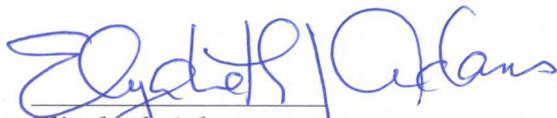


SECOND FIVE-YEAR REVIEW REPORT
FOR
UNITED HECKATHORN SUPERFUND SITE
RICHMOND, CALIFORNIA

September 2006

Prepared for
Contract No. 68-W-98-225/WA NO. 214-FRFE-09R3
U.S. Environmental Protection Agency
Region 9
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Acronyms and Abbreviations

µg/kg	milligrams per kilogram
ARAR	Applicable or Relevant and Appropriate Requirements
AWQC	Ambient Water Quality Criteria
CDFG	California Department of Fish and Game
CDHS	California Department of Health Services
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CFR	Code of Federal Regulations
COC	contaminants of concern
CSM	Conceptual Site Model
DDT	dichlorodiphenyl trichloroethane
DTSC	Department of Toxic Substances Control
ESD	Explanation of Significant Differences
FDA	Food and Drug Administration
FFS	Focused Feasibility Study
FS	Feasibility Study
in.	inch
LRTC	Levin Richmond Terminal Corporation
MLLW	Mean Lower Low Water
NAS	National Academy of Sciences
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
ng/l	nanogram per liter
NPL	National Priorities List
O&M	Operations and Maintenance
OSWER	Office of Solid Waste and Emergency Response
PIC	Parr Industrial Corporation
PRPs	Potentially Responsible Parties

RAO	Remedial Action Objectives
RI	Remedial Investigation
ROD	Record of Decision
RWQCB	Regional Water Quality Control Board
USACE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency
QAPP	Quality Assurance Project Plan
QA/QC	Quality Assurance and Quality Control
YBM	Younger Bay Mud

Five-year Review Summary Form

SITE IDENTIFICATION

Site name : United Heckathorn Superfund Site

EPA ID: CAD981436363 **CERCLIS ID :** 09R3

Region: 9 **State:** CA **City/County:** Richmond / Contra Costa County

SITE STATUS

NPL status: Final Deleted Other (specify)

Remediation status (choose all that apply): Operating Complete

Multiple OUs? YES NO **Construction completion date:** July 1999

Has site been put into reuse? YES NO

REVIEW STATUS

Reviewing agency: EPA State Tribe Other Federal Agency

Author name: Lynn Suer

Author title: Remedial Project Manager **Author affiliation:** EPA Region 9

Review period: March – June 2006

Date(s) of Site inspection: April 18 2006

Type of review: Statutory

- Policy Post-SARA Pre-SARA NPL-Removal only
 Non-NPL Remedial Action Site NPL State/Tribe-lead
 Regional Discretion)

Review number: 1 (first) 2 (second) 3 (third) Other (specify)

Triggering action:

Actual RA Onsite Construction at OU #__

Actual RA at OU #__

Previous Five-Year Review Report

Construction Completion

Other (specify) _____

Triggering action date: September 2001

Due date (five years after triggering action date): September 2006

Issues and Recommendations

Issue:

Post-remediation marine monitoring indicates that remediation goals for DDT and dieldrin for water and sediments have not been maintained. Further, concentrations of DDT and dieldrin in mussel tissues, while declining since remedial dredging occurred, are still elevated. These contaminants may still pose risk to fish-eating birds, mammals, and fishermen and their families.

Community interviews conducted by USEPA for the human health risk assessment (ICF 1994) confirmed that the marine area is used by recreational and subsistence fishermen, despite multilingual signs posted by the Department of Health Services that warn of the risks of consuming fish or shellfish. It is likely that some consumption of contaminated fish still occurs because access to the Site by trespassing boats cannot be completely eliminated. Also, fish within the Site may migrate to outlying areas that are legally accessible to fishermen. Such conditions may pose a risk to human health.

Recommendation and Follow-up Action:

Continue preparation of a Focused Feasibility Study (FFS) to evaluate alternatives for addressing the remaining contamination. It is not possible to determine what, if any, remedial actions should be taken to address contaminated sediments, water and tissues without a complete analysis of alternatives.

Protectiveness Statement

The remedy implemented at the **upland area** of the United Heckathorn Superfund Site is protective of human health and the environment, due to capping of contaminated soils which has eliminated human exposure pathways and prevented erosion. Routine inspection and monitoring assures the protectiveness of the upland remedy at the Site.

The remedy implemented at the **marine area** of the Site is not protective because potential exposure is clearly present. Fishermen and their families may be exposed to contaminants when fish or other edible biota from the Site are consumed. This may occur if warning and no-trespassing signs are ignored or misunderstood. Fish-eating birds and wildlife cannot be prevented from consuming potentially contaminated food from the Site. In addition, contaminated biota (e.g., fish) cannot be prevented from migrating to areas outside of the Site, where they might be harvested and consumed by fishermen, birds, or wildlife.

Executive Summary

A 5-year review of the United Heckathorn Superfund Site (the Site) in Richmond, California was prepared for completion in September 2006. A 5 year review is required by statute and conducted because hazardous substances, pollutants, or constituents remain at the site at concentrations above levels that would allow for unrestricted use and unlimited exposure. This is the second 5-year review for the site. The triggering action for this review is the United States Environmental Protection Agency (USEPA) approval date of the first 5-year review report on September 28, 2001.

The site has a long history of industrial activities. From the mid-1940s to the mid-1960s, it was used for processing, packaging, and shipping pesticides, particularly dichlorodiphenyl trichloroethane (DDT). Pesticide release to adjacent soils and waterways occurred as a result of poor material management and housekeeping controls during this period of operation.

The pesticide processing operations ended at the site in 1966. In 1980, the California Department of Health Services investigated and discovered chlorinated pesticides and metals in soil samples at the Site. In 1990, the Site was placed on the National Priorities List, and the USEPA assumed lead-agency status.

Extensive environmental investigations were conducted during the 1990s. Based on results from the remedial investigations, DDT and dieldrin were identified as the primary contaminants of concern. The area affected by the contaminants of concern included the northern 5 acres of upland area known as the terminal, as well as marine sediments in harbor channels, including the Lauritzen Channel, the Santa Fe Channel, the Parr Canal, and the Inner Richmond Harbor. Because of the existence of potential risks, USEPA determined that remedial action was necessary.

The Record of Decision (ROD) was signed in October 1995. The 1995 ROD presents the selected remedial action implemented at the Site. The remedial action goals of the Site were developed based on applicable or relevant and appropriate requirements (ARARs) and results from the human health and ecological risk assessments. The implemented remedy was proposed to address two areas: (1) the upland area and (2) the marine area. Major components of the remedy included:

- Dredging of all soft bay mud from the Lauritzen Channel and Parr Canal, with offsite disposal of dredge material.
- Placement of clean material after dredging.
- Construction of a cap around the former Heckathorn facility to prevent erosion.
- A deed restriction limiting use of the property at the former Heckathorn facility location to non-residential uses.
- Marine monitoring to verify the effectiveness of the remedy.

Based on a review of documents and data related to O&M and monitoring activities at the Site, the capping system at the upland area of the Site has been functioning as intended, effectively eliminating the potential for erosion and human exposure to contaminated upland soils. In addition, the implementation of the institutional controls for the upland area, as set forth in the ROD, has been effective. The perimeter fence at the site remains intact, and the property is operating as a marine terminal with a deed restriction that limits the land use to industrial (non-residential) use.

However, the remediation goals for DDT and dieldrin in the water and sediments of the marine area have not been maintained. This conclusion is based on results of post-remediation monitoring, source investigation studies, and the First Five-Year Review Report (USEPA 2001a).

A review of ARARs and other standards to be considered at the site, since the ROD was issued, indicates that changes have not occurred to action-specific, chemical-specific, location-specific ARARs, or standards to be considered. In addition, no new human health routes of exposure or new contaminants were identified.

The remedy implemented at the upland area of the United Heckathorn Superfund Site is protective of human health and the environment, due to capping of contaminated soils which has eliminated human exposure pathways and prevented erosion. Routine inspection and monitoring assures the protectiveness of the upland remedy at the Site.

The remedy implemented at the marine area of the Site is not protective because potential exposure is clearly present. Fishermen and their families may be exposed to contaminants when fish or other edible biota from the Site are consumed. This may occur if warning and no-trespassing signs are ignored or misunderstood. Fish-eating birds and wildlife cannot be prevented from consuming potentially contaminated food from the Site. In addition, contaminated biota (e.g., fish) cannot be prevented from migrating to areas outside of the Site, where they might be harvested and consumed by fishermen, birds, or wildlife. A Focused Feasibility Study is being prepared to evaluate alternatives to address these potential exposures.

SECTION 1.0

Introduction

This report summarizes findings of a 5-year review of the remedial actions implemented at the United Heckathorn Superfund Site (the site) in Richmond, California. The 5-year review evaluates whether the remedy at the Site remains protective of human health and the environment.

The United States Environmental Protection Agency, Region 9 (USEPA) conducted the 5-year review from March to May 2006. To assist the USEPA in documenting the methods, findings, and conclusions of this review, CH2M HILL prepared this report in accordance with USEPA's guidance document, *Comprehensive Five-Year Review Guidance* (USEPA 2001b). In addition, this report identifies any deficiencies found during the review and provides recommendations to address these deficiencies.

This 5-year review report is prepared pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), Section 121(c), the National Oil and Hazardous Substances Pollution Contingency Plan Section 300.400 (f)(4)(ii). CERCLA Section 121(c) states:

If the President selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the Site, the President shall review such remedial action no less often than each five years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented.

This requirement is further interpreted in the National Contingency Plan. Title 40 of the Code of Federal Regulations, Section 300.400 (f)(4)(ii) states:

If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the Site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such action no less often than every five years after the initiation of the selected remedial action.

Federal statute requires that 5-year reviews be conducted when the implemented remedy at the Site results in hazardous substances, pollutants, or constituents remaining at the Site above levels that allow for unrestricted use and unlimited exposure. The United Heckathorn Site consists of two areas, upland and marine. The cleanup goals specified by the Record of Decision (ROD) do not allow for unlimited use in the upland area, where contaminated soils are capped and the land use is restricted to industrial use. Therefore, the Site is subject to a statutory 5-Year Review, with the first review occurring five years after the remedial action construction start date, which is July 23, 1996. This start date was set by the mobilization of activities to remediate sediments in the marine area.

The reviews are required within 5 years of the remedial action and every 5 years thereafter to ensure that the remedy continues to be protective of human health and the environment.

This is the second 5-year review for the United Heckathorn Superfund Site. The trigger date for this review is September 28, 2001, the USEPA approval date of the first Five-Year Review report (USEPA 2001a). This report evaluates the remedial action objectives (RAOs) of the Site, as stated in the Record of Decision (ROD) (USEPA 1995) and Explanation of Significant Differences (ESD) (USEPA 1996).

This report is organized in the following manner:

- Section 1.0 provides an introduction.
- Section 2.0 provides a chronology of Site events.
- Section 3.0 describes site background, and initial response, and basis for taking cleanup actions.
- Section 4.0 discusses the implemented remedial action, current status, and operations and maintenance (O&M) of the remedy at the Site.
- Section 5.0 describes activities conducted and progress since the last 5-year review.
- Section 6.0 outlines findings from the 5-year review process.
- Section 7.0 discusses the technical assessment of the remedial action implemented at the Site.
- Section 8.0 provides issues and recommendations.
- Section 9.0 provides a protectiveness statement for the Site.
- Section 10.0 discusses the next 5-year review.
- Section 11.0 provides a list of works cited during the preparation of this document.

SECTION 2.0

Site Chronology

Table 2-1 provides a chronology of events at the Site.

TABLE 2-1
 Chronology of Site Events
Second 5-Year Review Report for United Heckathorn, Richmond, California

Event	Date
Pre-remediation	
Site used to formulate and package pesticides, particularly dichlorodiphenyltrichloroethane (DDT).	1947-1966
The Regional Water Quality Control Board inspected and cited the facility for the release of DDT-laden wastewater into the Lauritzen Channel.	1960
California Department of Fish and Game identified a discharge of wastewater overflow into the Lauritzen Channel and leakage from the pesticide settling tanks.	1965
California Department of Health Services investigated the Site as part of its Abandoned Site Project.	1980
California Department of Health Services designated the Site as a State Superfund Site.	March 1982
Interim Removal Actions occurred at the upland portion of the Site.	1982-1993
Last recorded maintenance dredging performed to Lauritzen Channel prior to remediation.	1985
The 1984-1985 California State Mussel Watch survey, for the first time, included Richmond Harbor and found levels of DDT and dieldrin "highest ever measured in mussels by the SMW program."	Results published 1986
Site listed on USEPA National Priorities List.	March 1990
Pursuant to USEPA Removal Order 90-22, approximately 1,500 cubic yards of soil and visible pesticide residue containing up to 100% DDT were excavated by several potentially-responsible parties.	November 1990
Approximately 1,800 cubic yards of residue and contaminated soil were excavated from Site.	1991
Final soil removal action completed.	May 1993
Battelle completed remedial investigation on marine sediment.	February 1994
Department of Toxic Substances Control issued advisory against consuming any bottom fish from the Inner Richmond Harbor.	April 1994
Battelle completed feasibility study.	July 1994
ROD signed.	October 1995

TABLE 2-1
 Chronology of Site Events
Second 5-Year Review Report for United Heckathorn, Richmond, California

Event	Date
Sediment Remediation	
Remedial Design/Remedial Action Work Plan for sediment dredging submitted.	May 1996
Consent Decree approved by US District Court.	July 1996
Remedial action at Parr Canal and Lauritzen Channel began.	August 1996
Remedial action at Parr Canal and Lauritzen Channel ended.	March 1997
Post-remediation biomonitoring began.	1997
Post-sediment Remediation	
Remedial Design/Remedial Action Work Plan for upland cap submitted.	April 1998
Construction of upland area cap began.	July 1998
Construction of upland area cap ended.	July 1999
Post-remediation Biomonitoring of Pesticides in Marine Waters Near the United Heckathorn Superfund Site, Year 1 Report prepared.	September 1998, revised July 2000
Post-remediation Biomonitoring, Year 2 Report prepared.	October 1999, revised July 2000
Post-remediation Biomonitoring, Year 3 Report prepared.	October 2000
Post-remediation Biomonitoring, Year 4 Report prepared.	June 2001
Five-year Review Report prepared.	September 2001
Post-remediation Biomonitoring, Year 5 Report prepared.	August 2002
Phase I Source Investigation completed by Battelle.	March and July 2002
Phase I Source Investigation Report prepared.	December 2002
Phase II Source Investigation completed by Battelle.	May 2003
Site conceptual model updated by CH2M HILL.	December 2003
Post-remediation Biomonitoring, Year 6 and Phase II Source Investigation Report prepared.	March 2004
Phase III Source Investigation completed by US Army Corps of Engineers.	July 2004
Phase III Fluid Mud and 2004 Water Quality Investigation Report completed.	December 2004

Site Background

This section provides Site background including the Site description, the current land use, the physical setting, the history of contamination, and the initial response and basis for taking action of cleanup.

3.1 Site Description and Current Land Uses

The Site is located in Richmond Harbor on the east side of San Francisco Bay in Contra Costa County, California. It is situated in an industrial area dominated by active petroleum and shipping terminals. A Site location map is provided in Figure 3-1.

The Site, as outlined in the ROD, is composed of two areas: (1) the upland area, which is the former United Heckathorn Site, and (2) the marine area, which includes the Lauritzen Channel, the Santa Fe Channel, the Parr Canal, and the Inner Richmond Harbor.

3.1.1 Upland Area

The former United Heckathorn Site is an approximate 5-acre upland area located at the northern portion of the Levin Richmond Terminal, which encompasses a total of approximately 42 acres. The property is currently owned by Levin Richmond Terminal Corporation (LRTC), and is operated as a dry bulk-cargo shipping terminal with docks for ocean-going vessels. The 5-acre upland capped area is mainly used for cargo stockpiling and railroad operations.

Land use at and in the surrounding vicinity of the former United Heckathorn Site consists of mainly industrial activities. This is consistent with the Bay Conservation and Development Commission San Francisco Bay Plan, which designates the area for port-priority or water-related industrial use, and the City of Richmond General Plan, which designates the area under heavy industrial (M3) zoning. No significant changes to land use, future land use, and land-use restrictions are anticipated at the Site in the foreseeable future.

Historical maps indicated the Richmond Harbor area was originally intertidal marshlands. Dredge and fill activities began prior to 1917. The Site upland area is now approximately 7 to 11 feet above mean lower low water (MLLW). The MLLW is the average height of the lower low water over a 19-year period referenced to a datum based at the Port of Richmond Terminal 2 and it is generally level (Battelle 1994).

3.1.2 Lauritzen Channel

The Lauritzen Channel is approximately 1,800 feet long (north-south) and varies in width between 120 feet near its northern end to 350 feet near its southern end at the connection to the Santa Fe Channel.

Historical water line channel depths ranged from -10 feet to -40 feet MLLW. Portions of the Lauritzen Channel had been periodically dredged. The most recent maintenance dredging occurred in January 1985 and reached a depth -41 feet MLLW.

The Lauritzen Channel continues to be actively used as a deep-water channel for LRTC operations and activities associated with Manson Construction, a dredging contractor located along the west shoreline of the Lauritzen Channel.

The channel shoreline features include riprap protection (including riprap materials derived from concrete construction debris), sandy gravel fill, pile-supported docks with and without metal plating to retain upland shoreline, and fill and free-standing wooden pilings associated with former docks that are in various stages of decay. The tidal zone within the Lauritzen Channel ranges between about -2 feet to +7 feet MLLW (Battelle 1994).

3.1.3 Parr Canal

The Parr Canal lies to the east of the Lauritzen Channel and is not actively used as a waterway. It is approximately 750 feet long (north-south), a maximum of 100 feet wide, and generally less than 10 feet deep relative to MLLW. The shoreline surrounding the Parr Canal is armored with riprap typically derived from concrete construction debris. A Richmond City stormwater outfall structure is located at the northern end of the Parr Canal (Battelle 1994).

3.1.4 Santa Fe Channel and Inner Richmond Harbor Channel

The south end of the Lauritzen Channel enters the Santa Fe Channel. The Santa Fe Channel runs northwest to southeast, is approximately 4,000 feet long, and is up to about 380 feet wide. Approximately one-half of the channel length is maintained at a depth of -35 feet MLLW by the United States Army Corps of Engineers (USACE). The head of the channel and its berth areas are maintained by the Port of Richmond or private owners. The Santa Fe Channel connects at its east end with the Inner Richmond Harbor Channel (Battelle 1994).

3.2 Physical Setting

The Site is located within a low-lying tidal flats area adjacent to an alluvial plain. This area lies near the western edge of a small northwest-trending structural graben called the Richmond Basin. The basin is bounded on the west by the San Pablo Fault, which parallels the eastern face of the Potrero-San Pablo Ridge west of the Site, and on the east by the Hayward Fault Zone, which forms the western scarp of the Berkeley Hills.

The basin comprises Franciscan bedrock between 140 and 400 feet below ground surface, overlain by a thick sequence of younger interfingering alluvial fan and estuary deposits. Bay Mud and marsh deposits are located approximately 15 to 30 feet deeper than the present San Pablo Bay and are found on the Bay side of the 1894 shoreline, located at the northern end of the Lauritzen Channel.

The surficial Bay Mud and marsh deposits were altered with construction activities that began in the 1950s. In some areas, Bay Mud and marsh deposits were partially removed and replaced with fill material of varying composition. Fill was simply placed over the natural surface in most areas at the Site, (CH2M HILL 1988).

Portions of the Lauritzen Channel embankment feature revetments that include riprap (consisting mostly of concrete construction debris), cobbles, gravel, as well as retaining features such as metal sheeting and pilings below the dock areas. A dock or other overhanging structures mostly visually obscure the eastern embankment adjacent to the upland area of the Site. In general, the channel embankments are abutted by paved surfaces (Battelle 2002b).

3.2.1 Lithology

The upland area of the Site is mostly paved. Underneath the pavement is a layer of fill soil that varies from approximately 5 to 15 feet below ground surface. The layer beneath the fill material is called Younger Bay Mud (YBM).

The majority of YBM within the Lauritzen Channel was either removed during original channel construction or had subsequently been removed during maintenance dredging and remedial dredging.

The YBM is underlain by Old Bay Mud, which is relatively more consolidated, stiffer, and laterally continuous. A relatively small amount of the upper Old Bay Mud may have been removed in conjunction with remediation dredging activities in 1996 and 1997.

3.2.2 Hydraulics

Exchange of water between the Lauritzen Channel and the Santa Fe Channel occurs relatively slowly because exchange is primarily driven by tidal action. Other factors that affect the circulation into and out of the channel include wind-induced circulation and intermittent flows resulting from stormwater runoff from adjacent land features and outfall structures. The tidal zone within the Lauritzen Channel ranges between about -2 feet to +7 feet (Battelle 1994). Tides at the Site are semidiurnal, with a mean tidal fluctuation of about 4.3 feet.

Interstitial porewater (bank storage) at the channel margin is considered the zone where surface water and groundwater mixing occurs. The hydraulics in this mixing zone are complicated and dependent on pore pressure, water density, and hydraulic conductivity. It is expected that some net discharge or seepage of groundwater diffuses to the harbor waters (CH2M HILL 2003).

Stormwater from areas to the north and west, outside of the Site, enters the channel through a concrete culvert at the north end of the Parr Canal and as sheet flow from surrounding upland areas. Stormwater within the upland area of the Site is captured and discharged to the sanitary sewer.

Generally, currents within the channel are mild. As a result, the Inner Richmond Harbor Channel, Santa Fe Channel, and Lauritzen Channel all experience net deposition of sediment and require maintenance dredging to remain navigable (CH2M HILL 1988). In addition, the bank slopes, especially in the area to the west of LRTC, known as the Levin Piers, are relatively steep, and it is expected that deposition from bank erosion and sloughing of upper bank sediments occur (CH2M HILL 2003).

3.3 History of Contamination

The Site has a long history of industrial activities. In the 1940s, World War II shipbuilding operations included a shipyard between Lauritzen Channel and Parr Canal. In 1948, the War Department transferred title of the land to Parr Industrial Corporation. Parr Industrial Corporation owned the Site from 1949 until 1961, followed by the Parr-Richmond Terminal Corporation, who owned the Site until 1981. The land was leased to various industrial tenants, including Universal Pigment and Chemical Company, who manufactured napalm.

From the mid-1940s to the mid-1960s, the Site was used for processing, packaging and shipping pesticides. United Heckathorn was one of a number of companies operating at the Site. Although many pesticides, such as aldrin, dieldrin and endrin, were processed onsite, dichlorodiphenyl trichloroethane (DDT) was by far the most commonly-processed pesticide.

Under United Heckathorn, the facility was used to receive technical-grade pesticides from manufacturers, grind the pesticide into powder, add solvents and other components to facilitate its application, and package the product for final use in liquid and powder forms. Information regarding the exact types and quantities of materials used and onsite waste disposal methods is limited and, at times, appears to be derived from anecdotal information.

It is indicated that during United Heckathorn operations, equipment containing pesticide residues was routinely washed, and washwater was permitted to infiltrate through the ground surface to discharge via outfall structures or utilities directly to nearby waterways. Later modifications included incorporating settling tanks to recover pesticide residuals; however, leaks from these tanks were believed to have occurred. Additionally, poor housekeeping controls, as well as spills, leaks, and releases, are believed to have facilitated direct discharges of DDT to soils and waterways.

In 1960, the San Francisco Regional Water Quality Control Board (Water Board) observed bulk storage of pesticides and solvents, leaking pipelines, and release of pesticide-laden wastewater to the Lauritzen Channel. In 1965, California Department of Fish and Game staff reported leakage from setline tanks and a discharge of water overflow to the Lauritzen Channel.

Pesticide processing operations ended at the Site in 1966, and United Heckathorn went bankrupt. In 1980, the California Department of Health Services investigated the United Heckathorn site. Chlorinated pesticides and metals were discovered in soil samples, and the area was designated as a state Superfund Site in 1982. In 1990, the Site was placed on the National Priorities List (NPL), and the USEPA assumed lead agency status (Battelle 1994).

3.4 Initial Response

Extensive environmental investigations on both marine sediments and upland areas were conducted during the 1990s to characterize, develop, and initiate removal actions for upland soils and remediation strategies for marine sediment contamination.

Interim response actions were conducted at the upland and embankment areas of the Site beginning in the early 1980s. As early as 1982, contaminated soil, asphalt, and concrete from the Site were excavated and moved to a nearby lot adjacent to the Parr Canal. These

materials were subsequently transported to several hazardous waste disposal facilities. In 1983, soils containing high levels of pesticides were removed by the current landowner during routine maintenance and extension of onsite railroad lines. A 6-inch to 8-inch layer of gravel was placed over the surface of the Site, including a 6-inch layer of ballast rock over the Lauritzen Channel embankment and selected areas of high DDT concentrations. In 1986, during excavation for the construction of a train scale, high levels of pesticides were detected and approximately 60 cubic yards of soil were removed.

After the Site was listed on the NPL in March 1990, a remedial investigation of the United Heckathorn was prepared by Levine-Fricke. A separate remedial investigation and feasibility study was prepared by Battelle/Marine Science Laboratory in 1994, which also included marine sediments in Lauritzen Channel, Parr Canal, Santa Fe Channel, and the Richmond Inner Harbor Channel to Point Potrero.

In November 1990, pursuant to USEPA Removal Order 90-22, approximately 1,500 cubic yards of soil and debris, containing up to 100 percent DDT, were excavated by several Potentially Responsible Parties (PRPs) (Levin, Montrose, Parr, Shell, and Stauffer) from the Lauritzen Channel embankment. Samples of this deposit contained approximately 30 percent DDT.

An additional 1,800 cubic yards of pesticide residue and contaminated soil were excavated by the same PRPs from this area in April 1991. The excavated material and stockpiles that had been placed onsite in the 1980s were hauled offsite to permitted hazardous waste disposal facilities.

A final soil removal action was completed in May 1993 by the same PRPs as well as Prentiss and Sherwin Williams prior to the implementation of the remedy in 1998. The USEPA estimated that approximately 99 percent of the mass of pesticides had been removed from the upland portion of the Site since 1990.

These removal actions were intended to address risks only at the upland portion of the Site. Marine sediment contamination was not addressed by these prior removal actions. The southeastern area of the Lauritzen Channel was last dredged for berth maintenance in 1985.

3.5 Basis for Taking Action

The nature and extent of contamination at the Site was delineated by a combination of state-ordered site investigations, which occurred prior to NPL listings, proposed and final, and the subsequent USEPA's remedial investigation(s).

Based on results from the remedial investigation(s), DDT and dieldrin were identified as the primary contaminants of concern (COCs) at the Site. The area affected by the COCs included the northern 5 acres of the terminal, as well as marine sediments in harbor channels, including the Lauritzen Channel, the Santa Fe Channel, the Parr Canal, and the Inner Richmond Harbor. Because of the existence of potential risks, USEPA determined that remedial action was necessary.

3.5.1 Upland Area

Based on results from the human health risk assessments, soil removal actions conducted at the upland area from 1983 to 1993 reduced contaminant concentrations in the soils to levels that are acceptable for current and expected future commercial or industrial uses. Nevertheless, an estimated 95,000 tons of pesticide-impacted soils were left over a large area of the Site.

Among all the remaining onsite environmental media, soil and embankment sediments contained the highest chlorinated pesticide concentrations, generally greater than 1 milligram per kilogram (mg/kg) near the upland area, and exceeding 10,000 mg/kg in localized areas. Ambient air measurement at the Site and downwind areas detected very low airborne DDT concentrations, approximately 1 nanogram per cubic meter (ng/m³).

These concentrations were an acceptable risk for areas of commercial and industrial uses; however, potential erosion of the contaminated upland soils to the adjacent waterways posed a threat to the marine environment.

3.5.2 Marine Area

Remedial investigation(s) for marine sediments identified the Lauritzen Channel as the area with the highest pesticide concentrations, followed by the Parr Canal. The pesticide concentrations typically decreased with increasing distance, which clearly indicated the former United Heckathorn Site was the source of contamination.

The highest total DDT concentration of 633,000 micrograms per kilogram (µg/kg) was measured in a sample from the center of Lauritzen Channel, while concentrations greater than 100,000 µg/kg were detected in sediment from the northern and western portions of the channel. Approximately 98 percent of the mass of DDT in Richmond Harbor was contained in the Lauritzen Channel. Concentrations of dieldrin were relatively lower compared to total DDT, with a maximum concentration of 16,000 µg/kg. A similar spatial trend was exhibited for relative concentrations.

Total DDT concentrations in sediment decreased by at least two orders of magnitude from the Lauritzen Channel to the Santa Fe Channel and decreased by another order of magnitude from the Santa Fe Channel to the Inner Richmond Harbor Channel. Pesticide concentrations in Parr Canal sediment were lower than those measured in the Lauritzen Channel but greater than those measured in Santa Fe or Inner Harbor Channels. The maximum and median total DDT concentrations measured in Parr Channel were 4,080 µg/kg and 840 µg/kg, respectively. The maximum dieldrin concentration was 170 µg/kg.

In general, sediment from the upper Lauritzen Channel and Parr Canal had higher concentrations of contaminants than sediment from the Santa Fe and Inner Harbor Channels. DDT and dieldrin were consistently found in sediment and biota at levels orders-of-magnitude higher than the regional background levels.

Results from the risk assessments indicated the risks from long-term consumption of fish caught in the Lauritzen Channel were unacceptable. The contaminant levels in the Lauritzen

Channel posed a threat to a variety of ecological receptors at various trophic levels, including benthic, water column organisms, and fish-eating birds.

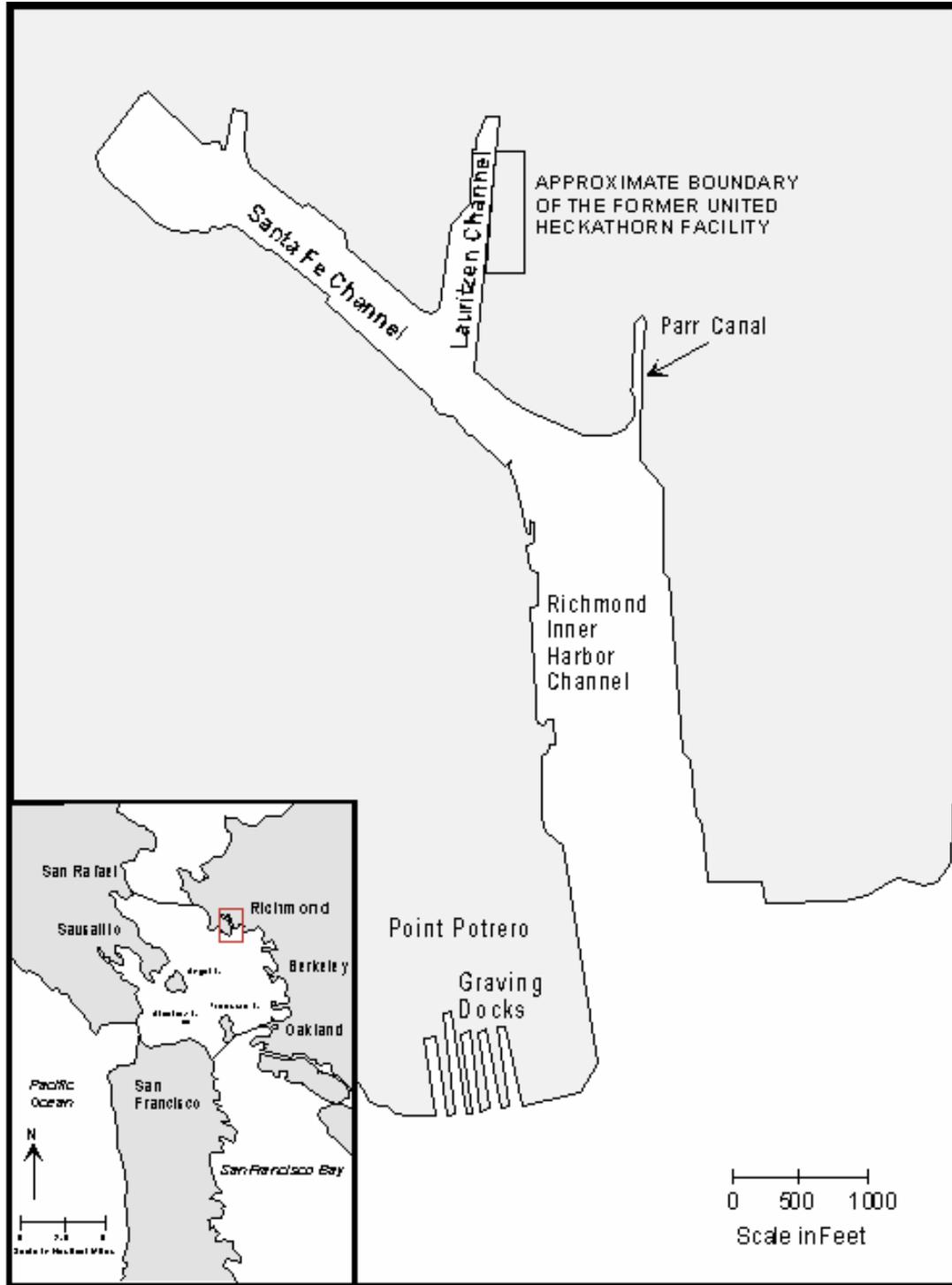


FIGURE 3-1
Location of the Study Area and United Heckathorn Superfund Site, Richmond, California

Remedial Actions

This section summarizes the remedial actions selected and implemented at the Site, as well as the operations and maintenance of the remedy. The ROD and the ESD for the Site were signed in 1995 and 1996, respectively.

4.1 Remedial Actions Selection

Remedial action goals for the Site were developed based on applicable or relevant and appropriate requirements (ARARs) and results from the human health and ecological risk assessments. For the marine area, the remedial action goal was to reduce concentrations of the COCs, DDT and dieldrin, in marine sediments and water to levels that would be protective of human health and the environment. For the upland area, the remedial action goal was to prevent exposure of soils to the surface and erosion of upland soils into the adjacent marine area.

The remedy presented in the ROD addressed both the upland and the marine remedial action goals. Major components of the remedy included:

- Dredging of all soft bay mud from the Lauritzen Channel and Parr Canal, with offsite disposal of dredged material.
- Placement of clean material after dredging.
- Construction of a cap around the former Heckathorn facility to prevent erosion.
- A deed restriction limiting use of the property at the former Heckathorn facility location to non-residential uses.
- Marine monitoring to verify the effectiveness of the remedy.

4.1.1 Upland Area

Potential erosion of the contaminated soil posed a threat to the marine environment because the upland area is located immediately adjacent to the Lauritzen Channel. Therefore, the remedial action goal was established for the prevention of erosion and transport of soil from the upland area into the Lauritzen Channel.

The selected remedy at the upland area consisted of construction of a 5-acre upland cap at the northern portion of the Levin Richmond Terminal, installation of a drainage system to collect surface runoff from the cap, and execution of a land use restriction to limit use of the property to industrial classification. In addition, cap inspection and stormwater monitoring programs were to be implemented as O&M activities for the upland capping system.

4.1.2 Marine Area

The USEPA's Ambient Water Quality Criteria (AWQC), promulgated under Section 304 of the Clean Water Act, were identified as ARARs for surface water at the Site. Criteria for the protection of saltwater aquatic life are, for most pollutants, based upon toxic effects data for water-column organisms. However, for DDT and its metabolite, which bioaccumulate to high levels and may cause toxicity to organisms at higher trophic levels, it was determined that more restrictive criteria were necessary to protect fish-eating birds.

The chronic marine aquatic life criterion for DDT is 1 nanogram per liter (ng/L). The water quality criterion for the protection of human health from the consumption of bioaccumulated DDT in fish is 0.59 ng/L. This is based on achieving a 1×10^{-6} lifetime excess cancer risk level.

The chronic marine aquatic life criterion for dieldrin is 1.9 ng/L. This criterion is set to achieve the Food and Drug Administration's (FDA) action level in fish oil after bioaccumulation and is protective of sensitive aquatic organisms. The water quality criterion for the protection of human health from the consumption of bioaccumulated dieldrin in fish is 0.14 ng/L. This is based on achieving a 1×10^{-6} lifetime excess cancer risk level.

Other to-be-considered (TBCs) criteria, as defined in Title 40 of the Code of Federal Regulation 300.400(g) (3), are non-promulgated advisories or guidance issued by federal or state government that are not legally binding but may provide useful information or recommended procedures for remedial action. The following were identified in the 1995 ROD, and are noted as TBC criteria for the Site:

No chemical-specific ARARs were identified as remediation goals for soil or sediment at the Site. The NAS saltwater action levels are TBCs, which provide an additional level of protection to fish-eating birds beyond the level that is the basis of the surface water ARARs for aquatic life. The National Academy of Sciences (NAS) action level was retained as a TBC to help determine the protectiveness of remediation, since the U.S. Fish and Wildlife Service raised concerns that the USEPA criteria for DDT might not be stringent enough for the protection of fish-eating birds. The NAS action level for DDT in fish = 0.05 mg/kg (milligrams per kilogram).

Based on results of the ecological risk assessment, mean sediment levels were calculated to prevent violations of the remediation goal ARARs for surface waters and to meet the NAS action level for DDT in fish to ensure protection of fish-eating birds, including endangered species. The Site remedial action goal for sediment is 590 $\mu\text{g}/\text{kg}$ for DDT, based on achieving a 1×10^{-6} lifetime excess cancer risk level.

The FDA action levels for the marketability of fish and shellfish are TBCs for protecting human health. These levels are less stringent than the levels that would be achieved by meeting the surface water ARARs (FDA action levels: DDT = 5.0 parts per million; dieldrin = 0.3 parts per million).

Water Board Resolution 68-16 requires that waters of the Bay be maintained free of toxic substances in concentrations that are lethal to or that produce detrimental responses in

aquatic organisms. Other relevant biological measures and effects on human health due to bioaccumulation will be considered. The Water Board identified Resolution 68-16 as an ARAR. The USEPA does not agree that 68-16 is an ARAR; however, the USEPA does agree that achieving the human health water quality criteria and the marine chronic water quality criteria would meet the requirements of 68-16.

Table 4-1 provides a summary of remediation goals for surface water and sediment at the Site.

TABLE 4-1
Summary of Remediation Goals
Second 5-Year Review Report for United Heckathorn, Richmond, California

Medium	Constituents	Level	Basis	Cancer Risk Level
Surface Water	DDT	0.59 ng/L	USEPA AWQC	1×10^{-6}
	Dieldrin	0.14 ng/L		1×10^{-6}
Sediment	DDT	590 μ g/kg	Ecological Assessment	1×10^{-6}

Source: USEPA 1995.

The selected remedy at the marine area consisted of dredging of soft bay mud from the Lauritzen Channel and the Parr Canal, transport and disposal of the dredged material to a permitted land disposal facility, and placement of clean material over the dredged areas. In addition, a post-remedial monitoring program on surface water and biota was to be implemented for at least 5 years, or longer, until it was demonstrated that the remediation goals had been achieved.

4.2 Remedial Actions Implementation

Remedial actions of the Site were implemented in two phases. The first phase entailed the marine area, and the second phase entailed the upland area.

4.2.1 Marine Area

Sediment dredging of Lauritzen Channel and Parr Canal at the marine area began in August 1996 and was completed in March 1997. The remedial action was performed by Montrose Chemical Corporation of California, Inc., pursuant to a USEPA Consent Decree, dated April 22, 1996.

During the remedial activities, silt curtains were installed to prevent suspended sediment from migrating out of the excavation area. Approximately 107,000 cubic yards of sediments were removed, transported by rail from the Site, and disposed of at designated disposal facilities.

Difficulties encountered during the remedial action include: (1) damage of the silt curtains, (2) unexpected finding of debris at the Site, and (3) change in designated disposal facility.

The silt curtain was damaged and repaired on numerous occasions throughout the project. The use of a temporary emergency curtain was required, and this curtain was deployed throughout the operations to contain the suspended sediment within the working area.

In addition to two sunken barges, used storage tank caissons, cables, and other previously located and identified large debris, a smaller metal barge and a concrete dock were found and removed from the dredging area. During the dredging operation, the sediments encountered from the excavation area were filled with metal debris, rail road spikes, metal cable, rope and miscellaneous rubble that damaged tires, halted pumping operations, stopped processing operations and caused severe damage to equipment. Overall processing cycles were impacted due to the discovery and subsequent operational challenges associated with this material.

Location for offsite disposal of the sediment was changed from Butterfield Station in Mobile, Arizona to an ECDC disposal facility in Utah due to community protests and demonstrations in Richmond, California, and Arizona. This led to difficulties in tracking trains and in keeping an adequate number of rail cars available, which resulted in a project delay of over 50 days.

After completion of the dredging operation, sediment samples were taken at the dredging area as confirmation of the remedial actions. Before remediation, the median total DDT concentration at the head of Lauritzen Channel and Parr Canal were 47,000 µg/kg and 840 µg/kg, respectively. After remediation, the average DDT concentrations in Lauritzen Channel were 264 µg/kg and in Parr Canal 200 µg/kg.

An average of 18 inches thick of clean sand was placed over the dredged areas to promote the return of habitat and fauna for the purpose of Site restoration.

4.2.2 Upland Area

Construction of the concrete cap at the upland area began in July 1998 and was completed in July 1999. The cap design and construction activities were performed by the property owner, pursuant to a Consent Decree with USEPA, under the oversight of USEPA.

Installation of the cap consisted of three steps: (1) Site grading to promote surface runoff to collection points; (2) installation of a drainage system to collect surface runoff, including best management practices for storm water pollution prevention; and (3) construction of a reinforced concrete cap in areas used for material stockpiling and construction of a geotextile fabric and gravel cap in low-traffic areas.

Due to the fact that a 1,100-gallon underground storage tank was found in the central portion of the former United Heckathorn Site during grading activities, additional work was conducted for the excavation and removal of the underground storage tank and all visibly-affected soil (approximately 250 cubic yards).

Institutional controls were also implemented at the Site. A deed restriction was implemented to the land parcel, which imposed limitation on the property to non-residential use.

4.3 Operations and Maintenance

To assess and ensure long-term effectiveness of the remedial actions, two aspects of O&M activities are being implemented at the Site, including (1) cap inspection and stormwater monitoring programs at the upland area and (2) post-remediation monitoring of surface water and biota at the marine area.

4.3.1 Upland Area

An O&M plan, stipulated by the USEPA Consent Decree, requires activities related to inspections, monitoring and maintenance of the upland cap. The results of these activities are documented in annual reports, submitted to the USEPA by July 1 of each year. For this Five-Year Review, annual reports documenting the implementation of the O&M Plan from June 2002 to 2005 were reviewed.

The objective of the cap inspection and stormwater monitoring programs is to identify any potential release of pesticide-impacted soils by examining the integrity of the system through inspection and stormwater monitoring. LRTC is responsible for the long-term management of the upland capping system, as well as maintaining institutional controls by ensuring no alteration in land use of the property to residential use.

4.3.1.1 Inspection Monitoring

The inspection monitoring program includes inspection of the concrete cap, gravel cover, and drainage system. While the upper layer of the capping system is being observed daily by the LRTC onsite personnel during normal operation, inspection of the drainage system around manholes and drop inlets is conducted on a monthly basis. A formal site inspection is performed once a year. The annual report is maintained at the LRTC office and submitted to the USEPA.

According to the O&M Plan, areas that show signs of deterioration and a potential for exposure of the underlying material are to be repaired in a timely manner within 2 weeks of discovery. Any evidence of deterioration and exposure of the underlying material are to be repaired within 1 week. Repairs are required to be documented in the annual report.

4.3.1.2 Stormwater Monitoring

The stormwater monitoring program consists of sampling and analysis of stormwater runoff from the upland capping system. There are 10 stormwater monitoring locations at the shipping terminal (SW-1 through SW-10), as shown in Figure 4-1. Stormwater runoff from the 5-acre upland cap area is directed by surface swales and subsurface piping into five stormwater interceptors (SW-3 through SW-7). The five stormwater interceptors are designed to have sufficient capacity to hold all stormwater runoff generated during the rainy season (October through May) to avoid direct discharge into Lauritzen Channel.

As part of the routine maintenance, the five interceptors are drained, emptied of all sediment, and pressure-washed, as necessary, to prevent outflow of sediments into the Lauritzen Channel. Direct discharge to the Lauritzen Channel is not anticipated. Stormwater within the interceptors is sampled and analyzed for discharge to the City of Richmond

publicly-owned treatment works under an annual industrial discharge permit. Sediments are tested and transported to a qualified landfill.

Because the facility is operating under the State Water Resources Board, Industrial Activities – Storm Water General Permit, the stormwater monitoring schedule and analytical program is incorporated into the existing LRTC's facility-wide Stormwater Pollution Prevention Plan and Stormwater Monitoring Plan. In addition to analyzing for pesticides using USEPA Test Method 8080, additional analyses required under the facility Stormwater Monitoring Plan include selected heavy metals; suspended sediments; pH; total petroleum hydrocarbons gasoline, motor oil and diesel; oil and grease; specific conductance; and chemical oxygen demand.

4.3.2 Marine Area

The objective of the marine monitoring program is to evaluate the long-term effectiveness of the implemented remedy by demonstrating a reduction in flux of contaminants from the United Heckathorn Superfund Site following the USEPA response actions.

As indicated in the ROD, post-remediation is required annually for at least 5 years or until the remediation goals have been achieved. As of June 2006, six sampling and analysis events have been conducted at designated stations along the Lauritzen Channel and Parr Canal by USEPA and Battelle Marine Sciences Laboratory.

The marine monitoring program includes: (1) surface water monitoring and (2) biological monitoring. Trends of COC concentration levels in surface water and mussel tissue samples are used as indicators of whether the remedy is effective and functioning as intended. Results from each marine monitoring event are to be documented in a post-remediation marine monitoring report.

4.3.2.1 Surface Water Monitoring

Periodic collection and analysis of surface water samples determine compliance with the USEPA's AWQC, which are ARARs for the Site. The post-remediation water monitoring data are compared with the pre-remediation data from the ecological risk assessment and with the remediation goals established for the Site. Sampling locations for surface water are shown on Figure 4-2.

4.3.2.2 Mussel Tissue Monitoring

Periodic deployment and subsequent collection and analysis of mussels determine the bioaccumulation of chemical concentration based on tissue residues. The post-remediation tissue monitoring data are compared with pre-remediation tissue concentration from the California State Mussel Watch program and the ecological risk assessment of the United Heckathorn Site. Sampling locations for mussel tissue are shown in Figure 4-2.

4.3.3 Operations and Maintenance Costs

Table 4-2 presents the estimated cost and the actual dollars spent for the O&M activities at the upland area of the Site. The information is provided by LRTC for this 5-year review.

Because the 5-acre upland area of the Site is currently part of the 42-acre marine terminal, LRTC cannot provide a breakdown on the cost of O&M and stormwater management

activities between the 5-acre upland capping area and the remaining area of the marine terminal. Therefore, it is assumed that approximately 25 percent of the total expense provided by LRTC is allocated to the upland capping system.

Although the actual annual O&M costs are higher than the original O&M cost estimate, it does not appear to be an early indicator of remedy problems because the original O&M cost estimate only included stormwater sampling, analysis, and reporting of the O&M activities of the 5-acre upland cap, and the actual annual costs provided by LRTC include purchases and labor charges on the O&M and stormwater management activities of the entire 42-acre marine terminal and all railroad operations. The total expenses also include additional items, such as purchases of absorbent materials and inserts, hay, booms, emergency supplies, permits, testing, consultants, and disposal.

In addition, no indicator of remedy problems was observed during the Site inspection.

TABLE 4-2
Operations and Maintenance Costs
Second 5-Year Review Report for United Heckathorn, Richmond, California

Year	Original Annual O&M Cost Estimate	Annual O&M Cost ^[a]	25% of Annual O&M Cost
From 07/01/2001 To 06/30/2002	\$5,750	\$32,000	\$8,000
From 07/01/2002 To 06/30/2003	\$5,750	\$11,800	\$2,950
From 07/01/2003 To 06/30/2004	\$5,750	\$71,400	\$17,850
From 07/01/2004 To 06/30/2005	\$5,750	\$71,600	\$17,900
From 07/01/2005 To 03/31/2006	\$5,750	\$86,400	\$21,600

Note:

^aAnnual O&M Cost for the 42-acre marine terminal.

Source: LRTC 2006.

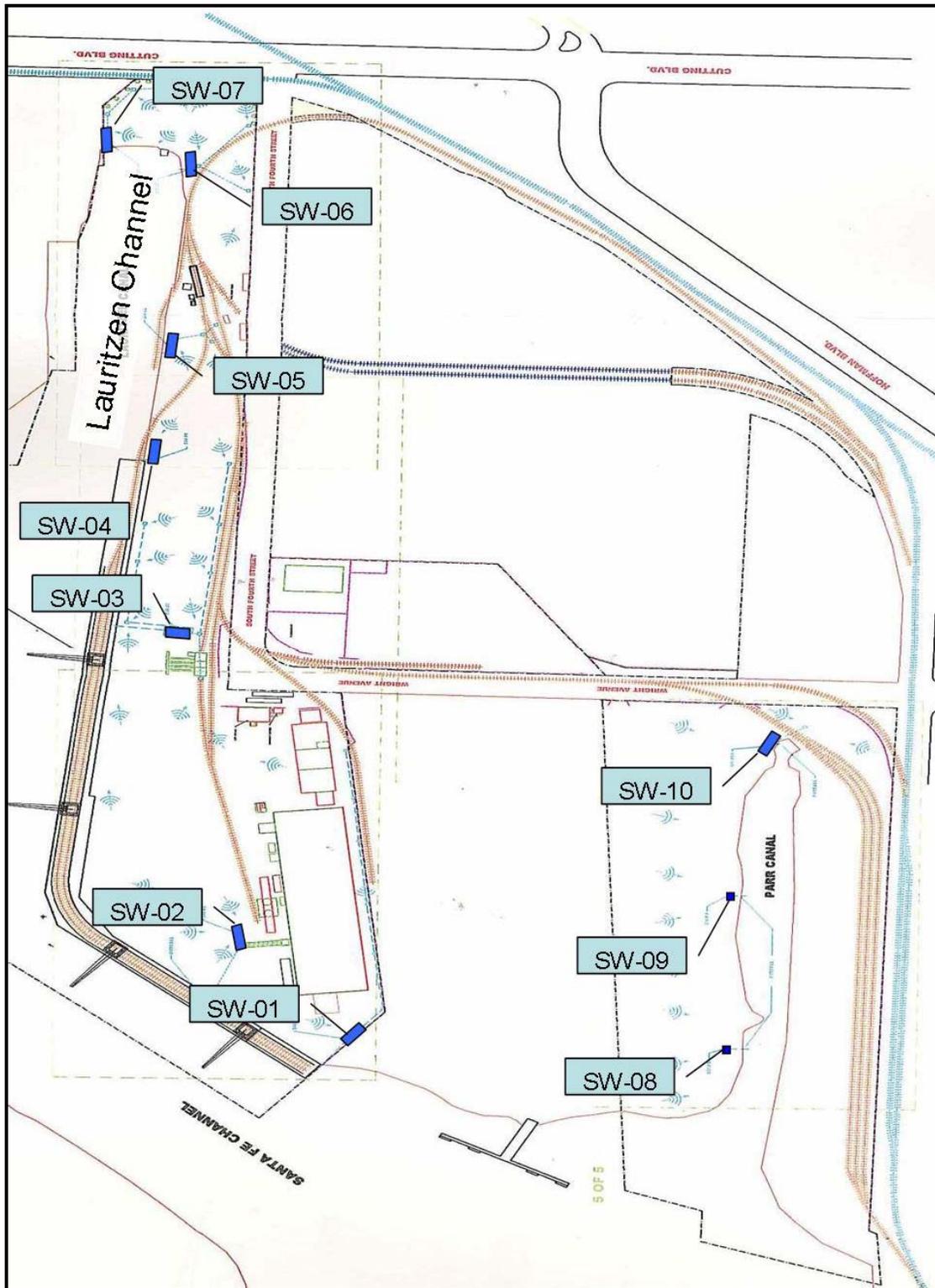


Figure 4-1
Location of Stormwater Catch Basins and Interceptors at Levin-Richmond Terminal
Source: Levin-Richmond Terminal Corporation



FIGURE 4-2
Sampling Locations for Marine Biomonitoring Program

Progress Since the Last 5-year Review

The last five-year review conducted at the United Heckathorn Superfund Site was prepared by USEPA Region 9 in September 2001.

5.1 Protectiveness Statements from Last Review

The protectiveness statement from the last five-year review was as follows:

“The remedy implemented at the upland area of the United Heckathorn Superfund Site is protective of human health and the environment. Yearly monitoring will assure that the remedy continues to be protective.

The remedy implemented at the remainder of the Site, i.e., in harbor channels, has not met remediation goals presented in the ROD and therefore is not protective of human health and the environment...Further investigation to identify source(s) and/or cause(s) of DDT contamination, followed by evaluation of additional remedial actions to address such sources/causes, is warranted.”

The last five-year review concluded that the upland concrete cap is functioning as intended. The RAOs for water and sediment, however, are not being met in Lauritzen Channel.

5.2 Issues and Recommendations from Last 5-year Review

Two issues were identified from the previous five-year review, as stated below:

- Post-remediation monitoring of the Site indicated that levels of DDT and dieldrin measured in the water and sediment do not meet the RAOs. While the concentrations do not pose an immediate risk to human health and the environment, through bioaccumulation up the food chain, the contaminants pose a potential risk to fish-eating birds, mammals, and fishermen in the Inner Richmond Harbor area.
- Laboratory reporting errors occurred in Years 1 and 2 of the post-remediation biomonitoring, grossly underestimating contaminant concentrations in mussel tissue. Conflicting data generated from another source led to the discovery of this error. Measures to tighten quality assurance and quality control (QA/QC) are warranted to ensure that such errors do not occur again.

The recommendations that were developed from the last five-year review include:

- Revise post-remediation monitoring plan and Quality Assurance Project Plan (QAPP).
- Review laboratory’s QA/QC procedures and Quality Problem Report and provide recommendations for preventive measures.

- Prepare a source identification study.
- Prioritize potential sources of re-contamination for further study, and prepare work plan for further investigation.
- Combine outfall water sampling with the next biomonitoring sampling event.
- Perform further field investigations to determine potential source of re-contamination.
- Evaluate data to determine next steps.

5.3 Follow-up Actions from Last 5-year Review

Follow-up actions have been conducted to address the issues and recommendations that were made in the last five-year review.

- Revision to the Post-remediation Monitoring Plan and QAPP were made, where necessary. Suspended particulates in the water column were considered to contribute to the variability in pesticide concentrations between replicate samples; hence, water samples in Year 4 and subsequent years' monitoring were analyzed in both bulk (total) phase and dissolved phase, as were total suspended solids, to evaluate the contribution of particulates to the total contaminant concentration.
- All procedures for sampling, sample custody, field and lab documentation, other aspects of documentation, quality assurance, and sample analysis were conducted in accordance with the QAPP for Remediation Investigation and Feasibility Study of Marine Sediments at the United Heckathorn Superfund Site (Battelle 1992). In addition, Addendum 1 to the QAPP (Battelle 2002a) was issued to cover modifications and updates of the sampling plan during the Year 5 monitoring.
- The laboratory's QA/QC procedures were reviewed. Reports for Years 1 and 2 post-remediation monitoring were revised and republished in July 2000, after discovery of a reporting unit error in the original documents published in 1998 and 1999. No additional reporting errors were identified in the remainder of the monitoring program.
- From the time of issuance of the previous five-year review until present, USEPA conducted additional investigations at the Site to: (1) further characterize the marine sediment, and (2) determine the potential source of current contamination at the Site. A Phase I investigative study was conducted in February and March 2002 to identify potential sources of re-contamination and to characterize areas in the channel that had not been dredged. Subsequent to the Phase I study, Phase II samples were collected in June 2003 to further characterize the nature, source, and extent of contaminants within the Lauritzen Canal.
- Results from the Phase I and II investigations confirmed that the Site remedial action has not met the RAOs. An outfall pipe, embankment, and under-pier soils or sediments along the channel were identified as potential sources of re-contamination.

- In 2003, USEPA entered into an agreement with USACE to prepare a focused feasibility study to assess a range of alternative actions that could be taken to remediate the remaining contamination at the Site.
- An existing conceptual site model, including the upland and marine areas, was updated in 2003. The model forms the foundation or framework for developing and evaluating the most cost-effective and technologically-feasible remedial alternative(s). It also provides a communication tool for discussion with various stakeholders.
- In preparing the focused feasibility study, it became clear that additional information on the nature of the sediments at the Site was necessary before an assessment of alternatives could be prepared. Therefore, USACE and USEPA gathered more information on the types of sediments found in Lauritzen Channel by conducting a Phase III Investigation to characterize the suspended sediments and dissolved pesticides at the near-bottom compartment of the water column.
- Results from the Phase III investigation indicated that a fluid mud layer is absent from the Lauritzen Channel, and flow management of materials during dredging should be feasible. In addition, there is evidence that mobile reservoirs of DDT and dieldrin exist near the sediment surface and admix into the middle and upper water column. The available quantities are, potentially, one of the contributors to the observed RAO exceedances in the water column in the Lauritzen Channel and bioaccumulation of the pesticides in mussels.

5-year Review Process

The following sections discuss findings from the 5-year review.

6.1 Administrative Components

Lynn Suer, USEPA Remedial Project Manager for the Site, led this second 5-year review. CH2M HILL provided technical support to the USEPA.

6.2 Community Involvement

USEPA published a notice in the local newspaper in February 2006 announcing the start of the 5-year review. The notice described the Site background, outlined the process associated with conducting a 5-year review, and invited community involvement. Jackie Lane is the USEPA community involvement coordinator for the Site. A copy of the newspaper ad is included in Appendix B.

Following the release of this document, a fact sheet will be prepared by USEPA for distribution to the community near the Site. The fact sheet will summarize the findings, solicit comments, and provide instructions on how to obtain a copy of this 5-year review report.

6.3 Document Review

As part of the 5-year review process, relevant documents and information related to the site activities were reviewed. The documents chosen for review primarily focused on progress since the last five-year review but ranged in publication date from 1995 to present. A list of the documents reviewed is provided in Appendix A.

6.4 Data Review

This section discusses the data and information found in documents relating to the upland O&M and marine monitoring activities at the Site.

6.4.1 Upland Area

For this 5-year review, annual reports documenting the implementation of the O&M Plan from June 2002 to 2005 were reviewed.

6.4.1.1 Inspection Monitoring

Based on review of the annual reports from June 2002 to 2005, the upland cap is determined to be uncompromised and functioning as intended. Only minor surface cracks were observed during the routine site inspections. It was indicated in the annual reports that the

surface cracks were not indicative of stress fractures but most likely developed subsequent to the curing of freshly-poured concrete. They were noted to be insignificant and too small to be repaired. The most recent cap inspection was conducted and documented on June 14, 2005. It was concluded that the integrity of the cap remains intact and in good condition.

Inspections of the stormwater drop inlets and interceptors are being conducted monthly, which is documented in the Annual Report for Stormwater Discharges Associated with Industrial Activities (Environmental Technical Services 2003, 2004 & 2005). According to the annual reports, the stormwater system, in general, has been maintained in good condition, with occasional minor sedimentation observed within the storm drains. Staining and odors have not been observed or detected.

6.4.1.2 Stormwater Monitoring

Based on review of the annual reports, no pesticides have been detected in the composite samples taken from the five stormwater interceptors during the monitoring events. The industrial discharge permit from the City of Richmond has been updated annually to allow discharge to the publicly-owned treatment works. The facility has been in compliance with both the O&M stormwater monitoring program and the stormwater general permit.

6.4.2 Marine Area

For this 5-year review, post-remediation biomonitoring reports from 1998 (Year 1) to 2003 (Year 6) were reviewed. In addition, various reports documenting additional investigations at the Site were reviewed (Appendix A).

6.4.2.1 Surface Water Monitoring

Analytical results of total DDT and dieldrin in surface water samples from the post-remediation marine monitoring and 2004 Water Quality Investigation are provided in Table 6-1 (all tables are located at the end of this section). Comparison of pre-remediation and post-remediation concentrations in water samples is shown on Figures 6-1 and 6-2.

As indicated in Figures 6-1 and 6-2, no persistent data trend is observed in total DDT and dieldrin concentrations in water samples throughout the monitoring program. The mean concentrations varied considerably from year to year. The remediation goals of 0.59 ng/L total DDT and 0.14 ng/L dieldrin established for the Site have not yet been achieved, with the exception of the following two instances: (1) total DDT and dieldrin concentrations were not detected at the Richmond Inner Harbor Channel (Station 303.1) in 2001 (Year 4), and (2) total DDT concentration was 0.52 ng/L at Richmond Inner Harbor Channel in 2003 (Year 6).

Data from the monitoring indicate the highest total DDT and dieldrin concentrations occur at Lauritzen Channel/End (Station 303.3), decrease with distance from Lauritzen Channel/Mouth (Station 303.2) to Santa Fe Channel/End (Station 303.4), and are the lowest at the Richmond Inner Harbor Channel. The most elevated and variable concentrations at the end of the Lauritzen Channel are suspected to be due to the re-suspension of sediment by frequent vessel traffic along the channel.

6.4.2.2 Mussel Tissue Monitoring

Analytical results of total DDT and dieldrin in the mussel tissue samples from the post-remediation marine monitoring and 2004 Water Quality Investigation are provided in Table 6-2. Comparison of pre-remediation and post-remediation concentrations in the tissue samples is shown on Figures 6-3 and 6-4.

As with surface water samples, the gradient of concentrations in the tissue samples followed a pattern with the highest total DDT and dieldrin concentrations at the end of Lauritzen Channel, decreasing with distance from this location. The lowest concentrations were found in mussels sampled from the Richmond Inner Harbor Channel.

As indicated in Figures 6-3 and 6-4, the bioavailability of total DDT and dieldrin in mussel tissues from post-remediation monitoring is substantially lower than the pre-remediation levels. In general, the COC concentrations are showing a downward trend since Year 1 post-remediation.

In addition, a recently release (SFEI 2006) reports that statistical analysis of DDT concentrations (after adjustment for variation in lipid content among years) detected significant declines in leopard shark, striped bass, and white croaker in San Francisco Bay from 1994-2003. Declining DDT concentrations in regional fish tissues is a positive trend that may be due, in part, to remedial efforts at the United Heckathorn Site.

6.4.2.3 Additional Investigations

Uncertainty and variability in data trends in surface water and mussel tissue samples throughout the marine monitoring program prompted the USEPA to conduct additional investigations at the Site. The results from a 1999 sediment investigation and an apparent increase in DDT availability in the 2001 (Year 4) monitoring event triggered the USEPA to undertake a phased investigation to supplement data gaps and to determine the potential source(s) and extent of re-contamination of the Site. This study included a Phase I Source Investigation in 2001, a Phase II Source Investigation in 2002, and a Phase III Fluid Mud and Water Quality Investigation in 2004.

The purpose of the Phase I and II source investigations was to identify the source(s) and extent of re-contamination in the Lauritzen Channel and Parr Canal after remedial dredging had occurred. Sediment and/or water sampling and analysis were conducted at outfall pipes, undredged channel sediment, and unexcavated bank sediment.

Results from the investigations confirmed that DDT concentrations in sediment continue to exceed the remediation goal of 590 $\mu\text{g}/\text{kg}$ dry weight in Lauritzen Channel. A broken concrete outfall (also known as seep), located below the riprap on the eastern shore about 180 feet north of the Levin Pier (Figure 4-2), was identified as a persistent, if not continuous, source of DDT to the channel. The seep pipe was plugged and sealed during low tide on July 18, 2003 to eliminate further potential discharge of DDT from the pipe into the Lauritzen Channel.

Based on results from the investigations, a hot spot of sediment contamination is located beneath the north end of the Levin Pier. The highest concentrations of DDT in sediment appear to be located along the eastern embankment of the Lauritzen Channel in proximity

to the former United Heckathorn Site. In addition, the highest concentration in embankment soil samples also correlate to areas near the northern portion of the Levin Pier embankment.

In 2004, USEPA entered into an agreement with USACE to prepare a focused feasibility study to assess a range of alternative actions that could be taken at the Site to remediate the remaining contamination. In preparing the focused feasibility study, it became clear that additional information on the nature of the sediments at the Site was necessary before an assessment of alternatives could be prepared. Therefore, the USACE and USEPA gathered more information on the types of sediments found in Lauritzen Channel by conducting the Phase III investigation to characterize the suspended sediments and dissolved pesticides within the near-bottom compartment of the water column.

The purpose of the Phase III investigation was to evaluate the presence of fluid mud and to determine whether contaminant loads within the near-bottom water column could, potentially, be contributing to elevated mid- to upper water COC concentrations.

Table 6-2 and Figures 6-1 & 6-2 compare the results of the 2004 Water Quality Investigation to the results of post-remediation surface water monitoring program. There is a clear relationship between the location and the concentrations of DDT and dieldrin along the Lauritzen Channel. There is also evidence of ship-related disturbance at the mouth of the Lauritzen Channel (Station 303.2).

Results from the investigation indicated that a fluid mud layer is not present in the Lauritzen Channel, and flow management of materials during dredging should be feasible. In addition, there is evidence that mobile reservoirs of DDT and dieldrin exist near the sediment surface and admix into the middle and upper water column, as indicated by a strong gradient of concentration. The available quantities, are, potentially one of the contributors to the observed RAO exceedances in the water column in the Lauritzen Channel and bioaccumulation of the pesticides in mussels.

6.5 Regulatory Review

A review of ARARs and TBCs was conducted for the selected remedy at the Site, as included in Appendix E. The review was conducted to determine if changes to standards and TBCs have occurred since the ROD was issued in 1995 that might affect current protectiveness of the selected remedy.

The specific documents that were reviewed for any changes, additions, or deletions include the ROD, issued October 26, 1995, and the ESD, issued November 29, 1996.

Based on the evaluation, there were no changes to existing action-specific, chemical-specific, location-specific ARARs, nor TBCs since the 1995 ROD that might affect the current protectiveness of the selected remedy.

6.6 Site Inspection

A site inspection was conducted by representatives of USEPA and CH2M HILL on April 18, 2006. The purpose of the site inspection was to observe conditions and the status of operation at the Site and its surrounding area. The inspection included a walking tour of the

5-acre upland capping area with LRTC onsite personnel at the Levin Richmond Terminal and a boat tour of the waterways (including Lauritzen Channel and Parr Canal) adjacent to the Site. A summary of the inspection findings is presented below. The site inspection checklist and photos are provided in Appendices C and D, respectively.

The Levin Richmond Terminal is surrounded by other industrial facilities. The property is fenced and secured by gates with limited access. Security guards are onsite 24 hours a day. All visitors entering the Site are required to register in the security office at the main entrance of the terminal.

Conditions during the inspection were favorable, sunny, with temperatures of 68° to 70°. Birds and water fowls were observed at the Site. According to the LRTC onsite personnel, stingrays were observed at the Lauritzen Channel in July 2005.

Based on observation from the site inspection, the integrity of the upland cap was well-maintained, and the cap was in good condition with no erosion. Although surface cracks were visible on the cap, it was indicated in the annual reports that they were not indicative of stress fractures but most likely developed subsequent to the curing of freshly-poured concrete. They were noted to be insignificant and too small to be repaired.

Stormwater interceptors (SW-3 to SW-7) were observed to be in good condition. Based on personal communication with the LRTC personnel, the stormwater interceptors were functioning properly during the previous rainy event. Hydrocarbon booms were placed upstream of the storm drain drop inlets near the fuel station. Bales were observed on four sides acting as pre-filter to stormwater flowing into the drop inlet. Ultra-storm guards were installed at the drop inlet to avoid inflow of silt and hydrocarbon.

It was perceived during the inspection that LRTC is proactively looking for optimization opportunities for maintenance of the upland cap, material management, and stormwater pollution prevention at the Site. General housekeeping was well-performed. A road sweeper was in operation during the site visit cleaning a small hydrocarbon spill. An onsite equipment staging area was designated to facilitate cleanup of any equipment during potential leakage. A dust collector was located onsite to suppress dust emission using fine mist, if necessary.

Based on observations from the site inspection, no major issues were identified on the upland capping area that could potentially affect the protectiveness of the remedy at the Site. The inspection and stormwater monitoring program should be continued for evaluation of any potential propagation of the existing surface cracks on the cap.

During the boat tour, advisory and warning signs indicating the presence of pesticides and other chemicals were observed at or near the Site. In addition, "No Trespassing" and "No Fishing" signs were displayed along the Lauritzen Channel and Richmond Harbor Channel. Mussels were observed on the abandoned piles along the waterways. Stormwater outfall pipes were observed along the Lauritzen Channel, including both interceptor outfalls from the upland area of the Site and the City of Richmond's outfalls. No significant issues were identified at the time of the boat tour.

6.7 Interviews

No interviews were conducted as part of this five-year review.

At this time, community outreach activity planned for this 5-year review will consist of a fact sheet issued upon completion of the review. It will provide an opportunity for the community to comment, with comments to be considered prior to the next 5-year review. Additional community activities are to be further determined on an as-needed basis upon completion of the review.

TABLE 6-1

Summary of Post-remediation Concentration of Total DDT and Dieldrin in Water Samples (Water Concentration in ng/L)
 Second 5-Year Review Report for United Heckathorn, Richmond, California

Sample ID	Location	Remediation Goal	Pre-Remediation ^a	Post-remediation						2004 Water Quality Investigation
				1998 (Yr 1)	1999 (Yr 2)	2000 (Yr 3)	2001 (Yr 4)	2002 (Yr 5)	2003 (Yr 6)	
Total DDT										
303.1	Richmond Inner Harbor	0.59	1	0.65	14.4	2.56	0.06U	0.66	0.52P	NS
303.2	Lauritzen / Mouth	0.59	NS	42.6	4.61	27.9	2.88	1.70	0.65	13.2
303.3	Lauritzen / End	0.59	50	103	62.3	83.7 (w/o rep b) 1773 (all reps)	142	18.4	396	261.2
303.4	Santa Fe / End	0.59	8.6	11	19.2	3.70	2.51	0.60	0.67P	NS
303.6	Parr Canal	0.59	NS	NS	NS	NS	NS	2.57	1.8	NS
Seep-T	Seep	0.59	NS	NS	NS	NS	NS	4455	8990	NS
Dieldrin										
303.1	Richmond Inner Harbor	0.14	< 1	0.65	0.62	1.57	0.08U	0.16	0.21J	NS
303.2	Lauritzen / Mouth	0.14	NS	8.18	0.48	8.96	0.46	0.43	0.22J	1.3
303.3	Lauritzen / End	0.14	18	18	12.5	83 (w/o rep b) 625 (all reps)	8.49	2.08	15	6.0
303.4	Santa Fe / End	0.14	1.8	2.47	0.37	2.11	0.46	0.20	0.17J	NS
303.6	Parr Canal	0.14	NS	NS	NS	NS	NS	0.98	0.88	NS
Seep-T	Seep	0.14	NS	NS	NS	NS	NS	2520C	3000	NS

Note:

^aPre-remediation water concentration is the average of samples collected in October 1991 and February 1992 for the ecological risk assessment.

C = Associated surrogate recovery was outside of QC limits because extract required 10:1 dilution.

J = Estimated value between reporting limit and method detection limit.

NS = not sampled.

P = Estimated value: >40% relative percent-difference between primary and confirmation columns.

U = All DDT compounds undetected; value is average reporting limit.

TABLE 6-2

Summary of Post-remediation Concentration of Total DDT and Dieldrin in Tissue Samples ($\mu\text{g}/\text{kg}$ wet weight)
Second 5-Year Review Report for United Heckathorn, Richmond, California

Station ID	Station Name	Pre-remediation		Post-remediation					
		SMW Transplant ^a	ERA Resident ^b	1998 (Yr 1) Resident	1999 (Yr 2) Resident	2000 (Yr 3) Resident	2001 (Yr 4) Resident	2002 (Yr 5) Resident	2003 (Yr 6) Resident
Total DDT									
303.1	Richmond Inner Harbor	47.0 ^c	40	127	30	52	25	9.3	28
303.2	Lauritzen / Mouth	629 ^d	--	1,222	176	310	340	139	214
303.3	Lauritzen / End	5,074 ^d 1,369 ^c	2,900	4,504	606	522	1,136	310	431
303.4	Santa Fe / End	369 ^c	350	256	76	75	150	24	24.8
303.6	Parr Canal	NS	NS	NS	NS	NS	NS	40	NS
Seep-T	Seep	NS	--	NS	NS	NS	NS	NS	135,700
Dieldrin									
303.1	Richmond Inner Harbor	7.7 ^c	4.0	5.43	1.9	5.4	0.7	0.7	2.9
303.2	Lauritzen / Mouth	87.0 ^d	--	40.3	6.5	27.7	6.3	2.9	6.2 ^{J,P,D1,#}
303.3	Lauritzen / End	602 ^d 100 ^c	97.0	184	28.4	42.7	32.1	17.0	18
303.4	Santa Fe / End	32.5 ^c	19.0	8.18	2.8	6.4	3.3	0.6	1.3
303.6	Parr Canal	NS	NS	NS	NS	NS	NS	1.2	NS
Seep-T	Seep	NS	--	NS	NS	NS	NS	NS	4,000

Note:

^aMost recent data available from State Mussel Watch program, transplanted California mussels (Rasmussen 1995).

^bEcological Risk Assessment Average concentration in resident mussel tissue from samples collected in October 1991 and February 1992 (Lee et al. 1994).

^cState Mussel Watch program sample from March 1991 (Rasmussen 1995).

^dState Mussel Watch program from January 1988 (Rasmussen 1995).

NS = Not sampled.

= Surrogate recovery control limits not applicable because of dilution factor.

D1 = Extract required 1:10 dilution for quantitation.

J = Estimated below reporting limit, but above method detection limit.

P = >40% RPD between primary and confirmation columns.

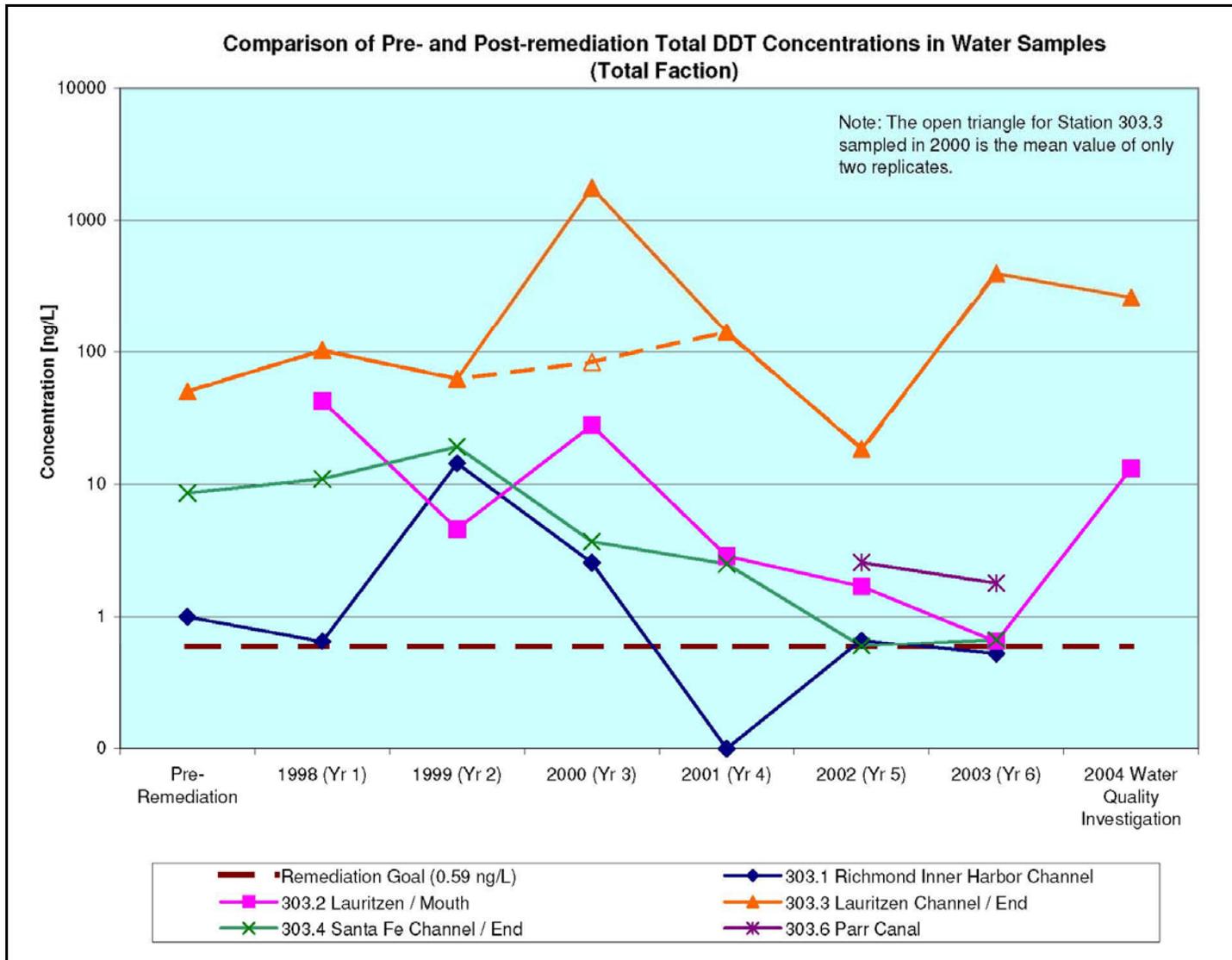


FIGURE 6-1 Comparison of Pre- and Post-remediation Total DDT Concentrations in Water Samples (Total Fraction)

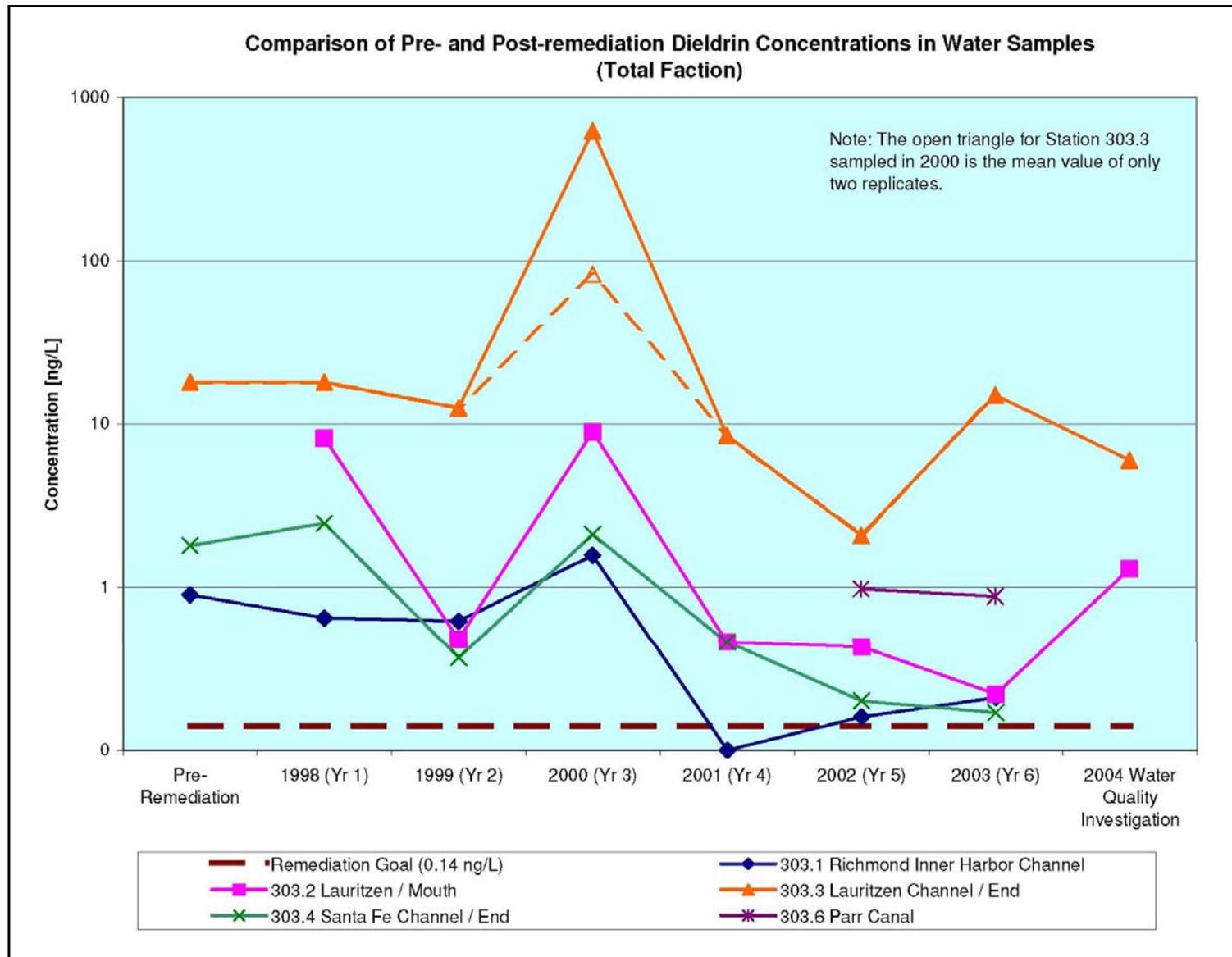


FIGURE 6-2
Comparison of Pre- and Post-remediation Dieldrin Concentrations in Water Samples (Total Fraction)

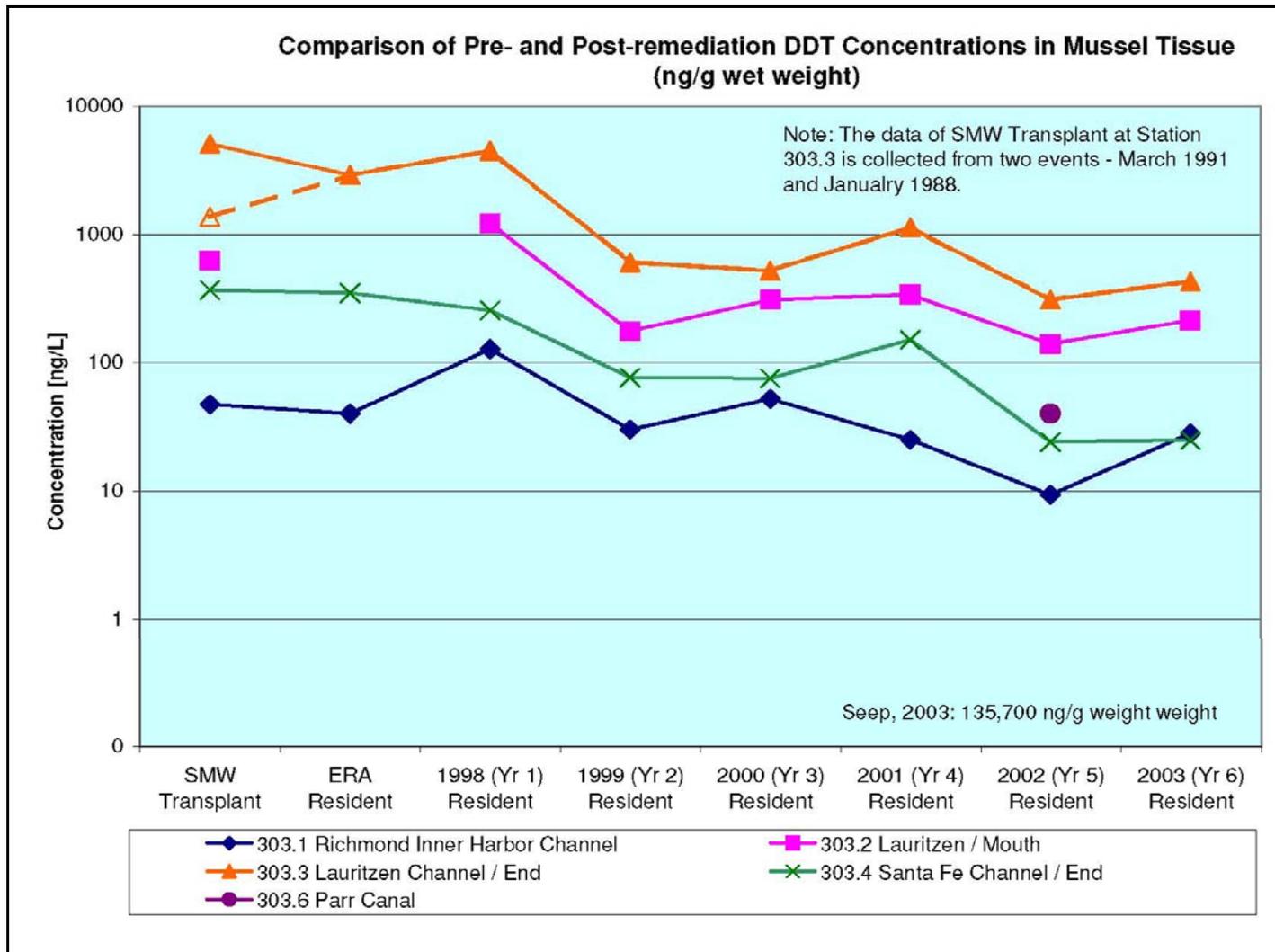


FIGURE 6-3 Comparison of Pre- and Post-remediation DDT Concentrations in Mussel Tissues (ng/g wet weight)

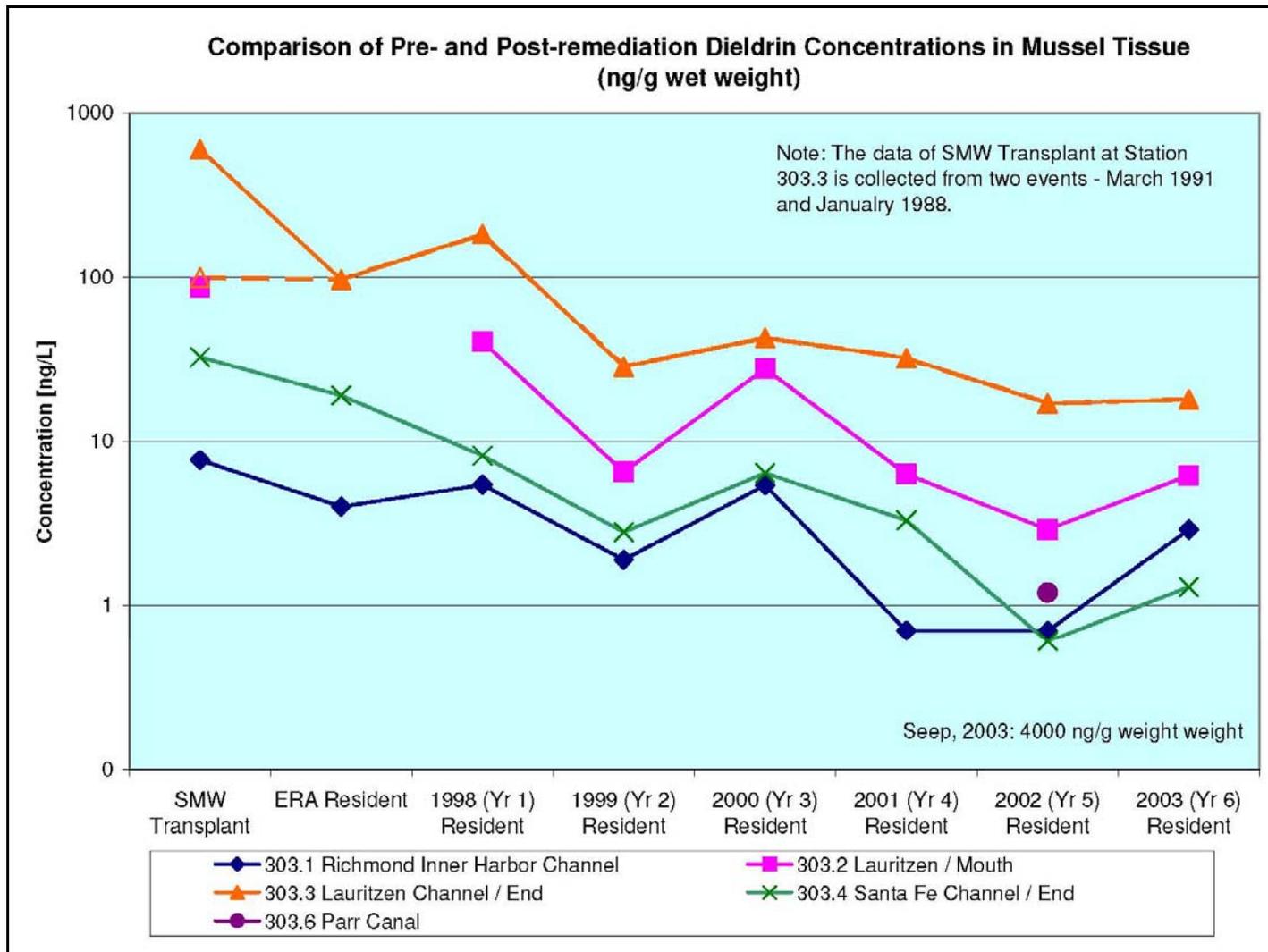


FIGURE 6-4 Comparison of Pre- and Post-remediation Dieldrin Concentrations in Mussel Tissue (ng/g wet weight)

Technical Assessment

This section evaluates the protectiveness of the implemented remedy at the Site based on data and information presented in the previous section. The technical assessment was conducted by examining three questions, as listed in the following subsections.

7.1 Question A: Is the Remedy Functioning as Intended by the Decision Documents?

This subsection discusses how the Site is operating and functioning in relation to its intended objectives, O&M implementation, optimization opportunities, any early indicators of potential issues, and institutional control implementation.

7.1.1 Upland Area

The review of documents, ARARs, risk assumptions, and the site inspection indicates that the remedy at the upland area is functioning as intended. The 5-acre capping area has achieved the remedial objectives by eliminating the potential of erosion and exposure of contaminated soils from the upland capping area. The implementation of institutional controls has been effective. The perimeter fence at the Site remains intact and the property is operating as a marine terminal under industrial land use classification. A deed restriction allows for only commercial or industrial (non-residential) uses.

O&M of the cap and drainage structures have been effective. Minor surface cracks on the cap are visible but do not compromise the protectiveness of human health and the environment. The O&M annual reports indicate the integrity of the cap remains intact and is in good condition. In addition, the facility has been in compliance with both the O&M stormwater monitoring program and the stormwater general permit.

There are no opportunities for system optimization observed during this review. The inspection and stormwater monitoring program provides sufficient data to evaluate the integrity of the upland capping system. Continual inspection and stormwater monitoring should be conducted to assess any further propagation of surface cracks and any potential erosion of the contaminated soil from the upland capping area.

There are no indications of any difficulties with the remedy. In addition, there are no known deficiencies related to the institutional controls set forth in the ROD. An institutional controls assessment memorandum is included in Appendix G. Should EPA ever receive notice under the Consent Decree that the Levin entities are planning to sell the parcels, EPA should, in an abundance of caution, evaluate whether the Covenant to Restrict Use of Property would be sufficient following the transfer of the two parcels to a new owner.

7.1.2 Marine Area

The review of documents, ARARs, risk assumptions indicates that the remedy at the marine area is not functioning as intended by the ROD. Based on the post-remediation marine monitoring program, the remediation goals for the marine area have not been maintained. The first post-remediation monitoring event, conducted in April 1997, indicated that RAOs had been achieved. However, subsequent monitoring indicated that DDT and dieldrin concentrations were not within the acceptable limits and that these COCs are accumulated by resident biota (i.e. mussels).

Additional Phase I and II source investigations and Phase III water quality monitoring have further confirmed that the marine environment of the Site has not met remediation goals.

The ARARs, toxicology, and institutional controls reviews are provided in Appendices D, E, and F, respectively.

7.2 Question B: Are the Assumptions Used at the Time of Remedy Selection Still Valid?

The exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection are generally unchanged. A technical memorandum related to risk assessment and toxicology analysis is included in Appendix F and is summarized as follows:

7.2.1 Upland Area

No major changes in the site conditions of the upland area that might affect the exposure pathways were identified. The Levin Richmond Terminal is surrounded by other industrial facilities. The property is fenced and access is limited.

In addition, no new human health or ecological routes of exposure were identified that would affect the protectiveness of the remedy, and no new contaminants were identified.

7.2.2 Marine Area

No major changes in the site conditions of the marine area that might affect the exposure pathways were identified. The Lauritzen and Parr Channels continue to be connected to the Santa Fe Channel, so that fish and other migratory aquatic biota have access to these areas. In addition, fish-eating birds forage in the area. Even though the marine areas are posted with warning and no trespassing signs, these areas may be accessed by boat. Fishermen may still harvest fish and other edible biota from these areas.

No new contaminants or changes in toxicity values that would affect the protectiveness of the remedy were identified for the marine area.

7.3 Question C: Has Any Other Information Come to Light that Could Call Into Question the Protectiveness of the Remedy?

7.3.1 Upland Area

No other information has surfaced that would call into question the protectiveness of the remedy at the upland of the Site.

7.3.2 Marine Area.

As discussed in Section 7.1, the remedy implemented at the marine area of the Site is not effective or functioning as intended by the ROD. A Focused Feasibility Study is in progress to determine how to address the current situation.

Issues and Recommendations

This section describes issues and recommendations identified for the United Heckathorn Site during this five-year review.

8.1 Issues Related to Upland Area

There are no issues related to the upland area.

8.2 Issues Related to Marine Area

Issue

Post-remediation marine monitoring indicates that remediation goals for DDT and dieldrin for water and sediments have not been maintained. Further, concentrations of DDT and dieldrin in mussel tissues, while declining since remedial dredging occurred, are still elevated. These contaminants may still pose risks to fish-eating birds, mammals, and fishermen and their families.

Community interviews conducted by USEPA for the human health risk assessment (ICF 1994) confirmed that the marine area is used by recreational and subsistence fishermen, despite multi-lingual signs posted by the Department of Health Services that warn of the risks of consuming fish or shellfish. It is likely that some consumption of contaminated fish still occurs because access to the Site by trespassing boats cannot be completely eliminated. Also, fish within the Site may migrate to outlying areas that are legally accessible to fishermen. Such conditions may pose a risk to human health.

Recommendation

Continue preparation of a focused feasibility study to evaluate alternatives for addressing the remaining contamination. It is not possible to determine what, if any, remedial actions should be taken to address contaminated sediments, water and tissues without a complete analysis of alternatives.

TABLE 8-1
 Issues, Recommendations, and Follow-Up Actions
Second Five-Year Review Report, United Heckathorn Superfund Site, Richmond, California

Issue	Recommendations and Follow-Up Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness (Y/N)	
					Current	Future
The RAOs for DDT and dieldrin in the marine area water and sediment have not been maintained.	Complete the focused feasibility study, which is currently underway.	USEPA	USEPA	August 2008	Y	Y

SECTION 9.0

Protectiveness Statement

The remedy implemented at the upland area of the United Heckathorn Superfund Site is protective of human health and the environment, due to capping of contaminated soils which has eliminated human exposure pathways and prevented erosion. Routine inspection and monitoring assures the protectiveness of the upland remedy at the Site.

The remedy implemented at the marine area of the Site is not protective because potential exposure is clearly present. Fishermen and their families may be exposed to contaminants when fish or other edible biota from the Site are consumed. This may occur if warning and no-trespassing signs are ignored or misunderstood. Fish-eating birds and wildlife cannot be prevented from consuming potentially contaminated food from the Site. In addition, contaminated biota (e.g., fish) cannot be prevented from migrating to areas outside of the Site, where they might be harvested and consumed by fishermen, birds, or wildlife.

SECTION 10.0

Next 5-Year Review

The next 5-year review for the United Heckathorn Site will be conducted in 2011, 5 years from the date of this review.

SECTION 11.0

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