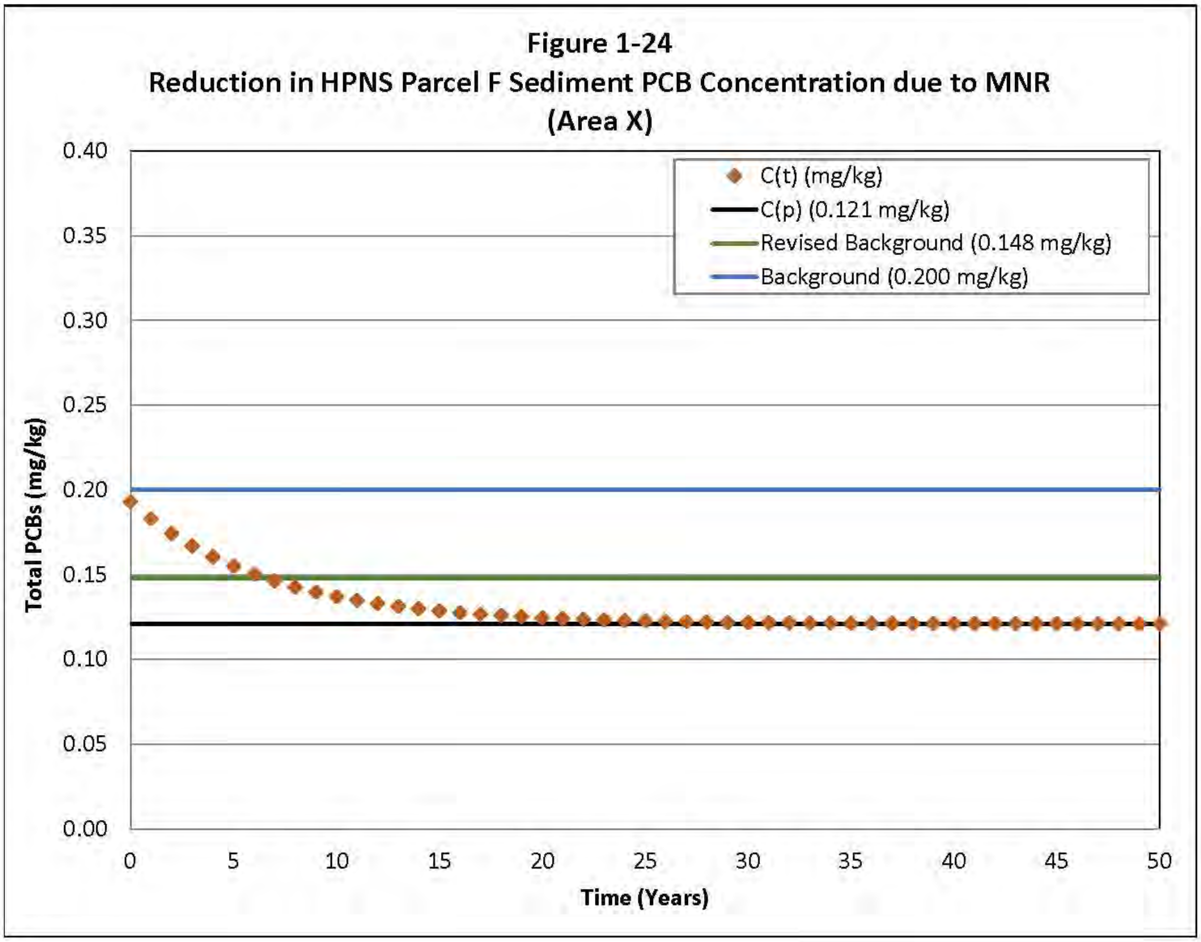
Notes
Post-Construction Surface Sediment Total PCB Concentration = 0.193 mg/kg
Sediment Deposition Rate = 0.5 cm/yr
Sediment Mixing Depth = 10 cm
Time to Revised Background is approximately 20 years

Acronyms/Abbreviations
C(p) - concentration of total PCBs in incoming sediment
cm/yr - centimeter(s) per year
C(t) - concentration of total PCBs at time t
HPNS - Hunters Point Naval Shipyard
mg/kg - milligram(s) per kilogram
MNR - monitored natural recovery
PCB - polychlorinated biphenyl



Notes
Post-Construction Surface Sediment Total PCB Concentration = 0.193 mg/kg
Sediment Deposition Rate = 1 cm/yr
Sediment Mixing Depth = 10 cm
Time to Revised Background is approximately 10 years

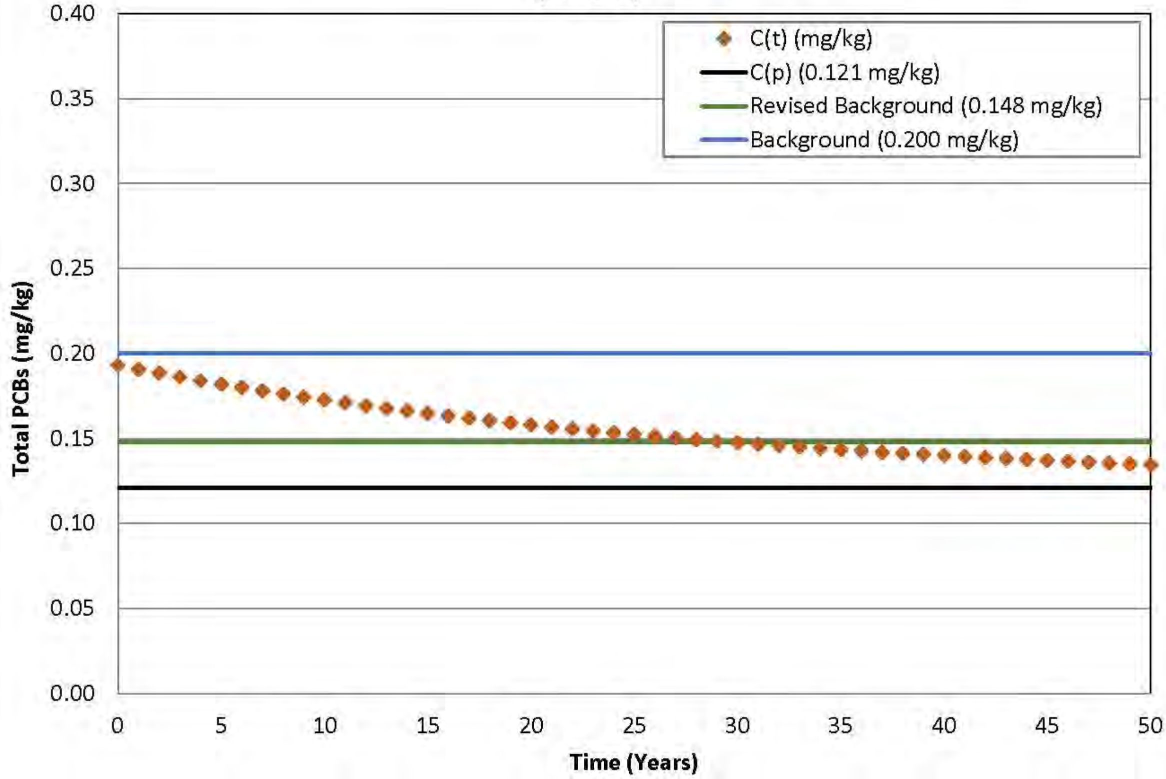
Acronyms/Abbreviations
C(p) - concentration of total PCBs in incoming sediment
cm/yr - centimeter(s) per year
C(t) - concentration of total PCBs at time t
HPNS - Hunters Point Naval Shipyard
mg/kg - milligram(s) per kilogram
MNR - monitored natural recovery
PCB - polychlorinated biphenyl



Notes
Post-Construction Surface Sediment Total PCB Concentration = 0.193 mg/kg
Sediment Deposition Rate = 1.5 cm/yr
Sediment Mixing Depth = 10 cm
Time to Revised Background is approximately 7 years

Acronyms/Abbreviations
C(p) - concentration of total PCBs in incoming sediment
cm/yr - centimeter(s) per year
C(t) - concentration of total PCBs at time t
HPNS - Hunters Point Naval Shipyard
mg/kg - milligram(s) per kilogram
MNR - monitored natural recovery
PCB - polychlorinated biphenyl

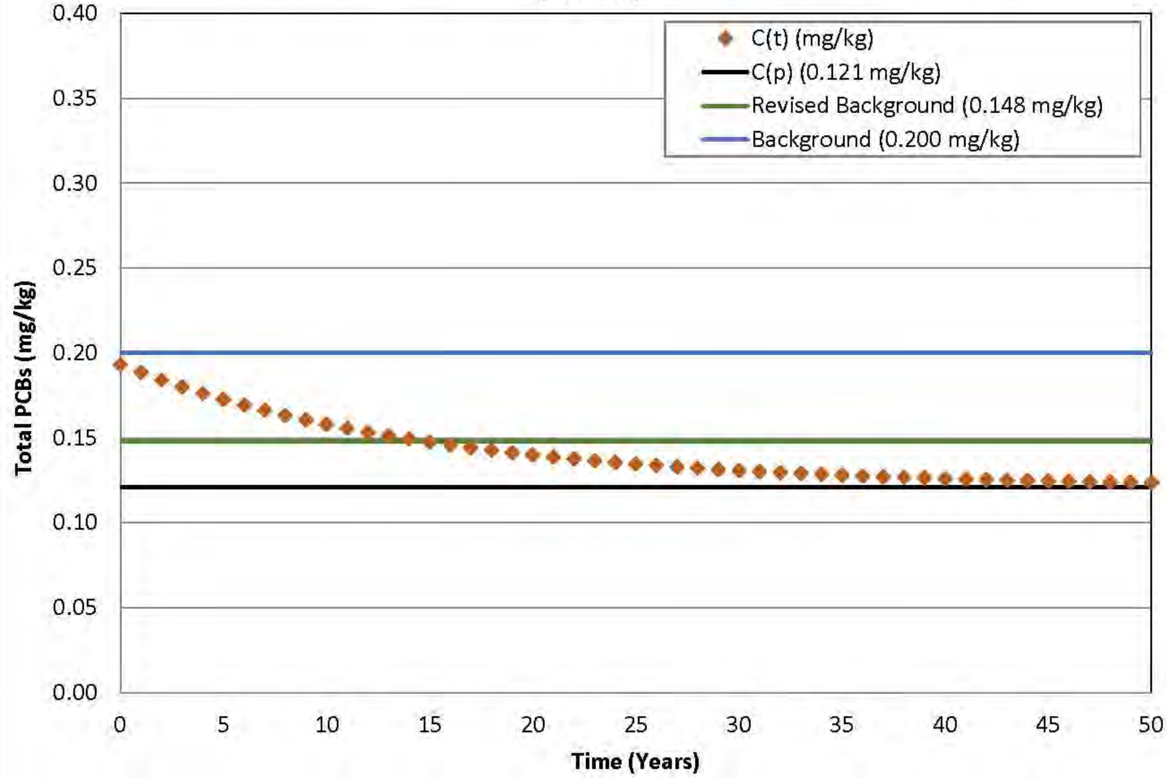
Figure 1-25
Reduction in HPNS Parcel F Sediment PCB Concentration due to MNR (Area X)



Notes
Post-Construction Surface Sediment Total PCB Concentration = 0.193 mg/kg
Sediment Deposition Rate = 0.5 cm/yr
Sediment Mixing Depth = 15 cm
Time to Revised Background is approximately 30 years

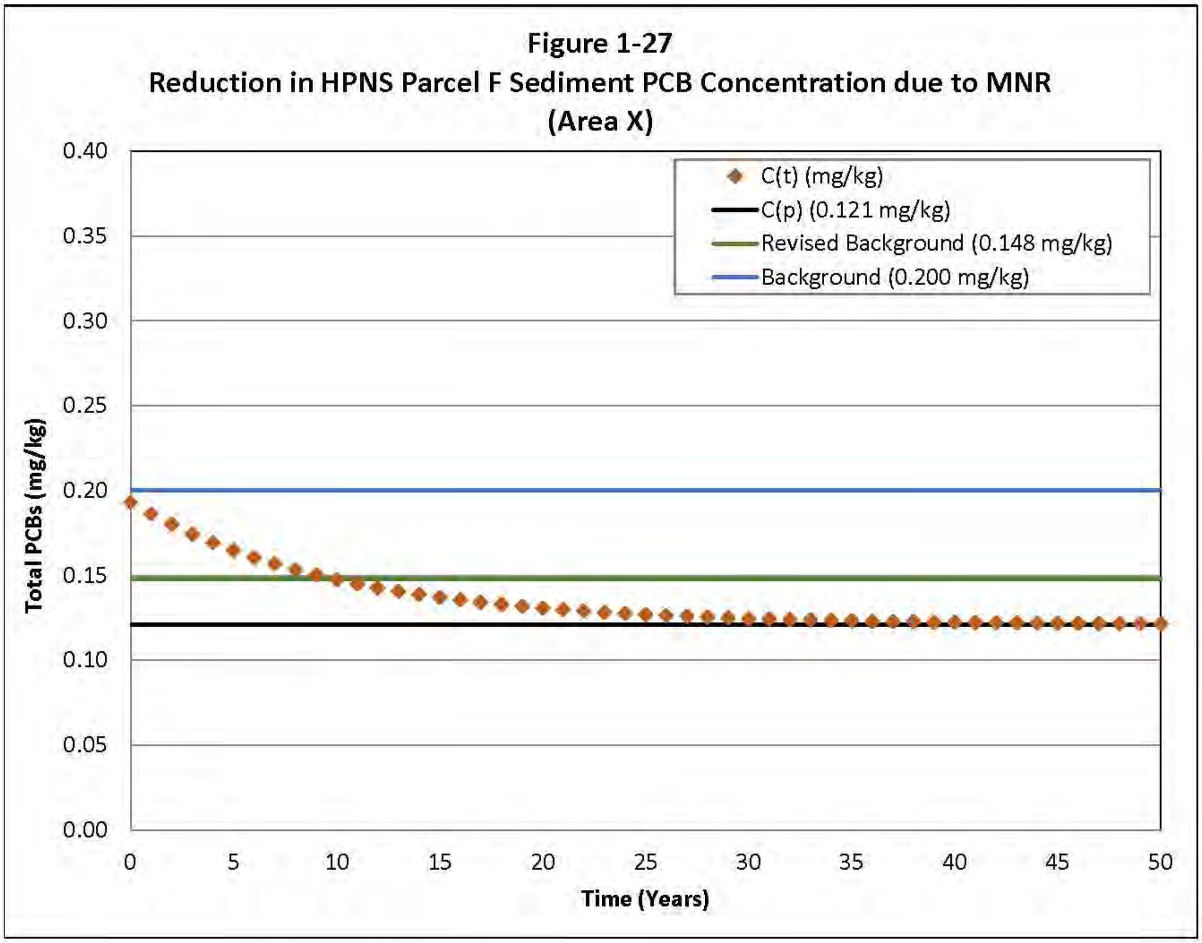
Acronyms/Abbreviations
C(p) - concentration of total PCBs in incoming sediment
cm/yr - centimeter(s) per year
C(t) - concentration of total PCBs at time t
HPNS - Hunters Point Naval Shipyard
mg/kg - milligram(s) per kilogram
MNR - monitored natural recovery
PCB - polychlorinated biphenyl

Figure 1-26
Reduction in HPNS Parcel F Sediment PCB Concentration due to MNR
(Area X)



Notes
Post-Construction Surface Sediment Total PCB Concentration = 0.193 mg/kg
Sediment Deposition Rate = 1 cm/yr
Sediment Mixing Depth = 15 cm
Time to Revised Background is approximately 15 years

Acronyms/Abbreviations
C(p) - concentration of total PCBs in incoming sediment
cm/yr - centimeter(s) per year
C(t) - concentration of total PCBs at time t
HPNS - Hunters Point Naval Shipyard
mg/kg - milligram(s) per kilogram
MNR - monitored natural recovery
PCB - polychlorinated biphenyl



Notes
Post-Construction Surface Sediment Total PCB Concentration = 0.193 mg/kg
Sediment Deposition Rate = 1.5 cm/yr
Sediment Mixing Depth = 15 cm
Time to Revised Background is approximately 10 years

Acronyms/Abbreviations
C(p) - concentration of total PCBs in incoming sediment
cm/yr - centimeter(s) per year
C(t) - concentration of total PCBs at time t
HPNS - Hunters Point Naval Shipyard
mg/kg - milligram(s) per kilogram
MNR - monitored natural recovery
PCB - polychlorinated biphenyl

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ATTACHMENT 2

REVISED AREAS IX/X REMEDY COST ESTIMATE

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Attachment 2-1. Updated Cost Estimate for Alternative 7 with Extended MNR Timeframes.

SCALING FACTORS

Focused Removal - volume of sediment	*Alternative 5*	*Optimized Alternative*	*Scaling factor*
cubic yards	66,200	39,000	59%
In situ treatment - Treatment volume	*Alternative 3*	*Optimized Alternative*	*Scaling factor*
cubic yards	66,200	32,000	48%
Monitored Natural Recovery - Area	*Alternative 5*	*Optimized Alternative*	*Scaling factor*
Number of samples	30	30	100%

ESCALATION FACTOR

Year	Escalation factor (2.1% per annum)	
2006	1.000	**Year FS Cost Estimate**
2007	1.021	
2008	1.042	
2009	1.064	
2010	1.087	
2011	1.110	
2012	1.133	
2013	1.157	
2014	1.181	
2015	1.206	
2016	1.231	
2017	1.257	**Year Optimized Alternative Cost Estimate**

DESIGN	**Original Alt Cost**	**Escalation Factor**	**Scaling factor**	**Optimized alt Cost**
Focused Removal	$ 987,419	1.26	59%	$ 731,124
In-situ treatment	$ 1,015,208	1.26	48%	$ 616,780
Monitored Natural Recovery	$ 13,810	1.26	100%	$ 17,357
			SUBTOTAL	**$ 1,365,261**

CAPITAL COSTS

Administrative Land Use Controls	**Alt 5 Cost**	**Escalation Factor**	**Scaling factor**	**Optimized alt Cost**
Planning Docs	$ 420,034	1.26	150%	$ 791,879
Planning Meetings	$ 89,056	1.26	150%	$ 167,895
Implementation	$ 211,646	1.26	150%	$ 399,011
Modification/Termination	$ 71,964	1.26	150%	$ 135,672

Focused Removal	**Alt 5 Cost**	**Escalation Factor**	**Scaling factor**	**Optimized alt Cost**
Excavation and Backfill	$ 3,063,718	1.26	59%	$ 2,268,499
Confirmation sampling	$ 29,540	1.26	59%	$ 21,873
Load and haul - sediment disposal	$ 5,959,526	1.26	59%	$ 4,412,671
Residual waste management - sediment and decon waste disposal	$ 22,250	1.26	100%	$ 27,965
Dewatering pad	$ 314,493	1.26	100%	$ 395,270
Decontamination facilities	$ 108,130	1.26	100%	$ 135,903
Professional labor management	$ 3,180,701	1.26	59%	$ 2,355,118
Yosemite Slough 825 ft long silt curtain	Not applicable			$ 80,000

Attachment 2-1 (continued). Updated Cost Estimate for Alternative 7 with Extended MNR Timeframes.

In situ treatment - General Conditions	Alt 3 Cost	Escalation Factor	Scaling factor	Optimized alt Cost
Long-term Monitoring - In situ treatment	INCLUDED IN MONITORED NATURAL RECOVERY			
Decontamination facilities	INCLUDED IN FOCUSED REMOVAL			
Residual waste management - decon wastes				
Professional labor management - In situ treatment	$ 2,798,715	1.26	48%	$ 1,700,332

Amendment Costs - purchase, mix, emplace	Cubic Yards	$ per Cubic Yard	Escalation Factor	Optimized Alt Cost
Carbon-coated pellets	32,000	$ 220	Not applicable; this is a different amendment mix than considered in Alt 3	$ 7,040,000
Sand	32,000	$ 10		$ 320,000
Mixing	32,000	$ 5		$ 160,000
Emplacement	32,000	$ 12		$ 384,000
			SUBTOTAL	**$ 20,796,087**

MONITORING

Monitored Natural Recovery	Alt 5 Cost	Escalation Factor	Scaling factor	Optimized alt Cost
Five-year review	$ 45,611	1.26	100%	$ 57,326
Annual Sample collection, genl monitoring, reporting	$ 115,341	1.26	100%	$ 144,966

PRESENT VALUE

	Total Cost	Year from Start	Escalation Factor (2.1% per annum)	Discount Factor	Total Present Value Cost
Design	$ 1,365,261	0	1	1	$ 1,365,261
Remedial Action Construction	$ 20,796,087	1	1.021	0.970	$ 20,595,821
Monitoring	$ 144,966	2	1.042	0.941	$ 142,143
Monitoring	$ 144,966	3	1.064	0.912	$ 140,671
Monitoring	$ 144,966	4	1.087	0.885	$ 139,457
Monitoring	$ 144,966	5	1.110	0.858	$ 138,063
Monitoring, cap repair, 5-Year Review	$ 202,292	6	1.133	0.833	$ 190,921
Monitoring	$ 144,966	7	1.157	0.808	$ 135,523
Monitoring	$ 144,966	9	1.206	0.76	$ 132,870
Monitoring, 5-Year Review	$ 202,292	11	1.257	0.715	$ 181,811
Monitoring	$ 144,966	13	1.310	0.672	$ 127,617
Monitoring	$ 144,966	15	1.366	0.633	$ 125,349
Monitoring, 5-Year Review	$ 202,292	16	1.395	0.614	$ 173,269
Monitoring	$ 144,966	17	1.424	0.595	$ 122,827
Monitoring, 5-Year Review	$ 202,292	21	1.547	0.527	$ 164,923
Monitoring, 5-Year Review	$ 202,292	26	1.717	0.452	$ 156,996
Monitoring, 5-Year Review	$ 202,292	31	1.905	0.388	$ 149,522

TOTAL PRESENT VALUE	**$ 24,183,044**
PREVIOUS TOTAL PRESENT VALUE	**$ 23,045,503**
INCREASE IN TOTAL PRESENT VALUE	**$ 1,137,541**

Source: ECC-Insight, LLC and CDM Smith, 2017. Final Technical Memorandum - Optimized Remedial Alternative for Parcel F, Hunters Point Naval Shipyard, San Francisco, CA . September.

Yellow highlighted cell indicates the information was added or modified from the source estimate presented in ECC-Insight, LLC and CDM Smith (2017).

Attachment 2-2. Cost Estimate for Alternative 7 Modified.

ALTERNATIVE 7 SCALING FACTORS

Focused Removal - volume of sediment cubic yards	*Alternative 5* 66,200	*Optimized Alternative* 39,000	*Scaling factor* 59%
In situ treatment - treatment volume cubic yards	*Alternative 3* 66,200	*Optimized Alternative* 32,000	*Scaling factor* 48%
Monitored Natural Recovery - Area Number of samples	*Alternative 5* 30	*Optimized Alternative* 30	*Scaling factor* 100%

ESCALATION FACTOR

Year	Escalation factor (2.1% per annum)	
2006	1.000	Year FS Cost Estimate
2007	1.021	
2008	1.042	
2009	1.064	
2010	1.087	
2011	1.110	
2012	1.133	
2013	1.157	
2014	1.181	
2015	1.206	
2016	1.231	
2017	1.257	Year Modified Alternative Cost Estimate

DESIGN	Original Alt Cost	Escalation Factor	Scaling Factor	Modified Alt 7 Cost
Focused Removal	$ 987,419	1.26	59%	$ 731,124
In-situ treatment	$ 1,015,208	1.26	48%	$ 616,780
Monitored Natural Recovery	$ 13,810	1.26	100%	$ 17,357
			SUBTOTAL	$ 1,365,261

CAPITAL COSTS

Administrative Land Use Controls	Alt 5 Cost	Escalation Factor	Scaling Factor	Modified Alt 7 Cost
Planning Docs	$ 420,034	1.26	120%	$ 633,503
Planning Meetings	$ 89,056	1.26	120%	$ 134,316
Implementation	$ 211,646	1.26	120%	$ 319,209
Modification/Termination	$ 71,964	1.26	120%	$ 108,537

Focused Removal	Alt 5 Cost	Escalation Factor	Scaling Factor	Modified Alt 7 Cost
Excavation and Backfill	$ 3,063,718	1.26	71%	$ 2,724,345
Confirmation sampling	$ 29,540	1.26	71%	$ 26,268
Load and haul - sediment disposal	$ 5,959,526	1.26	71%	$ 5,299,379
Residual waste management - sediment and decon waste disposal	$ 22,250	1.26	120%	$ 33,584
Dewatering pad	$ 314,493	1.26	120%	$ 474,692
Decontamination facilities	$ 108,130	1.26	120%	$ 163,210
Professional labor management	$ 3,180,701	1.26	71%	$ 2,828,369
Yosemite Slough 825 ft long silt curtain	Not applicable			$ 80,000

Attachment 2-2 (continued). Cost Estimate for Alternative 7 Modified.

In situ treatment - General Conditions	Alt 3 Cost	Escalation Factor	Scaling factor	Modified Alt 7 Cost
Long-term Monitoring - In situ treatment	INCLUDED IN MONITORED NATURAL RECOVERY			
Decontamination facilities	INCLUDED IN FOCUSED REMOVAL			
Residual waste management - decon wastes				
Professional labor management - In situ treatment	$ 2,798,715	1.26	38%	$ 1,328,861

Amendment Costs - purchase, mix, emplace	Cubic Yards	$ per Cubic Yard	Escalation Factor	Modified Alt 7 Cost
Carbon-coated pellets	25,000	$ 220	Not applicable; this is a different amendment mix than considered in Alt 3	$ 5,500,000
Sand	25,000	$ 10		$ 250,000
Mixing	25,000	$ 5		$ 125,000
Emplacement	25,000	$ 12		$ 300,000
			SUBTOTAL	$ 20,329,274

MONITORING

Monitored Natural Recovery	Alt 5 Cost	Escalation Factor	Scaling Factor	Modified Alt 7 Cost
Five-year review	$ 45,611	1.26	100%	$ 57,326
Annual Sample collection, genl monitoring, reporting	$ 115,341	1.26	100%	$ 144,966

PRESENT VALUE

	Total Cost	Year from Start	Escalation Factor (2.1% per annum)	Discount Factor	Total Present Value Cost
Design	$ 1,365,261	0	1	1	$ 1,365,261
Remedial Action Construction	$ 20,329,274	1	1.021	0.970	$ 20,133,503
Monitoring	$ 144,966	2	1.042	0.941	$ 142,143
Monitoring	$ 144,966	3	1.064	0.912	$ 140,671
Monitoring	$ 144,966	4	1.087	0.885	$ 139,457
Monitoring	$ 144,966	5	1.110	0.858	$ 138,063
Monitoring, cap repair, 5-Year Review	$ 202,292	6	1.133	0.833	$ 190,921
Monitoring	$ 144,966	8	1.181	0.783	$ 134,054
Monitoring, 5-Year Review	$ 202,292	11	1.257	0.715	$ 181,811
Monitoring	$ 144,966	13	1.310	0.672	$ 127,617
Monitoring, 5-Year Review	$ 202,292	16	1.395	0.614	$ 173,269
Monitoring, 5-Year Review	$ 202,292	21	1.547	0.527	$ 164,923
Monitoring, 5-Year Review	$ 202,292	26	1.717	0.452	$ 156,996
Monitoring, 5-Year Review	$ 202,292	31	1.905	0.388	$ 149,522
				TOTAL PRESENT VALUE	$ 23,338,211
				PREVIOUS TOTAL PRESENT VALUE	$ 23,045,503
				INCREASE IN TOTAL PRESENT VALUE	$ 292,708

Source: ECC-Insight, LLC and CDM Smith, 2017. Final Technical Memorandum - Optimized Remedial Alternative for Parcel F, Hunters Point Naval Shipyard, San Francisco, CA. September.

Yellow highlighted cell indicates the information was added or modified from the source estimate presented in ECC-Insight, LLC and CDM Smith (2017).

ATTACHMENT 3

RESPONSE TO BCT COMMENTS

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Response to BCT Comments on
DRAFT TECHNICAL MEMORANDUM
Proposed Revision to Total Polychlorinated Biphenyl Background Concentration and Remedial Action Objective 3 Remediation Goal, Parcel F Remedy,
Hunters Point Naval Shipyard, San Francisco, California
Dated July 26, 2021

The following comments were made jointly by Ms. Judy C. Huang (EPA), Juanita Bacey (DTSC), and David Tanouye (Water Board), on 8 September 2021:

Comment		Response
	GENERAL COMMENTS	
1.	For Area III, we concur with the Draft TM's conclusion that no remedy modification is necessary. For Areas IX/X, the additional Monitored Natural Recovery (MNR) duration required to achieve RAO 3 is greater than expected. We are concerned that the additional time required to achieve RAO 3 may increase the possibility that the Monitored Natural Recovery portion of Parcel F would re-contaminate not only the excavated and in-situ treatment portions of Parcel F but also the remediated areas of the adjacent Yosemite Slough site, which is hydrologically connected. Therefore, we request that the Navy update the Draft TM to include an evaluation of potential modifications to the existing preferred remedy components that would shorten the time to achieve RAO 3 in Areas IX/X by increasing the excavation and/or in-situ treatment footprints. This evaluation would provide the FFA parties with the information necessary to compare with the MNR modification-only approach and select a final remedy for Parcel F that is consistent with and ensures the protectiveness of the adjacent Yosemite Slough remedy.	The Navy evaluated additional modifications to the existing preferred remedy by adding removal or in situ treatment to shorten the monitored natural recovery (MNR) timeframe to achieve RAO 3 in Areas IX/X. Two scenarios were presented and discussed with the BCT in the October 21, 2021 and February 23, 2022 meetings. The Technical Memorandum (TM) was updated to include the evaluation of a revised remedial alternative with removal of a larger area in Area X adjacent to Yosemite Slough to achieve a lower post-remediation PCB area weighted average (AWA) concentration resulting in a reduced MNR timeframe to achieve RAO 3 in Area X. This alternative can then be compared to the MNR modification-only approach presented in the TM and support selection of the final Parcel F remedy. With respect to re-contamination potential, both the Navy and the Yosemite Slough parties have compiled information related to hydrodynamics and sediment transport, and this information indicates that South Basin and Yosemite Slough are low energy environments. The following text was added to the end of Section 1: "Information related to sediment transport in the South Basin is available from the Parcel F validation study (Battelle et al., 2005), the Parcel F Feasibility Study (FS) data gaps investigation (Battelle et al., 2007), and a hydrodynamic modeling, wave analysis and sedimentation evaluation for Yosemite Slough (Noble, 2005). Multiple lines of evidence contained within these documents indicate: • The South Basin sediment bed is stable, based on the preservation of well-defined, consistent PCB profiles in sediment cores throughout the

Comment		Response
		basin. • Tidal circulation in the South Basin is weak and variable, with a low potential of sediment re-suspension, and the basin is a net depositional environment. • The general stability of the sediments and PCB distributions in the South Basin illustrate that there is negligible lateral transport within Areas IX/X, or from HPNS Parcel E source areas or Areas IX/X into Yosemite Slough. Therefore, any sediments that are re-suspended due to tidal or wave action are expected to be re-deposited locally to the sediment bed.

END OF JOINT COMMENTS BY EPA, DTSC AND WATER BOARD

Response to BCT Comments on
DRAFT TECHNICAL MEMORANDUM
Proposed Revision to Total Polychlorinated Biphenyl Background Concentration and Remedial Action Objective 3 Remediation Goal, Parcel F Remedy,
Hunters Point Naval Shipyard, San Francisco, California
Dated July 26, 2021

The following comments were made by Ms. Amy Brownell, P.E. Environmental Engineer of the City and County of San Francisco Department of Public Health (SFDPH) on 1 September 2021.

Comment		**Response**
	GENERAL COMMENTS	
1.	Please reference and respond to the comment on the MNR estimated timeline that was raised by YSCPG. Specifically, YSCPG commented, on August 30, 2021, regarding the sensitivity analysis on the Navy's SEDCAM modeling results which indicate that the estimated timeframe for MNR to achieve the revised total PCB background goal may be longer than 13 years for Area IX and 17 years for Area X. Do these longer timeframes indicate a potential for Parcel F to recontaminate Yosemite Slough?	The revised TM presents a revised scenario, Alternative 7 Modified, to implement additional active remediation in Area X, lowering the MNR timeframe to attain the lower 148 µg/kg PCB background concentration to 8 years, consistent with the previous MNR timeframes projected for Area X to achieve 200 ug/kg. Also please see response to joint EPA, DTSC, and Water Board comment.
	SPECIFIC COMMENTS	
1.	**Section 3.1, Proposed Revision for Total PCB Background Concentration, Page 11:** Please provide detail on the referenced changes that will be made to the Parcel F ROD. Is a change to the RAO 3 RG for total PCBs proposed? How will the EPA be updating the Action Memorandum for Yosemite Slough and how will this be done in conjunction with the Parcel F ROD?	The San Francisco Bay Regional Water Quality Control Board (Water Board) requested a revision to the total polychlorinated biphenyl (PCB) background concentration from 200 to 148 micrograms per kilogram (µg/kg). The Parcel F ROD will be updated to: • describe the transition of the PCB background value from 200 µg/kg used in the FS (2008) and proposed plan (2018) to 148 µg/kg; • provide the technical basis and calculations used to derive the 148 µg/kg; • provide this technical memorandum to document the impacts of the proposed revision to the PCB background concentration on the Parcel F remedy (which is the basis of RAO 3 for Parcel F) as Attachment 5, Responses to Comments; and • incorporate the revised PCB background concentration of 148 µg/kg throughout the ROD.

Response to BCT Comments on
DRAFT TECHNICAL MEMORANDUM
Proposed Revision to Total Polychlorinated Biphenyl Background Concentration and Remedial Action Objective 3 Remediation Goal, Parcel F Remedy,
Hunters Point Naval Shipyard, San Francisco, California
Dated July 26, 2021

Comment		Response
		The Navy, BCT and YSCPG have initiated coordination meetings to discuss the basis of actions, and coordination between the Yosemite Slough and Parcel F remedies. The first meeting was held on February 23, 2022, and the second meeting is scheduled for June 29, 2022.
2.	**Section 4.2, Technical Impacts to Areas IX/X Remedy, Page 14, and Attachment 1, SEDCAM Sensitivity Analysis, Page A1-1:** The SEDCAM formula is presented as follows: $C(t) = C(p) \times (1 - e^{-t(ML/Rs}) + C(0) \times e^{-t/(\frac{ML}{Rs})}$ Please verify whether the exponent -t(ML/Rs) should be reversed to -t(Rs/ML) in the above formula to read as follows: $C(t) = C(p) \text{ x } (1 - e^{-t(Rs/ML)}) + C(o) \text{ x } e^{-t(Rs/ML)}$	The SEDCAM formula is correct as written. As written, term ML is in length units, and Rs is in length/time units. The ratio of these two is in units of time, which cancels out term t in the numerator and so the term in the exponent is unitless.
3.	**Attachment 1, SEDCAM Sensitivity Analysis, Page A1-2:** Specifically, the fourth bulleted item from the top, reads: • C(0) = 260 µg/kg for Area XI and 330 µg/kg for Area X Area XI should be changed to Area IX and read as follows: • C(0) = 260 µg/kg for Area *IX* and 330 µg/kg for Area X.	Comment noted, XI was replaced by IX.

END OF SFDPH COMMENTS

Response to BCT Comments on
DRAFT FINALTECHNICAL MEMORANDUM
Revision to Total Polychlorinated Biphenyl Background Concentration and Remedial Action Objective 3
Remediation Goal, Parcel F Remedy,
Hunters Point Naval Shipyard, San Francisco, California
Dated May 4, 2022

The following comments were made jointly by Ms. Judy C. Huang (EPA), Juanita Bacey (DTSC), and David Tanouye (Water Board), on June 1, 2022:

Comment		Response
	GENERAL COMMENTS	
1.	**Section 1.2, Parcel F Site Background, Bullet 3:** This bullet states "The general stability of the sediments and PCB distributions in the South Basin illustrate that there is negligible lateral transport within Areas IX/X, or from HPNS **Parcel E** source areas or Areas IX/X into Yosemite Slough." Please replace "Parcel E" with "Parcels E and E-2".	The change has been made as requested.
2.	**Section 2.1, Final Remedial Action Objectives and Remediation Goals:** The first paragraph of this section states "The RGs presented in the Proposed Plan and draft final ROD, summarized in Table 1**, are preliminary, and will be considered final in the final ROD**." Since RAO 3 PCBs RG has been modified after the issuance of the Draft Final ROD and to avoid confusion to the reader, please 1) delete ", and will be considered final in the final ROD" from the first paragraph and 2) insert a sentence to the end of the second paragraph and a footnote to Table 1, RAO 3, PCBs RG to state that the RAO 3 PCBs RG has been modified from 200 ug/kg to 148 ug/kg to reflect the updated background concentration after the issuance of the Draft Final Record of Decision.	The change has been made as requested.
3.	**Section 2.2, Selected Remedy for Parcel F, Monitoring and Maintenance:** Please include minimizing offsite impacts and ensure the integrity of the Yosemite Slough remedy as an objective for construction monitoring, performance monitoring, and long-term monitoring.	The text has been changed with changes shown as *italicized*: • <u>Construction Monitoring</u>: Monitoring will be implemented during remedial activities for construction quality control *and to minimize offsite impacts. Care will be taken during construction to not affect adjacent sediment sites.* Construction monitoring may include: water quality monitoring; confirmation sampling; and as prescribed in the remedial design, bathymetric surveying to ensure sediments are removed to required depths, backfill and cap materials are placed to

Comment		Response
		required elevations, and in situ treatment materials are placed appropriately. • Performance Monitoring: After the remedy is implemented, performance monitoring will be conducted to verify that the remedy is performing as intended *and offsite impacts are minimized*. Data will be collected to ensure that backfill, capping, and in situ treatment continue to meet design specifications and perform as intended. Routine physical inspections (e.g., for erosion) will be conducted of the removal and backfill and cap remediation zones in Area III, and the removal with backfill and in situ remediation zones in Areas IX/X. Inspections, monitoring, and repairs, as necessary, will be conducted of the backfill and cap zones of Areas III and IX/X and the Areas IX/X in situ treatment area after high intensity storms. If it is determined that the remedy is not performing as intended, contingency measures will be evaluated and implemented, as necessary. • Long-Term RG Monitoring: Long-term monitoring of surface sediments will be conducted in Areas IX/X to monitor progress towards achieving the RAO 3 total PCB RGs on an AWA basis, *and minimize offsite impacts*. Long-term RG monitoring will not be conducted in Area III, because all RGs will be achieved immediately after remedy implementation.

END OF JOINT COMMENTS BY EPA, DTSC AND WATER BOARD