Draft

Functional Equivalent Document

Consolidated Toxic Hot Spots Cleanup Plan

April 1999

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Division of Water Quality

STATE WATER RESOURCES CONTROL BOARD
CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY

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STATE WATER RESOURCES CONTROL BOARD

DRAFT FUNCTIONAL EQUIVALENT DOCUMENT

CONSOLIDATED TOXIC HOT SPOTS CLEANUP PLAN

April 1999

Notice of Filing

To: Any Interested Person

From: State Water Resources Control Board
P.O. Box 944213
Sacramento, CA 94244-2130

Subject:	Notice of Filing submitted under Section 21080.5 of the Public Resources Code
Project Proponent:	State Water Resources Control Board (SWRCB)
Project Title:	Consolidated Toxic Hot Spots Cleanup Plan
Contact Person:	Craig J. Wilson (916) 657-0671
Project Location:	The enclosed bays, estuaries and coastal waters of California.
Project Description:	The Bay Protection and Toxic Cleanup Program is required to develop Statewide and Regional Toxic Hot Spots Cleanup Plans and site ranking criteria to address any identified toxic hot spots in California enclosed bays, estuaries or coastal waters. The project is the adoption of the Consolidated Toxic Hot Spot Cleanup Plan that includes provisions for: (1) the toxic hot spot definition and ranking criteria, (2) a consolidated list of ranked known toxic hot spots, (3) a process for delisting sites, (4) guidance to the Regional Water Quality Control Boards (RWQCBs) on revision of Waste Discharge Requirements associated with toxic hot spots, (5) funding mechanisms to implement the Consolidated Plan, (6) policy on the prevention of toxic hot spots, (7) findings on the need for a Program to implement the Consolidated Plan, and (8) each Regional Toxic Hot Spots Cleanup Plan.

This notice is to advise that the SWRCB is considering adoption of a Consolidated Toxic Hot Spots Cleanup Plan pursuant to Water Code Section 13394. Action on this Plan will be taken in accordance with a regulatory program exempt under Section 21080.5 of the Public Resources Code from the requirement to prepare an Environmental Impact Report under the California Environmental Quality Act (Public Resources Code Section 21000 et seq.) and with other applicable laws and regulations.

Copies of the Functional Equivalent Document (which includes the draft Plan, reasonable alternatives, mitigation measures to minimize any significant adverse environmental impacts, and the Environmental Checklist Form) can be obtained from the Contact Person named above.

Comments on the proposed Policy should be submitted by June 3, 1999.

Signed: ____________________ Date: April 2, 1999

PREFACE

The State Water Resources Control Board (SWRCB) is required by the California Water Code to develop a Statewide Consolidated Toxic Hot Spots Cleanup Plan by June 30, 1999.

This document is the environmental document to support the development of the Consolidated Toxic Hot Spots Cleanup Plan (the Plan). This draft Functional Equivalent Document (FED) explores various alternatives, provides options and recommendations, and evaluates the environmental impacts of the Plan.

The Consolidated Cleanup Plan provides a listing of known toxic hot spots in California enclosed bays, estuaries and coastal waters. The Plan also lists actions to address these toxic hot spots, costs of remediation, benefits of remediation and provides findings on funding to implement the Plan. The SWRCB will hold a public hearing (June 3, 1999) on the draft FED.

This document has three parts: (1) the draft FED, (2) Volume I of the proposed Consolidated Toxic Hot Spots Cleanup Plan (which contains the consolidated lists, policy statements and findings), and (3) Volume II of the proposed Consolidated Toxic Hot Spots Cleanup Plan (which contains each of the Regional Toxic Hot Spots Cleanup Plans). Volumes I and II of the draft Consolidated Toxic Hot Spots Cleanup Plan are presented in Appendices A and B, respectively.

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ACL	Administrative Civil Liability
AMBAG	Association of Monterey Bay Area Governments
APA	Administrative Procedure Act
BAT	Best available technology economically achievable
BCT	Best conventional pollutant control technology
BIOS	Biologically Integrated Orchard System
BIPS	Biologically Integrated Prune System
BMP	Best management practice
BOD	Biochemical oxygen demand
BPTCP	Bay Protection and Toxic Cleanup Program
CAD	Confined aquatic disposal
CalEPA	California Environmental Protection Agency
CBOD	Carbonaceous biochemical oxygen demand
CCMVCD	Contra Costa Mosquito Vector Control District
CCR	California Code of Regulations
CCSF	City and County of San Francisco
CDF	Confined disposal facility
CEQA	California Environmental Quality Act
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CSO	Combined sewer overflow
CWA	Clean Water Act (federal)
cy	cubic yard
CZARA	Coastal Zone Act Reauthorization Amendments
DDT	dichlorodiphenyltrichloroethane
DDE	dichlorodiphenyldichloroethylene
DERP	Defense Environmental Response Program
DFG	Department of Fish and Game
DHS	Department of Health Services
DPR	Department of Pesticide Regulation
DTSC	Department of Toxic Substance Control
EE/CA	Engineering evaluation/cost analysis
EIR	Environmental Impact Report
EPA	U.S. Environmental Protection Agency
EQIP	Environmental Quality Incentives Program
ERL	Effects Range Low
ERM	Effects Range Median
EROD	Ethoxyresorufin O-deethylase
FDA	U.S. Food and Drug Administration
FED	Functional Equivalent Document

FEMA	Federal Emergency Management Agency
FS	Feasibility study
gpd	gallons per day
IR	Installation restoration
kg	kilogram(s)
LACSD	Los Angeles County Sanitation District
LRCS	Leachate removal and containment system
LTMS	Long-Term Management Strategy
MAA	Management Agency Agreement
MEP	Maximum extent practicable
MGD	million gallons per day
mg/kg	milligrams per kilogram (parts per million)
mg/l	milligrams per liter (parts per million)
MOCOCO	Mountain Copper Company
MOU	Memorandum of Understanding
MSD	Minimum significant difference
MS4	Municipal separate storm sewer system
NAS	National Academy of Sciences
NEPA	National Environmental Policy Act
ng/l	nanograms per liter (parts per trillion)
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NPS	Nonpoint Source
NRCS	Natural Resources Conservation Service
OAL	Office of Administrative Law
OEHHA	Office of Environmental Health Hazard Assessment
PAH	Polynuclear Aromatic Hydrocarbon
PCA	Pest control advisor
PCB	Polychlorinated biphenyl
PEP	Process effluent purification
PMP	Pesticide Management Plan
PRMP	Pilot Regional monitoring program
PY	Personnel year
RAP	Remedial action workplan
RBI	Relative benthic index
RCD	Resource Conservation District
RMP	Regional monitoring program
RWCF	Regional Wastewater Control Facility
RWQCB	Regional Water Quality Control Board
SAP	Sampling and Analysis Plan
SFEI	San Francisco Estuary Institute
SMBRP	Santa Monica Bay Restoration Project
SMW	State Mussel Watch

SOD	Sediment oxygen demand
SRF	State Revolving Fund
SWPPP	Storm water pollution prevention plan
SWRCB	State Water Resources Control Board
TBD	to be determined
THS	Toxic Hot Spot
TIE	Toxicity identification evaluation
TMDL	Total Maximum Daily Load
TSS	Total suspended solids
UPC	Urban Pesticide Committee
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WDR	Waste Discharge Requirement
WMI	Watershed Management Initiative

DRAFT FUNCTIONAL EQUIVALENT DOCUMENT

CONSOLIDATED TOXIC HOT SPOTS CLEANUP PLAN

INTRODUCTION

In 1989, the California State Legislature established the Bay Protection and Toxic Cleanup Program (BPTCP). The BPTCP has four major goals: (1) to provide protection of present and future beneficial uses of the bays and estuarine waters of California; (2) identify and characterize toxic hot spots; (3) plan for toxic hot spot cleanup or other remedial or mitigation actions; (4) develop prevention and control strategies for toxic pollutants that will prevent creation of new toxic hot spots or the perpetuation of existing toxic hot spots in the bays and estuaries of the State. Among other things, the BPTCP is required to develop Statewide and Regional Toxic Hot Spots Cleanup Plans and site ranking criteria.

The State Water Resources Control Board (SWRCB) and the Regional Water Quality Control Boards (RWQCBs) have used a three phase process for adoption of the Regional and Consolidated Toxic Hot Spots Cleanup Plans. The three phases are:

1. The SWRCB adopted a policy outlining the toxic hot spot definition, ranking criteria and other factors needed for the consistent development of the BPTCP cleanup plans.

   The SWRCB developed formal guidance on the development of toxic hot spot cleanup plans. This document is a Water Quality Control Policy (California Water Code Section 13140, 13142) that contains a specific definition of a toxic hot spot, ranking criteria to assist the SWRCB and the RWQCBs in establishing priorities for addressing toxic hot spots in the plans, and other measures necessary to facilitate the plans' completion. The Policy was accompanied by a functional equivalent document (FED) to facilitate California Environmental Quality Act (CEQA) and Administrative Procedure Act (APA) compliance and to provide technical justification to withstand peer review (as required by law).

   The SWRCB used the procedures for adopting and revising Water Quality Control Plans. The Policy and FED were adopted by the SWRCB on September 2, 1998. OAL approved the regulatory provisions of the Policy on November 9, 1998.

2. The RWQCBs adopted the Regional Toxic Hot Spots Cleanup Plans.

   Each RWQCB first developed proposed Regional Toxic Hot Spots Cleanup Plans in 1997 (RWQCB, 1997a; 1997b; 1997c; 1997d; 1997e; 1997f; 1997g). Subsequent to approval of the Guidance Policy the RWQCBs redeveloped their Cleanup Plans. Each RWQCB has held at least one public hearing or workshop on the revised Regional cleanup plan.

   The North Coast, Central Coast, Santa Ana and San Diego RWQCBs adopted their Regional Toxic Hot Spots Cleanup Plans using the normal procedures for RWQCB action (i.e., the public was given an opportunity to comment on the draft plan, the plan was revised in response to the comments received, and the plan was adopted by the RWQCB).

   The San Francisco Bay, Central Valley and Los Angeles RWQCBs did not adopt their Regional Toxic Hot Spots Cleanup Plans because they did not have the required number of Board Members to convene a meeting and adopt their cleanup plans. The Executive Officers of these RWQCBs submitted their cleanup plans to the SWRCB after RWQCB public hearings or workshops.

3. The SWRCB will compile and adopt the Consolidated Toxic Hot Spots Cleanup Plan.

   The SWRCB is now undertaking completion of this phase. The Consolidated Cleanup Plan will consist of the consolidated list of toxic hot spots as well as the Water Code-mandated requirements for addressing the toxic hot spots. The SWRCB is required to make specific findings in the Statewide plan (Water Code Section 13394; SWRCB, 1998a).

   The SWRCB will use the same procedures used for adoption of the Policy in Phase 1 for adoption of the Statewide Consolidated Toxic Hot Spots Cleanup Plan. The Consolidated Statewide Toxic Hot Spot Cleanup Plan will be submitted to the Legislature at the same time the regulatory provisions of the Plan are submitted to OAL for approval.

Purpose

The purpose of this Functional Equivalent Document (FED) is to present (1) alternative approaches for developing provisions of the Consolidated Plan, (2) SWRCB staff recommendations for the development of the Consolidated Plan, and (3) an assessment of the potential adverse environmental impacts of the recommended Plan. The topics addressed in the FED include: approaches for consolidating and compiling the Regional Toxic Hot Spots Cleanup Plans, remediation of known toxic hot spots, removing locations from the list of known toxic hot spots, guidance on waste discharge requirement reevaluation, and mechanisms to fund implementation of the consolidated plan.

This FED will not address issues related to the definition of a toxic hot spot, site ranking criteria and other issues addressed in the guidance policy (SWRCB, 1998a; 1998b). These issues were addressed in the adoption process for the Policy and were used as the foundation for the development of the Regional and Consolidated Toxic Hot Spots Cleanup Plans.

Necessity for the Regulatory Provisions of the Consolidated Toxic Hot Spots Cleanup Plan

The SWRCB and the RWQCBs are required to (1) identify and characterize toxic hot spots, (2) plan for the cleanup or other appropriate remedial or mitigating actions at sites, and (3) amend plans and policies to incorporate strategies to prevent the creation of new toxic hot spots and the further pollution of existing toxic hot spots (California Water Code Section 13392). The SWRCB is required to adopt a statewide Consolidated Toxic Hot Spots Cleanup Plan (Water Code Section 13394). The Consolidated Cleanup Plan must include: (1) a priority listing of all known toxic hot spots covered by the Plan; (2) a description of each toxic hot spot including a characterization of the pollutants present at the site; (3) an assessment of the most likely source or sources of pollutants; (4) an estimate of the total costs to implement the Cleanup Plan; (5) an estimate of the costs that can be recovered from parties responsible for the discharge of pollutants that have accumulated in sediments; (6) a preliminary assessment of the actions required to remedy or restore a toxic hot spot; (7) a two-year expenditure schedule identifying State funds needed to implement the plan; and (8) findings and recommendations concerning the need for establishment of a toxic hot spots cleanup program.

The regulatory provisions of the Consolidated Toxic Hot Spots Cleanup Plan are required to comply with California Water Code Sections 13392 and 13394).

CEQA Compliance

The SWRCB must comply with the requirements of CEQA and the APA when adopting a plan, policy or guideline. CEQA provides that a program of a State regulatory agency is exempt from the requirements for preparing Environmental Impact Reports (EIRs), Negative Declarations, and Initial Studies if certain conditions are met. The process the SWRCB is using to develop the Consolidated Toxic Hot Spots Cleanup Plan has received certification from the Resources Agency to be "functionally equivalent" to the CEQA process [Title 14 California Code of Regulations Section 15251(g)]. Therefore, this FED fulfills the requirements of CEQA for preparation of an environmental document.

Agencies qualifying for this exemption must comply with CEQA's goals and policies, evaluate environmental impacts, consider cumulative impacts, consult with other agencies with jurisdiction by law, provide public notice and allow public review, respond to comments on the draft environmental document, adopt CEQA findings, and provide for monitoring of mitigation measures. SWRCB regulations (California Code of Regulations [CCR], Title 23, Chapter 27, Section 3777) require that a document prepared under its certified regulatory programs must include:

1. A brief description of the proposed activity;

2. Reasonable alternatives to the proposed activity; and

3. Mitigation measures to minimize any significant adverse environmental impacts of the proposed activity.

This FED is very similar to the "program" environmental approach that is described in Title 14 CCR (CEQA Guidelines) Section 15168. That section provides that a program environmental impact report "may be prepared on a series of actions that can be characterized as one large project and are related ... (3) In connection with the issuance of rules, regulations, plans, or other general criteria to govern the conduct of a continuing program, or (4) As individual activities carried out under the same authorizing statutory or regulatory authority and having generally similar environmental effects which can be mitigated in similar ways." This "program" approach has enabled the SWRCB staff to examine typical effects of remediation and outline mitigation that may be used to lessen or avoid adverse effects.

However, it should be noted that this FED differs from the typical "program" environmental document approach in that it is not intended to provide CEQA compliance for the individual, site-specific remediation projects. Appropriate CEQA compliance is required when site-specific remediation plans are developed.

The environmental impacts that may occur as a result of the remediation alternatives identified in the proposed Consolidated Plan are summarized in an Environmental Checklist and analyzed in the Environmental Impacts section of the FED.

Background

California Water Code, Division 7, Chapter 5.6 established a comprehensive program within the SWRCB to protect the existing and future beneficial uses of California's enclosed bays and estuaries. SB 475 (1989), SB 1845 (1990), AB 41 (1989) and SB 1084 (1993) added Chapter 5.6 [Bay Protection and Toxic Cleanup (Water Code Sections 13390-13396.5)] to Division 7 of the Water Code.

The BPTCP has provided a new focus on the SWRCB and the RWQCBs efforts to control pollution of the State's bays and estuaries by establishing a program to identify toxic hot spots and plan for their cleanup.

Program Activities

The BPTCP is a comprehensive effort by the SWRCB and RWQCBs to programmatically link standards development, environmental monitoring, water quality control planning, and site cleanup planning. The Program includes six primary activities:

1. Development and amendment of the California Enclosed Bays and Estuaries Plan. This plan should contain the State's water quality objectives for enclosed bays and estuaries, and implementation measures for these objectives.

2. Development and implementation of regional monitoring programs designed to identify toxic hot spots. These

monitoring programs include analysis for a variety of chemicals, toxicity tests, measurements of biological communities, and various special studies to support the Program.

3. Development of a consolidated database that contains information pertinent to describing and managing toxic hot spots.

4. Development of narrative and numeric sediment quality objectives for the protection of California enclosed bays and estuaries.

5. Preparation of criteria to rank toxic hot spots that are based on the severity of water and sediment quality impacts.

6. Development of Regional and Statewide Toxic Hot Spot Cleanup Plans that include identification and priority ranking of toxic hot spots, identification of pollutant sources, identification of actions already initiated, strategies for preventing formation of new toxic hot spots, and cost estimates for recommended remedial actions.

Toxic Hot Spot Identification

The Water Code defines toxic hot spots as locations in enclosed bays, estuaries, or the ocean where pollutants have accumulated in the water or sediment to levels which (1) may pose a hazard to aquatic life, wildlife, fisheries, or human health, or (2) may impact beneficial uses, or (3) exceed SWRCB or RWQCB-adopted water quality or sediment quality objectives.

To identify toxic hot spots, water bodies of interest have been assessed on both a regional and site-specific basis. Regional assessments require evaluating whether water quality objectives are attained and beneficial uses are supported throughout the water body. In the past, the State Mussel Watch program, independent RWQCB studies, and other studies were used extensively to evaluate beneficial use impacts in many California enclosed bays and estuaries. The BPTCP efforts continue this work by focusing on measures of effects (such as toxicity) with the associated pollutants.

Generally, where sites were not well characterized, regional monitoring programs have been implemented. This monitoring activity has been performed by the Department of Fish and Game (DFG) under contract with the SWRCB. The consolidated statewide database required by the Water Code was planned to eventually include all data generated by the regional monitoring programs. All data collected as part of the BPTCP monitoring efforts are available on the BPTCP web page. The web page address is: http://www.swrcb.ca.gov/bptcp/bptcp.html.

A specific definition of candidate and known toxic hot spots was adopted by the SWRCB in September, 1998 (SWRCB, 1998a). This specific definition has been used by the RWQCBs in developing their lists of candidate toxic hot spots.

Ranking Criteria

The Water Code (Section 13393.5) requires the SWRCB to develop criteria for ranking toxic hot spots. The ranking criteria must consider the pertinent factors relating to public health and environmental quality. The factors include three considerations: (1) potential hazards to public health, (2) toxic hazards to fish, shellfish, and wildlife, and (3) the extent to which the deferral of a remedial action will result, or is likely to result, in a significant increase in environmental damage, health risks, or cleanup costs.

Ranking criteria were adopted by the SWRCB in September, 1998 (SWRCB, 1998a). These ranking criteria have been used by the RWQCBs in ranking their lists of candidate toxic hot spots.

Sediment Quality Objectives

State law defines sediment quality objectives as "that level of a constituent in sediment which is established with an adequate margin of safety, for the reasonable protection of beneficial uses of water or prevention of nuisances" (Water Code Section 13391.5). Water Code Section 13393 further defines sediment quality objectives as: "...objectives...based on scientific information, including but not limited to chemical monitoring, bioassays or established modeling procedures." The Water Code requires "adequate protection for the most sensitive aquatic organisms." Sediment quality objectives can be either numerical values based on scientifically defensible methods or narrative descriptions implemented through toxicity testing or other methods.

Toxic Hot Spot Cleanup Plans

The Water Code requires that each RWQCB must complete a toxic hot spot cleanup plan and the SWRCB must prepare a statewide Consolidated Toxic Hot Spots Cleanup Plan.

Each cleanup plan must include: (1) a priority listing of all known toxic hot spots covered by the plan; (2) a description of each toxic hot spot including a characterization of the pollutants present at the site; (3) an assessment of the most likely source or sources of pollutants; (4) an estimate of the total costs to implement the cleanup plan; (5) an estimate of the costs that can be recovered from parties responsible for the discharge of pollutants that have accumulated in sediments; (6) a preliminary assessment of the actions required to remedy or restore a toxic hot spot; and (7) a two-year expenditure schedule identifying State funds needed to implement the plan.

Within 120 days from the ranking of a toxic hot spot in the consolidated cleanup plan, each RWQCB is required to begin reevaluating waste discharge requirements for dischargers who have contributed any or all of the pollutants which have caused the toxic hot spot. These reevaluations shall be used to revise water quality control plans wherever necessary. Reevaluations shall be initiated according to the priority ranking established in cleanup plans.

The RWQCBs first developed proposed Regional Toxic Hot Spots Cleanup Plans in late 1997. These plans were revised subsequent to the adoption of the SWRCB Guidance Policy. (SWRCB, 1998a)

Program Organization

Three groups support or review the activities of the BPTCP: (1) the Monitoring and Surveillance Task Force, (2) the Scientific Planning and Review Committee, and (3) the BPTCP Advisory Committee. The functions of each of these groups follow:

1. *Monitoring and Surveillance Task Force (MSTF).* This committee was established to promote standard approaches for monitoring and assessing the quality of California's enclosed bays and estuaries [Section 13392.5(a)(1) of the Water Code]. While the primary focus of this committee has been on monitoring implementation, the committee has also developed and contributed to all other aspects of the Program including

cleanup planning and ranking criteria development. The members of the task force are staff of the SWRCB, coastal RWQCBs, DFG and the Office of Environmental Health Hazard Assessment (OEHHA).

2. *Scientific Planning and Review Committee (SPARC).* Although not legislatively mandated, SPARC brings together independent experts in the fields of toxicology, benthic ecology, organic and inorganic chemistry, program implementation and direction, experimental design, and statistics to review the approaches taken by the BPTCP. The committee has provided comments on the Program's monitoring approach(es), given input on the scientific merit of the approach(es) taken, and provided suggestions for monitoring improvement.

3. *BPTCP Advisory Committee.* This committee was established to assist the SWRCB in the implementation of the BPTCP (Section 13394.6(a) of the Water Code). The major purpose of the committee is to review the Program activities and provide its views on how the products of the BPTCP should be interpreted and used. The committee has members from (a) trade associations; (b) dischargers; and (c) environmental, public interest, public health and wildlife conservation organizations.

Legislative Deadlines

The BPTCP is required to complete several tasks using deadlines established in the Water Code (Table 1).

TABLE 1: WATER CODE-MANDATED DEADLINES FOR THE BPTCP

Activities	Deadline
Sediment Quality Objectives Workplan	July 1, 1991
Consolidated Database	January 30, 1994
Ranking Criteria	January 30, 1994
Progress Report	January 1, 1996
Regional Toxic Hot Spots Cleanup Plans	January 1, 1998
Consolidated Toxic Hot Spots Cleanup Plan	June 30, 1999

Scope of FED

The FED was developed with the consideration of: (1) existing State statute, regulations, and policies; (2) the Water Quality Control Policy for Development of Regional Toxic Hot Spots Cleanup Plans (SWRCB, 1998a); (3) revised Regional Toxic Hot Spots Cleanup Plans; and (4) the recommendations of the BPTCP Advisory Committee.

The draft FED contains nine major sections: Introduction, Project Description, Policy Issue Analysis, Environmental Setting at Toxic Hot Spots, Proposed Remediation Alternatives at Toxic Hot Spots, Environmental Benefits of the proposed Plan, Adverse Environmental Effects of the Proposed Plan, Environmental Checklist, and References. Policy issues are considered separately from the remediation alternatives and the potential environmental impacts of implementing the remediation.

This FED is a program environmental document that is more specific that the FED developed for the SWRCB Guidance Policy (SWRCB 1998b). The FED for the Consolidated Toxic Hot Spots Cleanup Plan addresses: (1) broad policy issues that address Statewide concerns about the remediation and prevention of toxic hot spots, and (2) the remediation alternatives at specific sites or water bodies that have been identified by the RWQCBs as candidate toxic hot spots. While the Consolidated Plan presents options for the remediation of toxic hot spots, no specific funding has been identified to fully implement the Plan. Also, since the SWRCB and RWQCBs are prevented from prescribing means of compliance (Water Code Section 13360), the specific actions that will be implemented will be developed when sites are actually remediated.

PROJECT DESCRIPTION

Project Definition

The project is a Consolidated Toxic Hot Spots Cleanup Plan adopted as Policy for Water Quality Control (pursuant to Water Code Section 13140). The Consolidated Cleanup Plan includes provisions for:

1. The toxic hot spot definition and ranking criteria adopted by the SWRCB in September, 1998 and approved by OAL in November, 1998 (SWRCB, 1998a).

2. A consolidated list of ranked known toxic hot spots.

3. A process for delisting sites.

4. Guidance to the RWQCBs on revision of WDRs associated with toxic hot spots.

5. Funding mechanisms to implement the Consolidated Plan.

6. Policy on the prevention of toxic hot spots.

7. Findings on the need for a Program to implement the Consolidated Plan.

8. Each Regional Toxic Hot Spots Cleanup Plan submitted by the RWQCBs (Parts II and III) as approved by the SWRCB.

The proposed Consolidated Plan addresses remediation at several toxic hot spots in the enclosed bays, estuaries and ocean waters of California in Regions 1, 2, 3, 4, 5, 8, and 9. The Plan is applicable to these water bodies. Figure 1 is a map of these areas. The prevention provisions of the Plan are also applicable to all watersheds that drain to enclosed bays, estuaries and coastal waters of the State. The Consolidated Cleanup Plan identifies 21 high priority, 20 moderate priority, and 6 low priority known toxic hot spots.

Statement Of Goals

The SWRCB's objectives for this project are to:

1. Comply with the Water Code-mandated requirement to submit a Consolidated Toxic Hot Spots Cleanup Plan to the California Legislature.

2. Provide approaches to address the identified pollution problems at high priority known toxic hot spots.

3. Provide policy to prevent the further pollution or creation of toxic hot spots in the enclosed bays, estuaries and coastal waters of the State.

4. Provide the RWQCBs with an approved Plan to attain the highest water quality that is reasonable and protect the quality of the most polluted coastal waters in the State from further degradation.

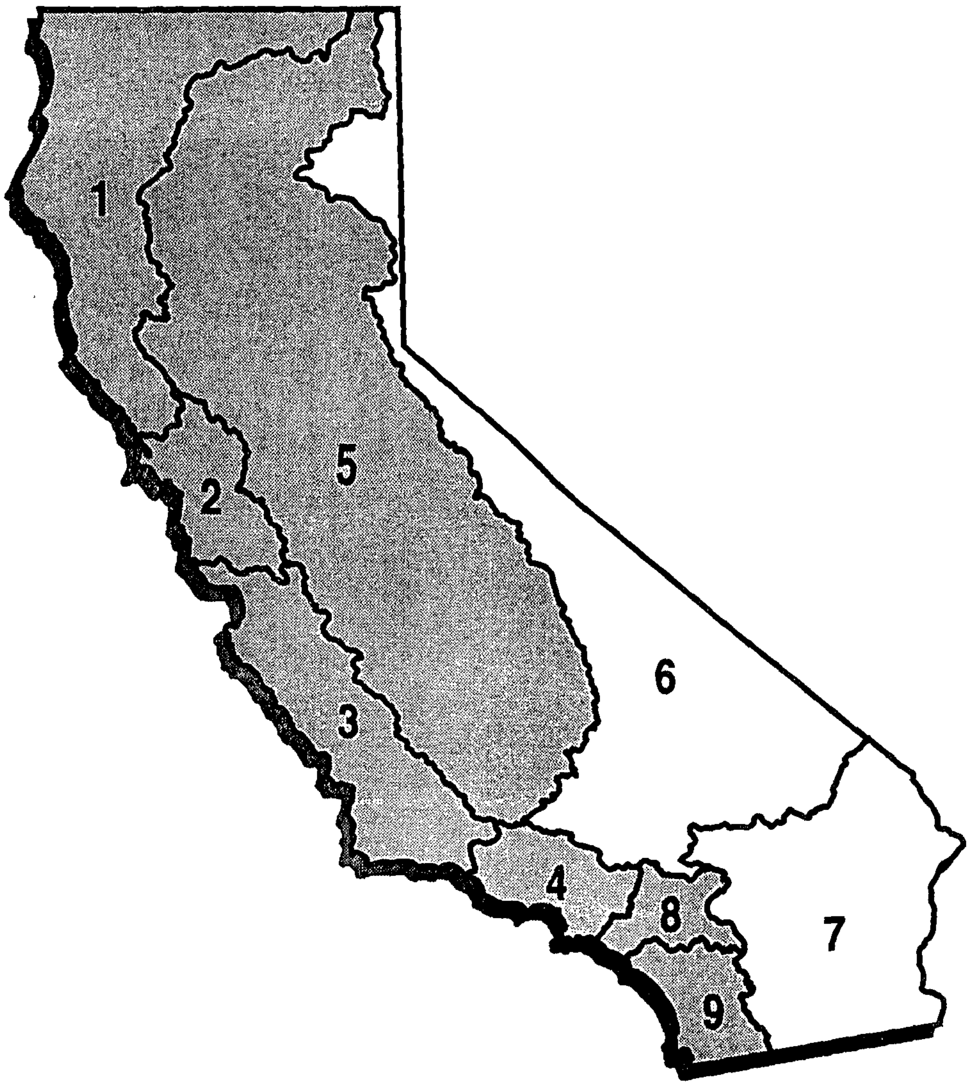


FIGURE 1: AREA THAT THE CONSOLIDATED CLEANUP PLAN IS APPLICABLE.

Proposed Action

The proposed action is SWRCB adoption of the proposed Consolidated Toxic Hot Spots Cleanup Plan as Policy for Water Quality Control outlined in the Project Definition (above).

The proposed Consolidated Plan is being developed as a part of a phased approach. (This phased approach and components of the Consolidated Cleanup Plan are also explained in the Introduction to this FED.) Phase 1 was the adoption of a Water Quality Control Policy for Guidance on Development of Regional Toxic Hot Spots Cleanup Plans. Phase 1 was completed in November 1998.

In Phase 2, the RWQCBs developed; considered at public hearings and workshops; and four RWQCBs adopted Regional Toxic Hot Spots Cleanup Plans pursuant to the Guidance Policy. The remaining three RWQCBs did not adopt the Cleanup Plans due to a lack of quorum).

Phase 3 is the development of the Consolidated Toxic Hot Spots Cleanup Plan by the SWRCB. The SWRCB has compiled the regional cleanup plans, made additional findings as required by the California Water Code and plans to submit the consolidated Statewide plan to the California Legislature. The SWRCB will comply with CEQA and the APA in developing the Consolidated Plan.

Under Phase 3, the SWRCB will issue the Consolidated Cleanup Plan that specifically identifies known toxic hot spots and presents actions that can be implemented to remediate the sites.

POLICY ISSUE ANALYSIS

The staff analysis of each policy issue addressed during the development of the Consolidated Toxic Hot Spots Cleanup Plan is formatted consistently to provide the SWRCB with a summary of the topic or issue as well as alternatives for their action. The draft Consolidated Toxic Hot Spots Cleanup Plan is presented in Appendices A and B.

Each issue analysis contains the following sections:

Issue:	A brief description of the issue or topic.
Present Policy:	A summary of any existing SWRCB policy related to the issue or topic.
Issue Description:	A more complete description of the issue or topic plus (if appropriate) any additional background information, list of limitations and assumptions, and descriptions of related programs.
Alternatives:	For each issue or topic, at least two alternatives are provided for SWRCB consideration.
Staff Recommendation:	In this section, a suggestion is made for which alternative (or combination of alternatives) should be adopted by the SWRCB.

Issue 1: ***Authority and Reference for the Consolidated Toxic Hot Spots Cleanup Plan***

Present Policy: None.

Issue Description: The Regional Toxic Hot Spots Cleanup Plans have been developed by the RWQCBs using the Water Quality Control Policy for Guidance on the Development of Regional Toxic Hot Spot Cleanup Plans (SWRCB, 1998a). As required by the California Water Code, the Consolidated Toxic Hot Spots Cleanup Plan is a compilation of the Regional plans with additional findings regarding the need for a cleanup program.

In creating the BPTCP, the California Legislature intended that a plan be prepared for remedial action at toxic hot spots (Water Code Section 13390) and required the development of cleanup plans that are distinct from Water Quality Control Plans (Chapter 5.6 requires the formulation of a water quality control plan for enclosed bays and estuaries (Section 13391) and toxic hot spot cleanup plans (Section 13394)). The Water Code further states (Section 13392) that the SWRCB and RWQCBs shall "...(1) identify and characterize toxic hot spots..., (2) plan for the cleanup or other appropriate remedial action at the sites, and (3) amend water quality control plans and policies to incorporate strategies to prevent the creation of new toxic hot spots and the further pollution of existing hot spots."

If implementation of the Consolidated Toxic Hot Spots Cleanup Plan is mandatory, then the SWRCB must adopt the Consolidated Plan (e.g., as a plan, policy or guideline) in accordance with the requirements of CEQA and the APA.

The SWRCB should consider the format and form of the Consolidated Toxic Hot Spots Cleanup Plan.

Alternatives:

1. The SWRCB should consider incorporating the Consolidated Toxic Hot Spots Cleanup Plan into a Statewide Water Quality Control Plan.

The SWRCB is required to adopt a Water Quality Control Plan for the Enclosed Bays and Estuaries of California (Water Code Section 13391). This plan was first adopted in 1991 and was subsequently amended in 1992. The Plan contained requirements for beneficial use designations, water quality objectives, guidance on development of site-specific water quality objectives, a program of implementation, and other regulatory provisions.

In 1994, the EBE Plan was nullified by the California Superior Court. The SWRCB is currently developing the Enclosed Bays and Estuaries Plan in two phases. The first phase is for the SWRCB to adopt a Policy for the Implementation of the California Toxics Rule (SWRCB, 1997b). Even though the Plan could be modified to contain the Consolidated Toxic Hot Spots Cleanup Plan, the EBE Plan redevelopment schedule would not allow the BPTCP to meet the Water Code-mandated deadline for adoption of the Statewide consolidated cleanup plan. This alternative is not appropriate because the California Water Code calls for a separate plan distinct from Water Quality Control Plans.

2. The SWRCB should consider adoption of the Consolidated Toxic Hot Spots Cleanup Plan as policy for water quality control. The SWRCB should adopt language that identifies the statutory authority to adopt a Policy and where the Policy applies.

The SWRCB has the authority to adopt Policy for Water Quality Control (Sections 13140 and 13142 of the Water Code).
Section 13142 states, in part:

> "State policy for water quality control shall consist of all or any of the following: (a) Water quality principles and guidelines for long-range planning, including ground water or surface water management programs and control and use of reclaimed water. (b) Water quality at key locations for planning...and for water quality control activities. (c) Other principles deemed essential by the state board for water quality control...."

Development of the Consolidated Toxic Hot Spots Cleanup Plan as policy for water quality control would allow the SWRCB and the RWQCBs to meet the requirements of the Water Code for development of remediation plans (Sections 13392 and 13394) and will allow the SWRCB to influence prevention of toxic hot spots because Basin Plans must conform to State policy for water quality control (Water Code Section 13240).

3. The SWRCB should not adopt the Consolidated Toxic Hot Spots Cleanup Plan as a policy for water quality control.

A Consolidated Toxic Hot Spots Cleanup Plan has never been developed for the State and possibly new procedures for adoption would be needed. This alternative would not relieve the SWRCB from the requirements of the California Environmental Quality Act or the Administrative Procedure Act.

Staff Recommendation: Adopt Alternative 2.

Please refer to the Policy for Water Quality Control section of the proposed Consolidated Toxic Hot Spots Cleanup Plan for the authority and reference for development of the Consolidated Plan as policy for water quality control.

Issue 2: Organization of the Consolidated Toxic Hot Spots Cleanup Plan

Present Policy:

The SWRCB adopted a specific format for the Regional Toxic Hot Spots Cleanup Plans, a definition for toxic hot spots and the site ranking criteria in the Water Quality Control Policy for Guidance on Development of the Regional Toxic Hot Spots Cleanup Plans (SWRCB 1998a).

Issue Description:

After adoption of the Guidance Policy the coastal RWQCBs used the policy as the foundation to finalize the Regional Toxic Hot Spots Cleanup Plans. Each RWQCB used the same format, definitions and ranking criteria to develop their cleanup plans.

Following the required format, each Regional Toxic Hot Spots Cleanup Plan contains the specific definition of a toxic hot spot and the ranking criteria. To avoid duplication, should the SWRCB remove the definition and ranking criteria from the regional plans and place it in the Consolidated Toxic Hot Spots Cleanup Plan? Also, should the lists of "Areas of Concern" remain in the Consolidated Toxic Hot Spots Cleanup Plan?

Alternatives:

1. Remove the specific definition of a toxic hot spot and ranking criteria from each Regional Toxic Hot Spots Cleanup Plan and place the definition and criteria in the Consolidated Toxic Hot Spots Cleanup Plan. List the "areas of concern" at the end of the Regional Plans.

The specific definition of a toxic hot spot and the ranking criteria are listed in each Regional cleanup plan. If complete Regional plans are consolidated then there would be significant duplication of the definition and ranking criteria. Listing the definition and ranking criteria one time would be concise and nonduplicative.

At present most of the Regional Toxic Hot Spots Cleanup Plans list "areas of concern" before the candidate toxic hot spot lists (as required by the Guidance Policy (SWRCB, 1998a)). It now seems more efficient and clear if the areas of concern are listed at the end of each regional cleanup plan.

2. Consolidate the Regional Toxic Hot Spots Cleanup Plans without change.

Under this alternative the plans would be compiled and each plan would have duplicate sections that present the toxic hot spot definition and ranking criteria. Some of the identified sites may not satisfy the definition of a toxic hot spot. There is some lack of clarity with respect to the "areas of concern".

Recommendation: Adopt Alternative 1.

Remove the toxic hot spot definition and ranking criteria from each Regional cleanup plan and place the definitions in Volume I of the Consolidated Toxic Hot Spots Cleanup Plan. Move the "areas of concern" sections to the end of each Regional cleanup plan.

Issue 3: ***Approaches for consolidating and compiling Regional Toxic Hot Spots Cleanup Plans***

Present Policy:

The SWRCB committed to address this issue in the Guidance Policy (SWRCB, 1998a).

Issue Description:

The priority ranking for each site was included in each Regional Toxic Hot Spots Cleanup Plan which describes a number of factors including identification of likely sources of the pollutants that are causing the toxic characteristics and actions to be taken to remediate each site. The regional lists of ranked candidate toxic hot spots are required to be consolidated into a statewide prioritized list of toxic hot spots, and included in the Consolidated Toxic Hot Spots Cleanup Plan. No specific direction on approaches for compiling the Regional toxic hot spot lists is given in the Water Code.

The issue is: What approach should the SWRCB take to clearly and concisely consolidate the toxic hot spot lists that allows for the best combination of Regional focus and between Region comparisons?

Alternatives:

1. Assemble the Regional Toxic Hot Spots Cleanup Plans into separate chapters.

The simplest way to consolidate and compile the Regional Toxic Hot Spots Cleanup Plans is to assemble the plans Region-by-Region into separate chapters. This alternative is simple and straight forward but does not allow for between region comparisons nor does it allow for a clear assessment of how many high priority toxic hot spots are identified Statewide.

2. Consolidate lists of candidate toxic hot spots into a single, summary list using the Regions' ranked lists; arrange by Region and alphabetical order. Use separate chapters for the remediation activities developed by the RWQCBs.

Compiling the RWQCB lists in this way would emphasize the most highly ranked toxic hot spots by geographic region. This alternative allows for a more comprehensive analysis of the toxic hot spots by Region. The alternative suffers from the same limitation as Alternative 1 that it makes it difficult to assess the numbers of high priority toxic hot spots Statewide.

3. Consolidate lists of toxic hot spots as follows: (1) toxic hot spots should be placed in a Statewide list and arranged in alphabetical order within each rank (high, moderate and low); and (2) toxic hot spots should be arranged by Region (from north to south) and in the order provided by the RWQCBs. Use separate chapters to detail remediation activities developed by the RWQCBs.

Alternative 3 allows for a clear analysis of the number of toxic hot spots in each ranking category as well as an analysis of the numbers of known toxic hot spots in each Region. The limitations of Alternatives 1 and 2 are avoided in this alternative. However, listing the toxic hot spots twice in the Consolidated Toxic Hot Spots Cleanup Plan seems duplicative. If the general list of known toxic hot spots by rank is presented in the portion of the cleanup plan intended for use by the Legislature and the Region-specific lists are presented when detailed action alternatives are presented then the duplication would be minimized.

The BPTCP Advisory Committee has evaluated the various approaches for listing toxic hot spots. The Committee has made the following recommendation to the SWRCB:

> "The SWRCB should consolidate lists of candidate toxic hot spots into two summary lists using the Regions' ranked lists as follows: (1) toxic hot spots should be placed in a Statewide list and arranged in alphabetical order (e.g., Table [2] within each rank (high, moderate and low); and (2) toxic hot spots should be arranged by Region (from north to south) and in alphabetical order (e.g., Table [3]). The SWRCB should use separate chapters to detail remediation activities approved by the Regional Water Quality Control Boards (RWQCBs)."

The BPTCP Advisory Committee further recommended the tables should take the take general form presented in Tables 3 and 4. The Committee (at their February 22, 1999 meeting) agreed that listing the toxic hot spots in the regional plans should be as the RWQCB listed the sites (and not alphabetically). To be more understandable to the Legislature the tables should also have columns that list what triggered the listing of the sites, sources and the pollutants that cause or contribute to the impacts observed at the sites.

The second listing of the toxic hot spots should be as provided by the RWQCBs in order to preserve the Regional perspective in the cleanup plan.

TABLE 2: TOXIC HOT SPOTS ARRANGED BY RANK AND IN ALPHABETICAL ORDER WITHIN EACH RANK

Rank	Water Body (Region)
High	Sites or water bodies listed alphabetically
Moderate	Sites or water bodies listed alphabetically
Low	Sites or water bodies listed alphabetically

TABLE 3: TOXIC HOT SPOTS ARRANGED BY REGION (FROM NORTH TO SOUTH) AND IN THE ORDER PROVIDED BY THE RWQCBS.

Region	Rank	Toxic Hot Spot
North Coast	High	Site or water bodies listed
	Moderate	
	Low	
San Francisco Bay	High	Site or water bodies listed
	Moderate	
	Low	
.	.	.
.	.	.
.	.	.
San Diego	High	Sites or water bodies listed
	Moderate	
	Low	

Staff Recommendation: Adopt Alternative 3.

Issue 4: RWQCB Listing and Ranking of Candidate Toxic Hot Spots

Present Policy:

The RWQCBs were required to use the SWRCB-adopted definition for toxic hot spots and the site ranking criteria in the Water Quality Control Policy for Guidance on Development of the Regional Toxic Hot Spots Cleanup Plans (SWRCB 1998a).

Issue Description:

After adoption of the Guidance Policy the coastal RWQCBs used the policy as the foundation to finalize the Regional Toxic Hot Spots Cleanup Plans. Each RWQCB used the same definition of a toxic hot spot and the same set of ranking criteria while exercising their independent judgment where allowed by the Guidance Policy. Each RWQCB created a list of candidate toxic hot spots and a ranking matrix for each of the identified toxic hot spots. The RWQCBs identified a total of 21 high priority toxic hot spots, 21 moderate priority toxic hot spots, and 6 low priority toxic hot spots (Table 4).

Did each RWQCB correctly evaluate and use the definition of a toxic hot spot and rank sites using the approved ranking criteria? Should the SWRCB adopt the lists of candidate toxic hot spots and the ranking matrices as developed by the RWQCBs?

It appears that for the most part the RWQCBs have used the definition of a candidate toxic hot spot correctly. There are, however, two sites that have been identified as candidate toxic hot spots that do not meet the requirements of the definition of a toxic hot spot listed in the Guidance Policy.

Alternatives:

1. <u>Maintain the lists of candidate toxic hot spots as provided by the RWQCBs. Do not modify the regional cleanup plan lists of candidate toxic hot spots.</u>

Under this alternative the SWRCB would not exercise its independent judgment of the lists of candidate toxic hot spots developed by the RWQCBs. A disadvantage of this alternative is that if toxic hot spots are listed in the Consolidated Toxic Hot Spots Cleanup Plan that do not meet the adopted definitions and ranking criteria, the SWRCB may be vulnerable to the court action because it did not follow its own rules.

TABLE 4: CANDIDATE TOXIC HOT SPOTS IDENTIFIED IN THE REGIONAL TOXIC HOT SPOTS CLEANUP PLANS.

Rank	Site Identification	Reason for Listing Definition trigger	Pollutants
High	Cañada de la Huerta Shell Hercules Gas Plant Site	Aquatic Life Concerns - Sediment & Water Toxicity, Sediment chemistry, bioaccumulation, Water Quality Concerns - violations of Basin Plan & Ocean Plan objectives.	PCBs
High	Delta Estuary, Cache Creek watershed including Clear lake	Human health impacts	Mercury
High	Delta Estuary	Aquatic life impacts	Diazinon
High	Delta Estuary - Morrison Creek, Mosher Slough, 5 Mile Slough, Mormon Slough & Calaveras River	Aquatic life impacts	Diazinon & Chlorpyrifos
High	Delta Estuary - Ulatis Creek, Paradise Cut, French Camp & Duck Slough	Aquatic life impacts	Chlorpyrifos
High	Humboldt Bay Eureka Waterfront H Street	Bioassay Toxicity,	Lead, Silver, Antimony, Zinc, Methoxychlor, PAHs
High	Los Angeles Inner Harbor Dominguez	Human health, aquatic life impacts	DDT, PCBs, PAH, Cadmium, Copper, Lead, Mercury, Zinc, Dieldrin, Chlordane

Rank	Site Identification	Reason for Listing Definition trigger	Pollutants
	Channel, Consolidated Slip		
High	Los Angeles Outer Harbor Cabrillo Pier	Human health, aquatic life impacts	DDT, PCBs, Copper
High	Lower Newport Bay Rhine Channel	Sediment Toxicity, Exceeds Objectives	Arsenic, Copper, Lead, Mercury, Zinc, DDE, PCB, TBT
High	Moss Landing Harbor and Tributaries	Aquatic life & Human health concerns - Sediment Chemistry, Toxicity, Bioaccumulation and exceedances of NAS and or FDA guidelines	Pesticides, PCBs, Nickel, Chromium, TBT
High	Mugu Lagoon/ Calleguas Creek tidal prism, Eastern Arm, Main Lagoon, Western Arm	Aquatic life impacts	DDT, PCBs, metals, Chlordane, Chlorpyrifos
High	San Diego Bay Seventh St. Channel Paleta Creek, Naval Station	Sediment Toxicity and Benthics community impacts	Chlordane, DDT, PAHs and Total Chemistry[1]
High	San Francisco Bay Castro Cove	Aquatic life impacts	Mercury, Selenium, PAHs, Dieldrin

[1] The total toxic chemical concentrations for a station were calculated as follows: The sum of individual ERMs (or PELs) was divided by the number of chemicals analyzed for which ERMs (or PELs) were known. The "average" ERM (or PEL), known as the Effects Range Median Quotient or ERMQ (or Probable Effects Level Quotient or PELQ) was compared to the "threshold" ERMQs (or PELQs) calculated to be 0.85 X ERMQ (or 1.29 X PELQ). If a threshold quotient was equaled or exceeded, the station was assumed to have a total chemistry hit

Rank	Site Identification	Reason for Listing Definition trigger	Pollutants
High	San Francisco Bay Entire Bay	Human Health Impacts	Mercury, PCBs, Dieldrin, Chlordane, DDT, Dioxin Site listing was based on Mercury and PCB health advisory
High	San Francisco Bay Islais Creek	Aquatic life impacts	PCBs, chlordane, dieldrin, endosulfan sulfate, PAHs, anthropogenically enriched H_2S and NH_3
High	San Francisco Bay Mission Creek	Aquatic life impacts	Silver, Chromium, Copper Mercury, Lead, Zinc, Chlordane, Chlorpyrifos, Dieldrin, Mirex, PCBs, PAHs, anthropogenically enriched H_2S and NH_3
High	San Francisco Bay Peyton Slough	Aquatic life Impacts	Silver, Cadmium, Copper, Selenium, Zinc, PCBs, Chlordane, ppDDE, Pyrene
High	San Francisco Bay Point Potrero/ Richmond Harbor	Human Health	Mercury, PCBs, Copper, Lead, Zinc
High	San Francisco Bay Stege Marsh	Aquatic life impacts	Arsenic, Copper, Mercury, Selenium, Zinc, chlordane, dieldrin, ppDDE, dacthal, endosulfan 1, endosulfan sulfate, dichlorobenzophenone, heptachlor epoxide, hexachlorobenzene, mirex, oxidiazon, toxaphene and PCBs
High	San Joaquin River at City of Stockton	Exceedances of water quality objective	Dissolved oxygen

Rank	Site Identification	Reason for Listing Definition trigger	Pollutants
High	Santa Monica Bay Palos Verdes Shelf	Human health, aquatic life impacts	DDT, PCBs
Moderate	Anaheim Bay, Naval Reserve	Sediment toxicity	Chlordane, DDE
Moderate	Ballona Creek Entrance Channel	Sediment toxicity	DDT, zinc, lead, Chlordane, dieldrin, chlorpyrifos
Moderate	Bodega Bay-10006 Mason's Marina	Bioassay toxicity	Cadmium, Copper, TBT, PAH
Moderate	Bodega Bay-10028 Porto Bodega Marina	Bioassay toxicity	Copper, lead, Mercury, Zinc, TBT, DDT, PCB, PAH
Moderate	Bodega Bay-10007 Spud Point Marina	Bioassay toxicity	NA
Moderate	Delta Estuary Delta	Aquatic life impacts	Chlordane, Dieldrin, Lindane, Heptachlor, Total PCBs, PAH & DDT
Moderate	Delta Estuary Delta	Human health impacts	Chlordane, Dieldrin, Total DDT, PCBs, Endosulfan, Toxaphene
Moderate	Delta Estuary Smith Canal, Mosher & 5-Mile, Sloughs & Calaveras River	Exceedance of water quality objective	Dissolved oxygen
Moderate	Los Angeles River Estuary	Sediment Toxicity	DDT, PAH, Chlordane

Rank	Site Identification	Reason for Listing Definition trigger	Pollutants
Moderate	Upper Newport Bay Narrows	Sediment Toxicity, Exceeds Water Quality Objectives	Chlordane, Zinc, DDE
Moderate	Lower Newport Bay Newport Island	Exceeds Water Quality Objectives	Copper, Lead, Mercury, Zinc, Chlordane, DDE, PCB, TBT
Moderate	Marina del Rey	Sediment Toxicity	DDT, PCB, Copper, Mercury, Nickel, Lead, Zinc, Chlordane
Moderate	Monterey Harbor	Aquatic life impacts, Sediment Toxicity	PAHs, Cu, Zn, Toxaphene, PCBs, Tributyltin
Moderate	San Diego Bay Between "B" Street & Broadway Piers	Benthic community impacts	PAHs, Total Chemistry
Moderate	San Diego Bay Central Bay Switzer Creek	Sediment toxicity	Chlordane, Lindane, DDT, Total Chemistry
Moderate	San Diego Bay Chollas Creek	Benthic community impacts	Chlordane, Total Chemistry
Moderate	San Diego Bay Foot of Evans & Sampson Streets	Benthic Community Impacts	PCBs, Antimony, Copper, Total Chemistry

Rank	Site Identification	Reason for Listing Definition trigger	Pollutants
Moderate	San Francisco Bay Central Basin, San Francisco Bay	Aquatic life impacts	Mercury, PAHs
Moderate	San Francisco Bay Fruitvale (area in front of stormdrain)	Aquatic life impacts	Chlordane, PCBs
Moderate	San Francisco Bay Oakland Estuary. Pacific Drydock #1 (area in front of stormdrain)	Aquatic life impacts	Copper, Lead, Mercury, Zinc, TBT, ppDDE, PCBs, PAHs, Chlorpyrifos, Chlordane, Dieldrin, Mirex
Moderate	San Francisco Bay, San Leandro Bay	Aquatic life impacts	Mercury, Lead, Selenium, Zinc, PCBs, PAHs, DDT, pesticides
Low	Seal Beach NWR Navy Marsh	Sediment toxicity	DDE
Low	Seal Beach Bolsa Avenue NWR	Sediment toxicity	Arsenic
Low	Bolsa Chica Ecological Reserve	Sediment toxicity	DDE
Low	Seal Beach NWR Left Reach	Sediment toxicity	DDE

Rank	Site Identification	Reason for Listing Definition trigger	Pollutants
Low	Seal Beach NWR Middle Reach	Sediment toxicity	Arsenic
Low	Huntington Harbor Upper Reach	Sediment toxicity	Chlordane, DDE, Chlorpyrifos

2. <u>Remove the RWQCB-listed candidate toxic hot spots from the final lists of toxic hot spots because the provisions of the toxic hot spot definition were not satisfied.</u>

Under this alternative the SWRCB would exercise its judgment in determining if the RWQCBs appropriately used the approved definitions and ranking criteria.

The lists of candidate toxic hot spots, supporting information and reference used as a foundation for the site listing are presented in each of the Regional Toxic Hot Spots Cleanup Plans (please refer to Appendix B; RWQCB 1998a; 1998b; 1998c; 1999a; 1999b; 1999c; 1999d). The site listed in Table 5 does not meet the definition of a toxic hot spot (as presented in the SWRCB, 1998a).

TABLE 5: SITE IDENTIFIED BY RWQCBS THAT DOES NOT QUALIFY AS A TOXIC HOT SPOT.

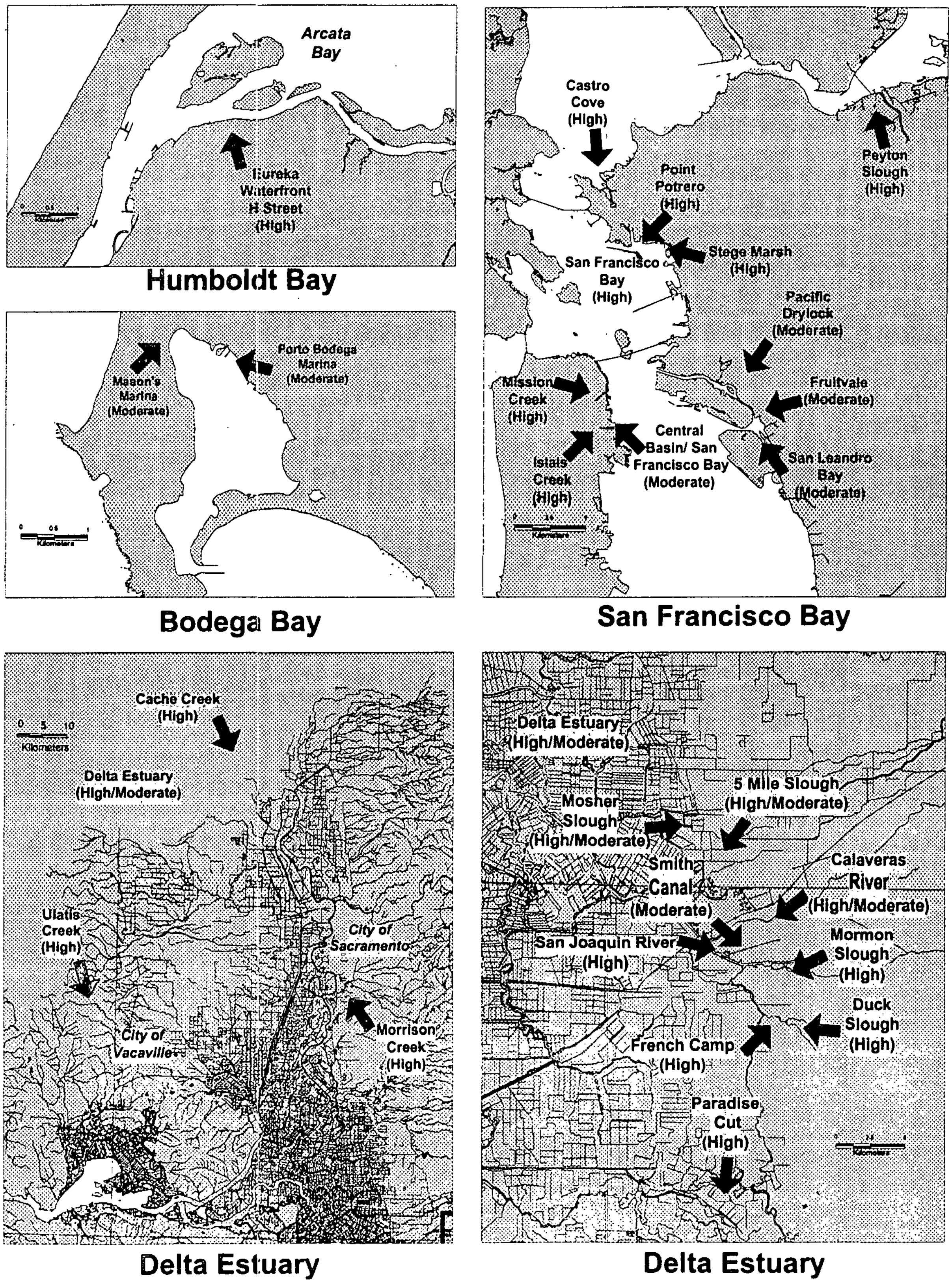
Region	Water Body, Site Identification	Reason for listing	Pollutants	Reason the site should be removed from the candidate toxic hot spot list
North Coast	Bodega Bay, Spud Point Marina	Bioassay Toxicity	Unknown	Pollutants associated with sediment toxicity are not identified.

Each of the other candidate toxic hot spots identified by the RWQCB satisfy the requirements of the specific definition of a toxic hot spot. All candidate toxic hot spots appear to be ranked appropriately.

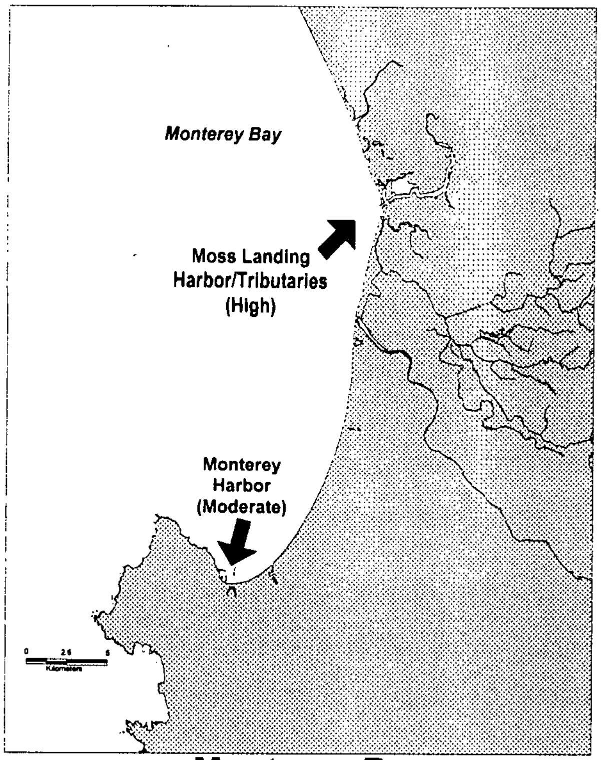
Recommendation: Adopt Alternative 2.

The SWRCB should (1) remove one candidate toxic hot spot listed in Alternative 2, (2) adopt the remaining candidate toxic hot spots as known toxic hot spots, and (3) present figures showing generally where the known toxic hot spots are located (Figure 2). The lists and figure should be included in the Consolidated Toxic Hot Spots Cleanup Plan with all the supporting information provided by the RWQCBs.

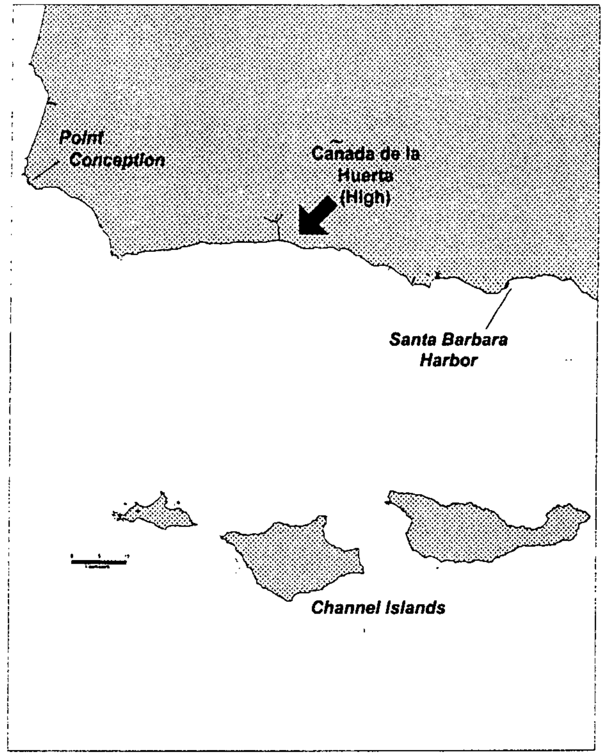
FIGURE 2: HIGH, MODERATE, AND LOW PRIORITY KNOWN TOXIC HOT SPOTS



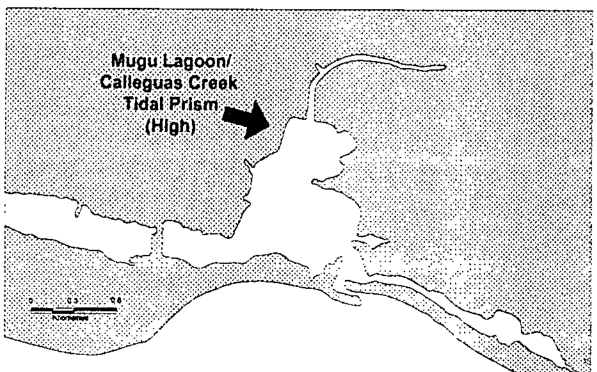
High, Moderate, and Low Priority Known Toxic Hot Spots



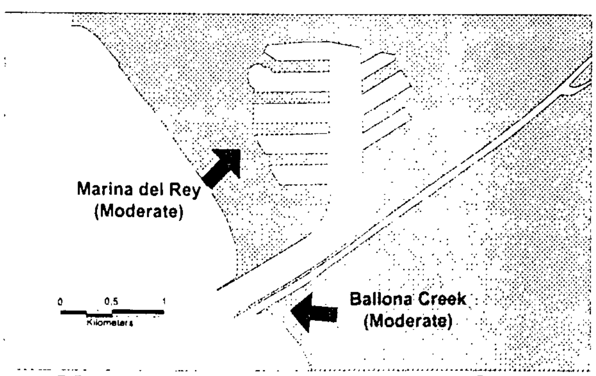
Monterey Bay



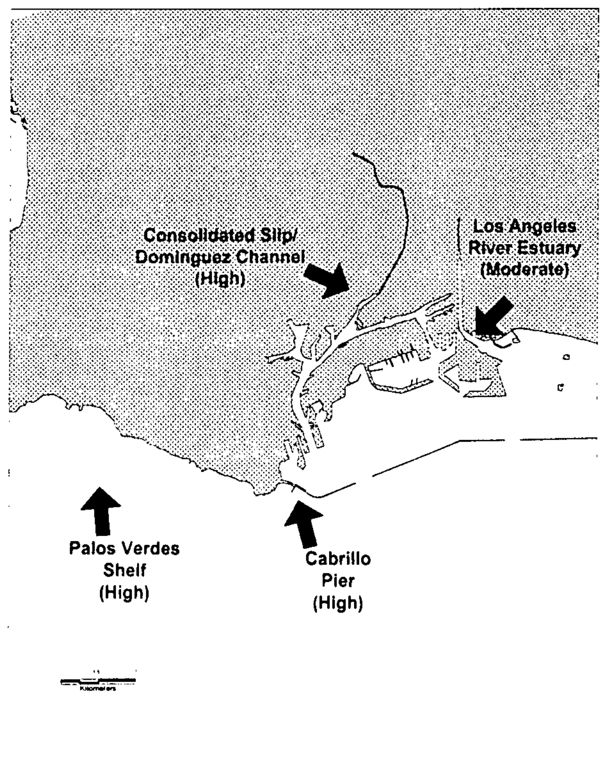
Cañada de la Huerta



Mugu Lagoon

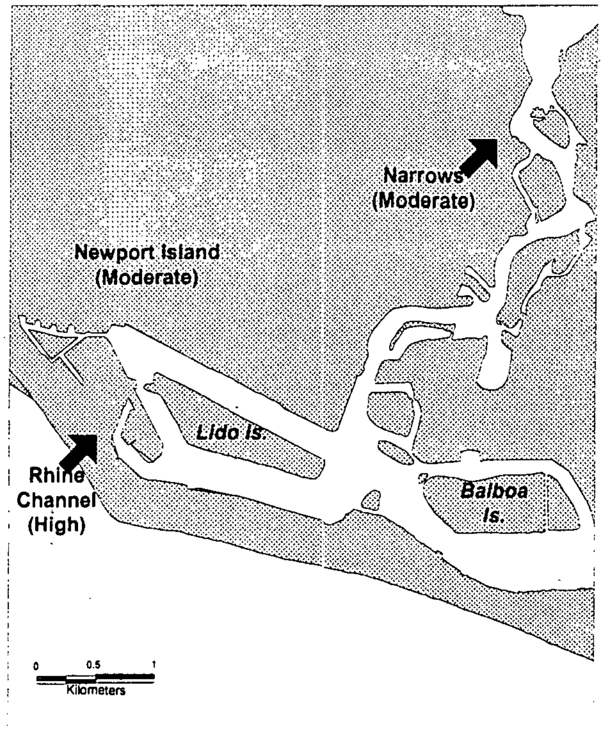


Marina del Rey/ Ballona Creek

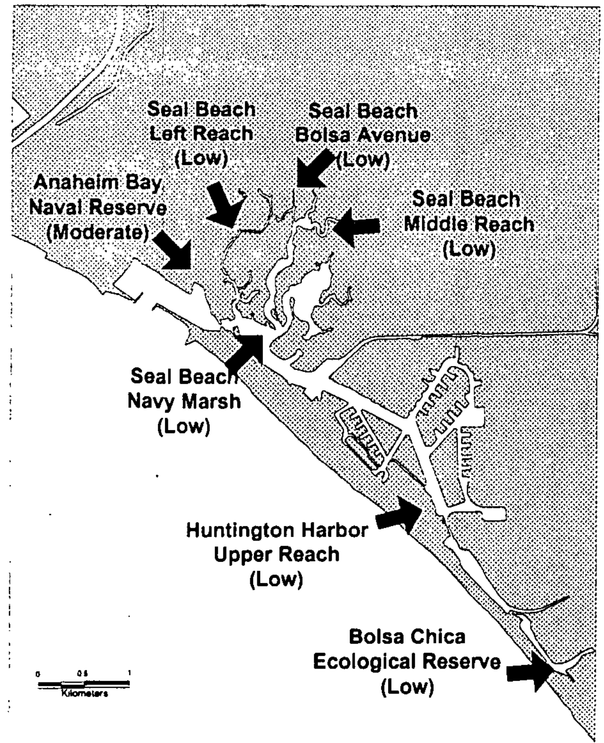


Los Angeles/Long Beach Harbor/ Palos Verdes Shelf

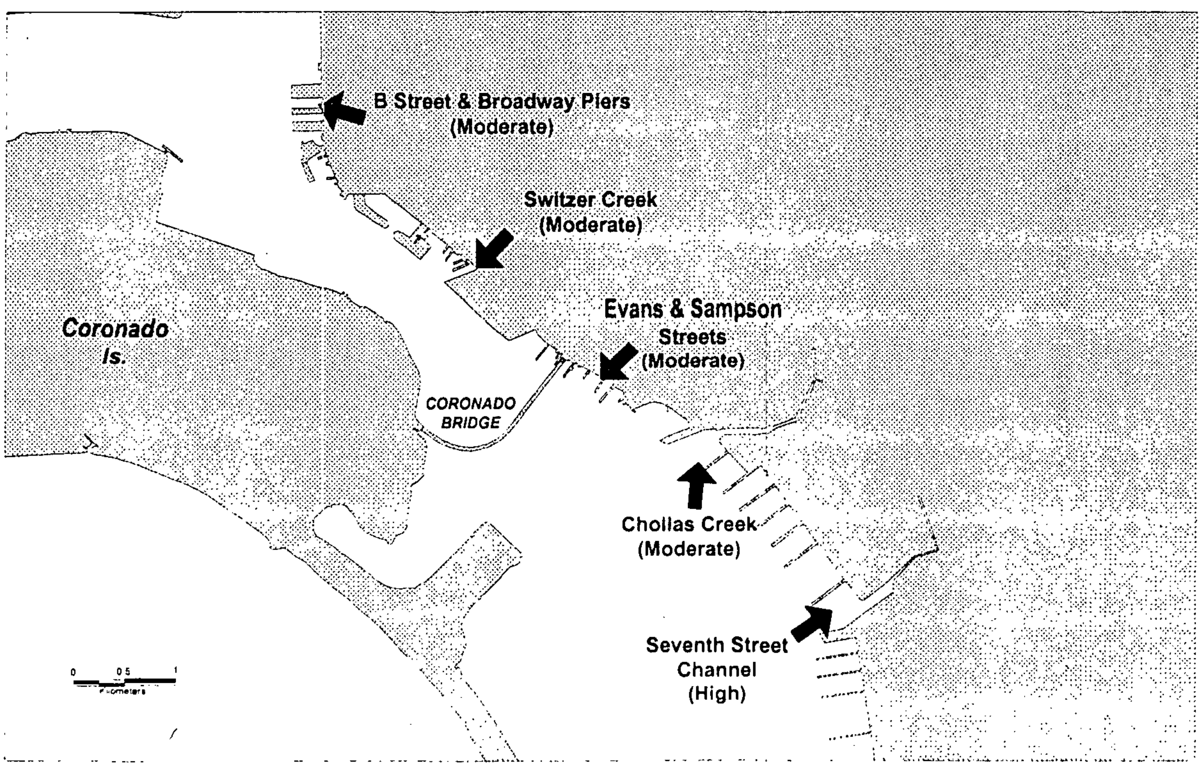
High, Moderate, and Low Priority Known Toxic Hot Spots



Newport Bay



Huntington Harbor/Anaheim Bay



San Diego Bay

Issue 5: ***Removing locations from and reevaluating the list of known toxic hot spots***

Present Policy:

The SWRCB committed to address this issue in the Guidance Policy (SWRCB, 1998a).

Issue Description:

During the development of the Guidance Policy, many commenters discussed the need to establish a system for delisting of sites from the Consolidated Toxic Hot Spots Cleanup Plan . The SWRCB committed to consider this issue as part of the development of the Consolidated Plan.

The concern raised concerning delisting was that sites that have been remediated should no longer be listed in the Consolidated Toxic Hot Spots Cleanup Plan. If a site is remediated presumably the site is no longer a toxic hot spot.

The issue is: What approach should the SWRCB use to remove sites from the Consolidated Toxic Hot Spots Cleanup Plan or otherwise address sites that have been remediated?

Alternatives:

1. Provide no approach for delisting sites in the Consolidated Toxic Hot Spots Cleanup Plan .

Under this alternative, the SWRCB would not adopt an approach for delisting sites. If sites are to be delisted the SWRCB would have to create approaches to do so each time a request was made to remove a site from the toxic hot spot list.

The disadvantages of this alternative are many. There would be no mechanism for removing sites or acknowledging that the site has been remediated. Not having a delisting system would create significant confusion. It would also be unfair to affected dischargers because there would be no clear approach for clearing from the list sites that have been adequately addressed.

2. Once sites are remediated or no longer qualifies as a toxic hot spot, remove the sites from the Consolidated Toxic Hot Spots Cleanup Plan.

This alternative would require that the SWRCB modify the Consolidated Toxic Hot Spots Cleanup Plan to remove sites that have been remediated, were inappropriately listed as toxic hot spots, or no longer qualify as a toxic hot spot (as defined). This process could involve petitioning the SWRCB to remove the site. The SWRCB would then evaluate the reasons for removing the site from the Plan. The SWRCB would consider the RWQCBs view on delisting the site. The SWRCB would remove all reference to the corrected site after complying with CEQA and the APA in modifying the consolidated plan.

In using a delisting approach the SWRCB should consider providing the factors required to consider delisting a site (e.g., delisting criteria used by the State of Washington (Department of Ecology, 1995)). Some examples of factors to consider include:

- The reason for site delisting
- Documentation of investigations performed to demonstrate the site is no longer a toxic hot spot (post-remediation monitoring)
- All remediation actions taken
- Documentation of the likelihood the toxic hot spot will be prevented from reoccurring

A distinct advantage of this alternative is that by using this type of approach, it may be an incentive to dischargers to remediate sites quickly so their site can be removed from the Consolidated Toxic Hot Spots Cleanup Plan. Another advantage is that if sites are removed, this will allow greater focus in the Plan on sites where work is continuing.

A possible disadvantage is that the process for removing sites from the Plan may require the SWRCB to prepare the environmental documentation to support the delisting. This report may take considerable time to complete. This disadvantage could be lessened by interested parties and RWQCBs compiling the needed information before the petition is filed.

3. Do not remove sites from the Consolidated Toxic Hot Spots Cleanup Plan but, rather, report on the status of remedial action at sites.

This alternative would set up a status reporting system so RWQCBs could report to the SWRCB on whether a site has been remediated and whether any further action is necessary. Site status would be reported by a RWQCB if no further action is necessary to remediate the site. This system would not require that a site be removed from the known toxic hot spot list in the Consolidated

Plan. Rather, a RWQCB would issue certification of "no further action" (NFA) to notify the discharger and the public that a site has been remediated. The SWRCB would then take a formal action to update the status of the toxic hot spot. The status of site remediation would be reported administratively by the SWRCB to interested parties.

Under this option, the RWQCB would make the finding that no further action was required at the site. The issue would then have to be brought before the SWRCB for action to consider concurrence in the RWQCB finding. Even if sites were found to require no further remedial action the site would remain on the lists of known toxic hot spots. The site would still be considered a toxic hot spot even though the RWQCB has found remediation is complete. This approach would penalize dischargers even if they had made every effort to cleanup a site.

Recommendation: Adopt Alternative 2.

Proposed language is presented in Volume I of the proposed Consolidated Toxic Hot Spots Cleanup Plan (Appendix A).

Issue 6: ***Guidance on reevaluating waste discharge requirements in compliance with Water Code Section 13395***

Present Policy:

The SWRCB committed to develop additional guidance on WDR revision when the Guidance Policy was adopted (SWRCB, 1998a). The Policy commits to consideration of new guidance to the RWQCBs on considerations when reevaluating WDRs in compliance with Water Code Section 13395.

Issue Description:

During the development of the Guidance Policy, the SWRCB received many comments on the need to provide specific guidance on the reevaluation of WDRs. Many of the commenters said that the specific guidance should be provided in the Guidance Policy. However, it was pointed out in the Final FED (SWRCB, 1998b) that it was premature to develop guidance before the scope of the needed guidance could be evaluated.

The SWRCB should evaluate what additional guidance is needed for WDRs and the clearest way to reevaluate WDRs as required by the Water Code. California Water Code Section 13395 states that:

"Each regional board shall, within 120 days from the ranking of a toxic hot spot, initiate a reevaluation of waste discharge requirements for dischargers who, based on the determination of the regional board, have discharged all or part of the pollutants which have caused the toxic hot spot. These reevaluations shall be for the purpose of ensuring compliance with water quality control plans and water quality control plan amendments. These reevaluations shall be initiated according to the priority ranking established pursuant to subdivision (a) of Section 13394 and shall be scheduled so that, for each region, the first reevaluation shall be initiated within 120 days from, and the last shall be initiated within one year from, the ranking of the toxic hot spots. The regional board shall, consistent with the policies and principles set forth in Section 13391, revise waste discharge requirements to ensure compliance with water quality control plans and water quality control plan amendments adopted pursuant to Article 3 (commencing with Section 13240) of Chapter 4, including requirements to prevent the creation of new toxic hot spots and the maintenance or further pollution of existing toxic hot spots. The regional board may determine it is not necessary to revise a waste discharge requirement only if it finds that the toxic hot spot resulted from practices no longer being conducted by the discharger or permitted under the existing waste discharge requirement, or that the discharger's contribution to the creation or maintenance of the toxic hot spot is not significant."

The BPTCP Advisory Committee has provided the SWRCB with their advice on what guidance is necessary (Advisory Committee, 1998).

Alternatives:

1. Provide no additional guidance.

The RWQCBs use a variety of regulations and water quality control plans and policies to develop WDRs and NPDES permits. None of the existing guidance links or explains the relationship between NPDES permits or WDRs and the requirements of Water Code Section 13395.

The advantage of this alternative is the SWRCB would not have to issue any new regulations or guidance on WDR revision or reevaluation. The RWQCBs would continue to rely on existing programs for guidance to carry out the reevaluations required in Water Code Section 13395.

The disadvantages of this alternative are many. Section 13395 could be read to mean that all WDRs associated with high priority toxic hot spots should be reopened within 120 days of the approval of the Consolidated Toxic Hot Spots Cleanup Plan. This could place an unreasonable burden on the RWQCBs to complete revision of WDRs. There could also be confusion with regard to what action or revisions are necessary to address the toxic hot spots. Another serious disadvantage is the potential lack of consistency on the WDR reevaluations.

2. Provide guidance to the RWQCBs on the meaning of "reevaluation," guidance on how to carry out a reevaluation on WDRs that are associated with known toxic hot spots, and prevention of toxic hot spots.

The time frame for "reevaluation" of WDRs associated with known toxic hot spots is very short (the first reevaluations should be initiated within 120 days). There may be so many WDRs (such as those WDRs associated with toxic hot spots in San Francisco Bay) that initiating a reevaluation of all WDRs may be not possible because of staffing limitations. To avoid creating this situation, the SWRCB should consider defining "...initiating a reevaluation of waste discharge requirements..." as a requirement to the RWQCBs to establish which and in what order WDRs will be revised. This planning could be completed in the time frames established in Water Code Section 13395.

The SWRCB should also consider requiring RWQCBs to acknowledge the existence of the toxic hot spot in the WDR and the special measures needed to improve the water quality at the site or in the water body.

An advantage of this alternative is defining "reevaluation", all dischargers and the RWQCB themselves would be clear on what is required to be in compliance with Water Code Section 13395. This would eliminate any confusion for "reevaluation" as used in the Water Code and would avoid interpretations that a "reevaluation" is a "reopening," "revision" or "reconsideration" of WDRs. Another advantage of this alternative is the RWQCB would be required to acknowledge if a toxic hot spot needs to be addressed in a WDR.

The BPTCP Advisory Committee has recommended this approach to the SWRCB (Advisory Committee, 1998).

A possible disadvantage is WDR scheduling would be delayed or not completed. This problem can be avoided by the SWRCB requiring that the RWQCBs submit a priority list for WDRs within the Section 13395 time frames.

Another disadvantage of this alternative is that the focus is primarily on point dischargers. In preventing toxic hot spots, RWQCBs should also consider all sources of pollutants. Revising WDRs alone will not address the wide range of pollutant sources that may contribute to the formation and worsening of toxic hot spots. One way to mitigate this disadvantage is to issue a policy statement that the RWQCBs should favor the use of watershed management approaches to prevent toxic hot spots.

The SWRCB should consider adoption of the Prevention Section provisions from the SWRCB Guidance Policy (SWRCB, 1998a) into the Consolidated Plan. By adopting these provisions the SWRCB will take a comprehensive approach to including point and nonpoint sources of pollution in preventing toxic hot spots.

3. Provide guidance on a range of WDR-related issues. For example, guidance on self-monitoring programs or permit conditions.

The SWRCB could provide specific guidance on any special permit conditions that may be necessary to address a wide range of toxic hot spots. The guidance could range from specific monitoring requirements, lists of special conditions to address toxic hot spots, or consideration of alternate implementation procedures (e.g., the use of prohibitions to reduce discharge at or near toxic hot spots).

An overriding disadvantage of this alternative is that environmental conditions vary greatly throughout the State and prescribing detailed guidance may cause RWQCBs to implement measures at sites that are either more protective or less protective than necessary. RWQCBs should be given substantial flexibility in developing WDR revisions that are tailored to Regional and site-specific needs.

Staff Recommendation: Alternative 2.

The SWRCB should provide guidance to the RWQCBs on the approach to take when preventing toxic hot spots. The proposed language encourages the use of watershed management. When reevaluating WDRs, the proposed approach requires a reevaluation letter be sent from the RWQCBs to the SWRCB stating:

1. The list of WDRs associated with each known toxic hot spot that can reasonably be expected to cause or contribute to the creation and maintenance of the known toxic hot spot.

2. An assessment of the need to revise the WDR to improve the quality of the known toxic hot spot.

3. A schedule for completion of the needed WDR revisions.

Issue 7: ***Implementation of Remediation at Identified Toxic Hot Spots***

Present Policy: The SWRCB Guidance Policy (SWRCB, 1998a) requires the RWQCBs to develop a preliminary list of actions to remediate toxic hot spots identified using the specific definition and ranking criteria.

Issue Description: The California Water Code requires the RWQCBs and the SWRCB to present a preliminary assessment of the actions required to remedy or restore a toxic hot spot (Section 13394). The Water Code prevents the RWQCBs and the SWRCB from specifying "... the design, location, type of construction, or particular manner in which compliance may be had...." (Section 13360). To comply with both of these sections, the SWRCB Guidance Policy requires the RWQCBs to develop a list of preliminary alternate actions required to remedy or restore a toxic hot spot. The RWQCBs were required to list a range of alternatives so, if potential dischargers are identified, the actions listed were not prescriptive.

The SWRCB should also consider a requirement for the RWQCBs to implement the Consolidated Toxic Hot Spots Cleanup Plan. In developing this requirement, the SWRCB is limited by the fact that funding for remediation of toxic hot spots where dischargers are not identified is currently unavailable.

Alternatives:

1. Require RWQCBs to implement the Consolidated Plan for all toxic hot spots.

Under this alternative the SWRCB would direct the RWQCBs to begin implementation of the Consolidated Cleanup Plan even though funding for each site has not been identified. This alternative would require that funding be redirected from other high priority activities.

2. Require the RWQCBs to move forward with implementation of the Consolidated Plan for toxic hot spots where the discharger is identified. Delay implementation of other remediation activities until funding is identified. Provide a listing of some possible sources of funding.

With this alternative the RWQCBs could begin implementation of some aspects of the Consolidated Cleanup Plan immediately. At Sites where the potential discharger(s) have been identified, the RWQCBs could use their existing authorities to begin remediation activities. Where funding is not currently available, the RWQCB could seek funding through a variety of existing mechanisms (e.g., Clean Water Act Section 319, CALFED, supplemental environmental projects, etc.). The SWRCB could report the balance of funding needed to the California Legislature for their consideration. A summary of the estimated range of funding needed to remediate sites, the funds potentially recoverable from dischargers and the unfunded amount needed is presented in Table 6.

3. Do not provide direction on whether to proceed with implementation of the Consolidated Plan.

This alternative would leave it up the discretion of the RWQCB whether to implement the Cleanup Plan and how best to fund the identified activities. Under this alternative, the RWQCB would be allowed to implement the Cleanup Plan at their desecration and within the existing resources. While this alternative provides considerable flexibility to RWQCBs it may allow inconsistent or no implementation of the Cleanup Plan.

Recommendation: Adopt Alternative 2.

TABLE 6: RANGE OF COSTS TO REMEDIATE TOXIC HOT SPOTS, FUNDING POTENTIALLY RECOVERABLE FROM DISCHARGERS AND UNFUNDED AMOUNT.

Site	Low Estimate	High Estimate	Amount Recoverable From Dischargers	Unfunded Amount
Cañada de la Huerta[2]	$2,600,000	$2,600,000	All	0
Delta Estuary Mercury[3]	$3,105,000	$3,105,000	None	$3.1 million
Delta Estuary Pesticides (3 THS)	Not Determined	Not Determined	Not Determined	Not Determined
Humboldt Bay "H" Street	$500,000	$5,000,000	All	0
Los Angeles Inner Harbor	$1,000,000	$50,000,000	None	$1.0-$50 million
Los Angeles Outer Harbor	$500,000	$50,000,000	None	$0.5-$50 million
Lower Newport Bay Rhine Channel	$10,581,800	$10,581,800	1-10% of total cost	$9.5-$10.5 million
Moss Landing Harbor & Tributaries[4]	$2,387,000	$3,273,167	25-50% of Ag. cost share	$1.94 to 1.99 million
Mugu Lagoon	$1,000,000	$72,500,000	None	$1.0-$72.5 million
San Diego Bay 7th St. Channel	$145,520	$7,405,200	50% of total cost	$73,000 to $3.7 million
San Francisco Bay, Castro Cove	$2,200,000	$21,200,000	All	0
San Francisco Bay, Entire Bay[5]	$25,000,000	$45,000,000	$5.8-8 million + $75,000	$19.05-36.9 million
San Francisco Bay, Islais Creek[6]	$1,900,000	$81,400,000	All	0
San Francisco Bay, Mission Creek[6]	$1,900,000	$78,000,000	All	0
San Francisco Bay, Peyton Slough	$415,000	$1,260,000	All	0
San Francisco Bay, Point Potrero[7]	$822,000	$3,040,000	All	0
San Francisco Bay, Stege Marsh	$1,600,000	$10,200,000	All	0
San Joaquin River Dissolved O_2[8]	$692,000	$692,000	None	$692,000
Santa Monica Palos Verdes Shelf[9]	$13,000,000	$67,000,000	All	0
Total	**$69,348,320**	**$512,257,167**		**$36.85-$229.4 million**

[2] Estimated total cost to cleanup site. Estimated cost for first 2 years is $332,400.
[3] Estimated grand total. Multi year cost for Cache Creek monitoring studies is $1,120,000. Multi-year cost for estuarine monitoring studies is $1,500,000.
[4] Cost sharing programs to implement management measures to control erosion generally require project proponent to share 25% to 50% of overall project cost.
[5] Estimated cost to carry out RMP is $75,000/year for 2 years. Outreach and Public Education cost is $150,000 for first two years then $50,000/yr.
[6] If significant structural changes are needed the cost could increase by $75 million.
[7] Sheetpile Bulkhead, Capping and Institutional Controls is the preferred alternative plus RWQCB costs at $30,000/year for 3 years.
[8] Includes Steering Committee cost is $12,000/year. Monitoring/Reevaluation will cost $20,000/year.
[9] Via Superfund program it is estimated that up to $125 million may be recoverable from municipalities, Montrose, Westinghouse, and other industrial dischargers.

Issue 8: Sources of Funds to Address Toxic Hot Spot Remediation

Present Policy: None.

Issue Description:

If a potential discharger is not identified to pay the total cost of remediating a toxic hot spot, the SWRCB and RWQCB may need to address these problems by using funds allocated in the SWRCB budget. It is estimated that approximately $37 to $229 million is needed to fully implement the proposed Consolidated Plan (Table 6). There are several sources of funding that are potentially available to address existing toxic hot spots. Since no dedicated fund source is available specifically to fund remediation of toxic hot spots, RWQCBs need to identify funding to complete remediation. There are several funding sources available to the RWQCBs.

The RWQCBs need to locate and secure existing funding sources, to the extent possible, in order to address several of the listed known toxic hot spots. This issue focuses on which fund sources are currently available and which funds can be possibly directed to implement the Consolidated Toxic Hot Spots Cleanup Plan.

Alternatives:

1. Nonpoint Source Grants Clean Water Act (CWA) Section 319

The Clean Water Act (CWA), Section 319(h), provides grant funds for projects directed at the management of nonpoint source pollution. High priority projects are considered those which implement specified nonpoint source management practices under Section 319 requirements, and projects which address nonpoint source waters listed pursuant to CWA section 303(d), water quality limited segments.

2. Wetlands Grants

Section 104(b) of the Clean Water Act provides funds for wetland restoration. The focus of these grants is wetland protection, but wetland restoration can be included when it is part of an overall wetland protection program. Priorities for funding include watershed projects to address watershed protection which have a substantial wetlands component in a holistic, integrated manner, and development of an assessment and monitoring.

3. State Revolving Funds (SRF) Loan Program

The State Revolving Funds (SRF) Loan Program provides funding for the construction of publicly-owned treatment works (POTWs), for nonpoint source correction programs and projects, and for the development and implementation of estuary conservation and management programs. The loan interest rate is set at one-half the rate of the most recent sale of a State general obligation bond.

4. Agricultural Drainage Management Loan Program

The State Agricultural Drainage Management Loan Program funds are available for feasibility studies and the design and construction of agricultural drainage water management projects. The project must remove, reduce, or mitigate pollution resulting from agricultural drainage.

5. CALFED

The CALFED Bay-Delta Program was initiated in 1995 to address environmental and water management problems associated with the Bay-Delta system, an intricate web of waterways created at the junction of the San Francisco Bay and the Sacramento and San Joaquin rivers and the watershed that feeds them. The CALFED Bay-Delta Program is carrying out a process to achieve broad agreement on comprehensive solutions for problems in the Bay-Delta System.

6. Cleanup and Abatement Fund

The State Water Pollution Cleanup and Abatement Account (Cleanup and Abatement Fund) (Water Code Section 13440 et seq.) can be used by the SWRCB to pay for cleaning up waste or abating the waste effects on waters of the State. RWQCBs may apply for these funds if, among other things, the RWQCB does not have adequate resources budgeted.

7. ACLs to address problems at toxic hot spots. Exchange penalties for supplemental environmental projects at toxic hot spots.

The RWQCB may impose administrative civil liability orders on an alleged violator for discharging waste, for failure to furnish or furnishing false technical or monitoring reports, for various cleanup and abatement violations, and other issues. These orders are based on the violation of a WDR, a NPDES permit, or a prohibition in a water quality control plan. As part of this process the RWQCB may direct dischargers to provide funding for a Supplemental Environmental Project. Supplemental projects should mitigate damage done to the environment by the discharger, and usually should involve the restoration or enhancement of wildlife and aquatic habitat or beneficial uses in the vicinity of the violation (SWRCB, 1997a).

8. Mass-based Permit Offset System (Trading credits)

A mass-based permit offset system is a tool used to ensure that the largest controllable ongoing sources of pollutants and most cost-effective approaches are used to reduce the discharge of pollutants. An offset system provides an increase in flexibility for dischargers with potential compliance problems or for groups that wish to develop credit for anticipated offset of future loads associated with future population growth or increase in industrial discharges.

The San Francisco Bay RWQCB has develop a pilot offset system for better and more cost-effective control of mercury discharges (SFRWQCB, 1998). Factors that the RWQCB is considering are: (1) favoring application of the system to sites that do not have a responsible discharger identified, (2) bioaccumulation of pollutants at sites near discharges, (3) toxicity at sites where pollutants are allowed at higher concentrations, and (4) the chemical form of the pollutant discharged.

9. Any combination of Alternatives 1 through 8 and any other funding source identified by the RWQCBs.

No one source of funding is large enough to accommodate all the needs identified in the Regional Toxic Hot Spots Cleanup Plans. It is therefore necessary for the RWQCB to use whatever sources are available to address sites where no potential discharger has been identified. Using or considering multiple funding sources will increase the chances for the cleanup plans to be implemented. Because toxic hot spots are considered to be the worst sites and the sites where we have the best information on impacts, it is likely that any planned work will have a good chance for funding.

Staff Recommendation: Adopt Alternative 9.

The Consolidated Toxic Hot Spots Cleanup Plan should list the programs most likely to fund different aspects of the Regional cleanup plans.

Issue 9: ***Findings in the Consolidated Toxic Hot Spots Cleanup Plan***

Present Policy: None.

Issue Description: The California Water Code requires the SWRCB to make a specific finding and recommendation in the Consolidated Toxic Hot Spots Cleanup Plan on the need for establishment of a toxic hot spots cleanup program (Water Code Section 13394(i)). This cleanup program would presumably be a new effort focused on implementing the Consolidated Toxic Hot Spots Cleanup Plan since the existing BPTCP would end after completion of the Regional and Consolidated Toxic Hot Spots Cleanup Plans.

Since these findings are directed to the California Legislature and focused on funding, the findings are not regulatory. Consequently, it is not necessary for OAL to approve this section (Government Code Section 11353).

The issue is: What findings and recommendations should be made on the need for a follow-up program to implement the Consolidated Toxic Hot Spots Cleanup Plan?

Alternatives: 1. Recommend that the BPTCP be continued as it currently exists.

The existing BPTCP started the task of identifying toxic hot spots and planning for their cleanup in 1990. The Program has focused resources on identifying problem areas using the best available scientific methods and approaches, development of Regional Cleanup Plans and now preparation of the Consolidated Toxic Hot Spots Cleanup Plan.

The BPTCP has provided new insights into locating and assessing water and sediment quality problems in California's bays and estuaries (please refer to SWRCB, 1996). No funding beyond the current year is available to support any new program activities. Certain activities that do not have Water Code-mandated deadlines (e.g., development of the California Enclosed Bays and Estuaries Plan) have yet to be completed. These activities could be completed using existing or redirected resources. The Consolidated Toxic Hot Spots Cleanup Plan would have to be implemented using existing resources.

2. Recommend that the focus of the BPTCP be changed to remove certain mandates and add new mandates.

The existing BPTCP has effectively identified toxic hot spots in several enclosed bays and estuaries in California. Plans to remediate high priority toxic hot spots have also been developed.

Consideration should be given to reassessment of the need for, or modification of, the existing BPTCP activities. Suggestions have been made over the years that the BPTCP be modified to focus activity on monitoring enclosed bays and estuaries and providing information for implementation of watershed management (SWRCB, 1996).

3. Recommend that the Consolidated Toxic Hot Spots Cleanup Plan be implemented through existing authorities and that watershed management be the focus of implementation measures. Identify a range of resource needs.

Under the California Water Code, the SWRCB and the RWQCBs have broad authority to regulate water quality. The tools for implementing a regulatory program are available currently but identification of problem locations has been difficult in some circumstances. The Consolidated Toxic Hot Spots Cleanup Plan lists many sites that are considered to be the worst-of-the-worst sites and many of the actions proposed to remediate the sites focus on existing regulatory approaches. To fairly address both point and nonpoint sources of pollution, new emphasis on prevention of toxic hot spots and watershed management should be highlighted and special funding could be sought to support these activities.

Under this alternative, the SWRCB would make findings on the number of toxic hot spots Statewide, present a range of costs to implement the Consolidated Toxic Hot Spots Cleanup Plan (from Table 6), and recommend that funding be provided for implementation of the cleanup plans and watershed management to the extent funding is allocated in the State budget.

4. Recommend a combination of Alternatives 1, 2 and 3.

Recommendation: Adopt Alternative 3.

The SWRCB should provide to the California Legislature: (1) findings on the number of known toxic hot spots, (2) findings on the relative rank of toxic hot spots, (3) findings on the estimate of how much funding is needed (i.e., a range) to implement the Consolidated Toxic Hot Spots Cleanup Plan, and (4) the need to create a program to fund cleanup.

Additionally, the SWRCB should address the need to fund watershed management.

ENVIRONMENTAL SETTING AT TOXIC HOT SPOTS

This section is a description of the physical environmental conditions in the vicinity of the proposed high priority known toxic hot spots, as they exist before the commencement of the project from both a local and regional perspective. The RWQCBs have used the hot spot definition in the SWRCB Guidance Policy to identify a number of toxic hot spots in coastal areas of the State.

In the following sections, the environmental setting at each high priority toxic hot spot is described. The general locations of the high priority toxic hot spots is presented in Figure 3. General descriptions of the environmental setting in each Region is presented in the FED prepared for the SWRCB Guidance Policy (SWRCB, 1998b). Several reports developed by the BPTCP are available that assess the conditions of selected enclosed bays, estuaries and coastal waters (e.g., Jacobi et al., 1998; Hunt et al., 1998a; Downing et al., 1998; Anderson et al., 1998; Phillips et al., 1998; Fairey et al., 1996; and Fairey et al., 1998). Each site environmental setting is a summary of the information presented in the Regional Toxic Hot Spots Cleanup Plans. For a complete description of the sites please refer to Appendix B.

North Coast Region (Region 1)

G&R Metals at the Foot of H Street Between First Street and Humboldt Bay Eureka, California (scrap yard)

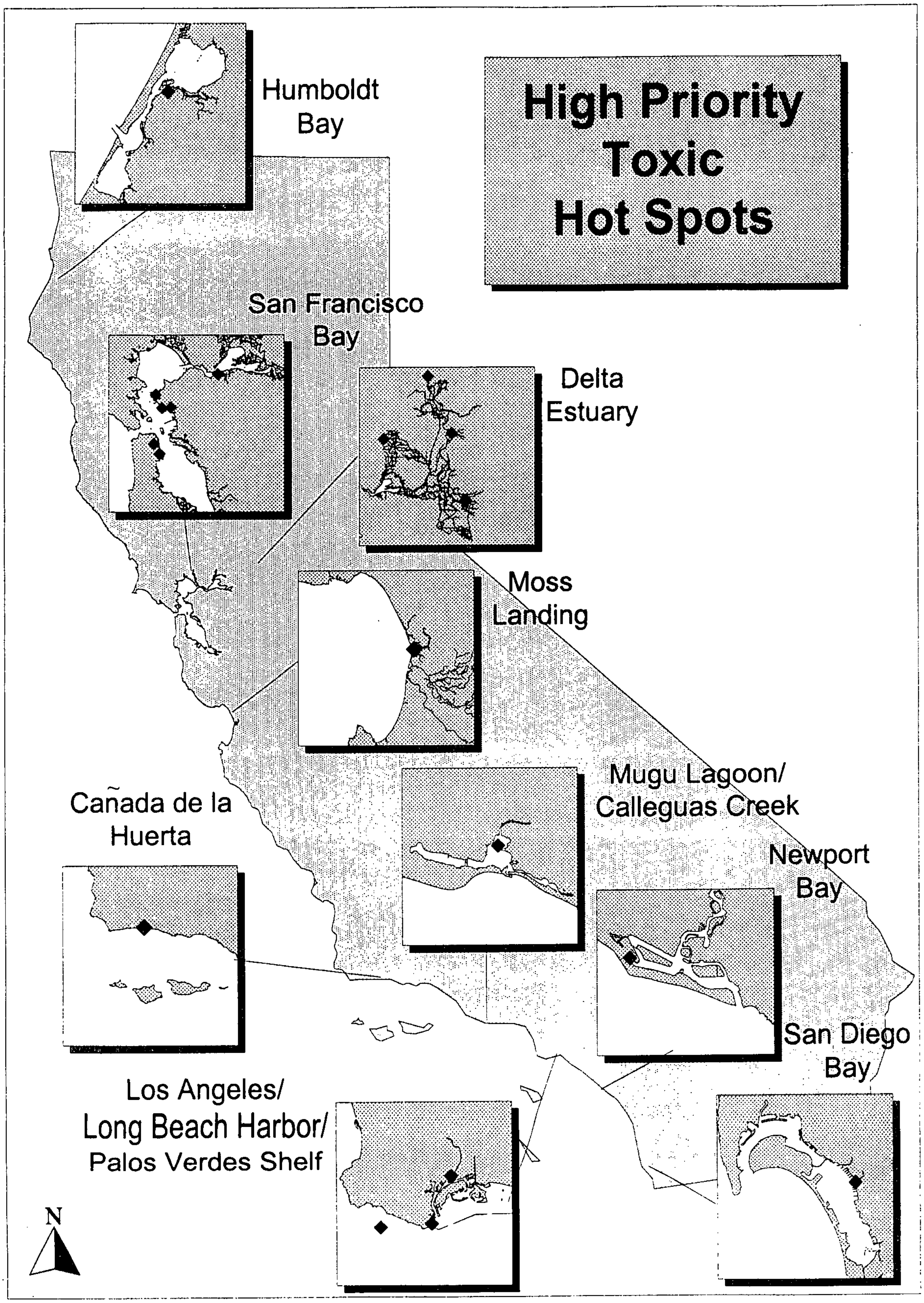
Site Description

Humboldt Bay includes Arcata Bay and three segments of Humboldt Bay. This whole area encompasses approximately 15,000 acres and is considered a shipping port, industrial center and a population hub. Fifteen sampling stations were located in the Humboldt Bay, The G&R Metals (scrap yard) site at the foot of "H" Street between first street and Humboldt Bay shore was found to rank high in the Toxic Hot Spot Ranking list due to sediment toxicity.

Pollutants of Concern

The pollutants of concern at this site are lead, arsenic, chromium, cadmium, cobalt, copper, mercury, zinc, and PCBs.

FIGURE 3: HIGH PRIORITY TOXIC HOT SPOTS



Background

The northern and central portions of the Bay are encircled by two cities and several small unincorporated communities. Along with these communities there are associated industrial activities, such as pulp mills, bulk petroleum plants, fossil fuel and nuclear power plants, lumber mills, boat repair facilities and fish processing plants. Small commercial and sport marinas have been constructed in the Bay and agricultural lands surround much of the Bay. Two large landfills are located adjacent to the Bay. Coal and oil gasification plants historically have been operated at various locations at the edge of the Bay. Municipal wastewater, industrial wastewater and storm water runoff have been discharged into the Bay throughout its 150 year history. Because there is a very narrow opening connecting Humboldt Bay and the Pacific Ocean, circulation and flushing are severely restricted, resulting in a high potential for sediment and pollutant deposition.

Areal Extent

The areal extent of the toxic hot spot has been estimated to be 3.5 acres with an average depth of pollution of 2 feet. The total polluted sediment quantity is about 10,000 cubic yards.

Sources

The site is located on the shore of Humboldt Bay and has been used for industrial activities since the early part of the century. It has been operated as a scrap metal facility since the early 1950s. Operations at the site included disassembly, incineration, and crushing of automobiles, storage of metals, batteries, radiators, metals reclamation from electrical transformers, and miscellaneous refuse. These operations occurred across the site. All industrial activities have ceased at the site but the historic uses have resulted in an area contaminated with PCBs, PAHs, metals and Methoxychlor. Cleanup and abatement activities remain to be performed at this site. These activities include: a.) performing an ecological and human health risk assessment, b.) conducting a feasibility study assessing remedial alternatives, and c.) performing appropriate cleanup and abatement activities. The site has not been used since 1980. On-going activity is limited to site assessment work to determine the extent of the contamination and the appropriate remediation needed to clean up the site.

San Francisco Region (Region 2)

The San Francisco Bay Region is comprised of most of the San Francisco estuary up to the mouth of the Sacramento-San Joaquin Delta. The San Francisco estuary conveys the water of the Sacramento and San Joaquin rivers into the Pacific Ocean. Located on the central coast of California, the Bay system functions as the only drainage outlet for waters of the Central Valley. It also marks a natural topographic separation between the northern and southern coastal mountain ranges.

The Sacramento and San Joaquin rivers, which enter the Bay system through the Delta at the eastern end of Suisun Bay, contribute almost all of the freshwater inflow to the Bay. Many smaller rivers and streams also convey fresh water to the Bay system. The rate and timing of these freshwater flows are among the most important factors influencing physical, chemical and biological conditions in the estuary. Flows in the region are highly seasonal, with more than 90 percent of the annual runoff occurring during the winter rainy season between November and April.

San Francisco Bay is typical of estuaries worldwide in that it provides critical habitat for aquatic species, including many commercially and ecologically important marine species that use estuaries as rearing grounds for sensitive early life-stages. San Francisco Bay is also home to hundreds of introduced exotic species, brought in over the last 150 years, primarily in ship ballast water. The San Francisco estuary is made up of many different types of aquatic habitats that support a great diversity of organisms. Suisun Marsh in Suisun Bay is the largest brackish-water marsh in the United States. San Pablo Bay is a shallow embayment strongly influenced by runoff from the Sacramento and San Joaquin Rivers. The Central Bay is the portion of the Bay most influenced by oceanic conditions. The South Bay, with less freshwater inflow than the other portions of the Bay, acts more like a tidal lagoon. Together these areas sustain rich communities of aquatic life and serve as important wintering sites for migrating waterfowl and spawning areas for anadromous fish.

San Francisco Bay

Site Description/ Background

San Francisco Bay is part of an estuarine system which conveys the waters of the Sacramento and San Joaquin rivers to the Pacific

Ocean. This is a highly complex system that includes large brackish marshes, tidal lagoons and freshwater rivers and creeks. The diversity of these ecosystems support a wide variety of organisms. While the upper part of the estuary has been widely used for mining and agricultural activities the San Francisco Bay region has been heavily urbanized and is the site of many industrial activities and ports.

The San Francisco estuary has high concentrations of metals due to contributions from numerous sources, both natural and anthropogenic. Natural sources include drainage of water from formations that are naturally enriched in some metals, such as the Franciscan Formation that is exposed throughout the Bay area, and the rocks that make up the Sierra Nevada Mountains. This drainage flows into the streams that empty into the Bay. Localized concentrations of these metals were exploited in a great wave of mining activity from the 1820's continuing, in some cases, into the 1970s.

Mercury was mined at numerous locations in the Coastal Range and then transported to the Sierra Nevada foothills to be used in the amalgamation of gold in placer and hydraulic mining. Drainage from natural mercury deposits, mine tailings, and directly from mining activities have had a major impact on the San Francisco Bay and estuary.

San Francisco Bay is an extremely dynamic depositional environment. Sediments flow from the major river systems and are deposited in the Bay. Strong winds and tidal currents resuspend and redeposit these sediments resulting in a system where sediments are well mixed. Bioaccumulative contaminants attach to sediments and are distributed and mixed by the same physical processes. Therefore, the sediment acts as a sink for contaminants. The sediment, however, is also a source of contaminants to organisms in the aquatic food chain and ultimately to humans.

Although the San Francisco estuary extends from the ocean up through the river systems, the jurisdiction of the San Francisco Bay RWQCB only extends to the area just west of Antioch. The Central Valley RWQCB includes the Delta and extends through the river systems. Since the health advisory on fish consumption effects both Regions, it is important that a coordinated strategy is developed, especially in regard to mercury contamination.

Reason for listing

In 1994, the BPTCP conducted a study to measure the levels of contaminants in fish in San Francisco Bay (SFBRWQCB, 1995). Results from the study indicated that six chemicals exceeded the screening levels based on U.S. EPA guidance (U.S. EPA, 1993, 1995) that were established prior to the study. These chemicals were PCBs, mercury, DDT, chlordane, dieldrin and dioxins. In response to the results of the study, the Office of Environmental Health Hazard Assessment (OEHHA) issued a health advisory on consumption of fish caught in San Francisco Bay and the Delta. The health advisory was primarily based on elevated levels of PCBs and mercury in fish tissue and the human health risk related specifically to these chemicals. While, DDT, dieldrin, chlordane and dioxins were also listed as chemicals of concern as a result of exceedance of screening values, OEHHA determined that the available data was insufficient to establish an advisory based on these other four chemicals. Therefore, while the general discussion will include DDT, dieldrin, chlordane and dioxins, the remediation plan for San Francisco Bay will focus on mercury and PCBs.

Areal extent

The San Francisco Bay and Delta cover approximately 1631 square miles.

Sources

Mercury

Mercury was mined in the Coast Range from the early 1800s through the mid-1900s. Initially most of the mercury was used in the amalgamation of gold in placer and hydraulic mining operations. Mining activity introduced mercury into the San Francisco Estuary system in a number of ways. Runoff from mercury mines within the region transported sediment rich in mercury to the Bay and estuary. In the Sierra, mercury was added to sediment to aid in the separation of gold from waste in placer and hydraulic mining operations. Most of this mercury ended up in the aquatic system, becoming attached to sediment particles flushing downstream. The mining of gold and silver ores may also expose surrounding rock that was enriched in mercury by the same geologic processes that created the gold and silver deposits, again introducing sediment enriched in mercury to the stream systems that drain into San Francisco Bay. Ongoing drainage from these mines has introduced mercury and other metals into the streams that drain into the estuary.

Core samples of Bay sediment indicate background concentrations of mercury of 0.06 +/- 0.02 ppm dw (Hornberger et al., 1999). Superimposed upon these background levels are concentrations that reflect historic and ongoing loadings. Core samples of Bay sediment indicate that an historic gradient of contaminated sediment (up to 0.9 ppm Hg) entered the Bay from the Sacramento-San Joaquin Delta during the Gold Rush, then diffused into cleaner sediment as it moved seaward towards the Golden Gate. These core samples indicate a contaminated (0.5-0.9 ppm Hg) layer buried in the sediment, the depth of which varies from location to location, with the most concentrated levels of mercury in the upper estuary. Surficial sediments throughout the Bay system generally contain 0.3 to 0.4 ppm mercury, except in areas of the lower South Bay affected by drainage from the New Almaden mining area. Mixing between these two sediment layers is a key factor in determining the concentration of mercury in surficial sediments, the mass balance of mercury in the Bay and the rate at which concentrations can change.

The estuary, therefore, has become a sink for sediments rich in mercury and an ongoing source for the bioaccumulation of mercury up the food chain. Monitoring data from the BPTCP shows that mercury concentrations in the estuary are elevated and highly dispersed. There are a number of individual sites around the margins of the Bay where mercury concentrations higher than these generally elevated levels are found. These are usually due to past industrial practices such as the smelting of ore.

Although there is very little active mining in the San Francisco Bay drainage system, runoff from abandoned mines and mine tailings continue to be an ongoing source of mercury to the estuary. Data from the Sacramento River indicate that the Cache Creek drainage and the Sacramento drainage above the Feather River are major, ongoing sources to the lower watershed. In the southern part of San Francisco Bay, the major ongoing source is the drainage from New Almaden mining region. Other less significant sources include urban runoff, POTWs, industrial discharges and aerial deposition. Recent pollution prevention audits indicate that human waste, water supplies, laundry waste, household products, thermometers, and waste from hospitals and dental facilities are the most significant sources to POTWs. Known industrial discharges of mercury are from raw materials used in the facilities. About half the aerial deposition appears to come from global fuel combustion and the other half from local fuel combustion.

The key environmental concern about mercury in the San Francisco Bay system is the extent to which it bioaccumulates in the food chain. Bioaccumulation, in turn, is governed by the level of methyl mercury in the aquatic environment. Methyl mercury is formed primarily by microbial activity, and only under certain physical and chemical conditions. A complex set of factors influence the rate and net production of methyl mercury by bacteria. These include chemical factors that change the oxidation state of mercury in the aquatic system; "habitat" characteristics that promote the growth of methylating bacteria such as the availability of sulfur compounds used as food and the presence of anoxic zones conducive to these bacteria; and much larger scale processes such as wind, tide, and runoff patterns that serve to mix and transport particle bound mercury throughout the estuary. Significant changes in any of these factors may potentially change the rate of mercury methylation. These processes must be better understood in order to appropriately manage environmental risks associated with the existing reservoir of mercury, as well as to regulate ongoing sources. A particular concern is to prevent the creation of environments, that is some subset of these physical and chemical factors, that may increase the rate of mercury methylation.

PCBs

PCBs have also accumulated in the sediments of the estuary due to historic use. This class of chemicals is comprised of 209 compounds called congeners. Mixtures of congeners have been manufactured in the U.S. since 1929 and sold under the trade name Aroclor. These mixtures were used extensively in the U.S. prior to 1979 when their manufacture, processing, use and application was banned, except in totally enclosed applications such as transformers. PCBs were used for industrial applications requiring fluids with thermal stability, fire and oxidation resistance, and solubility in organic compounds. PCBs have proven to be extremely persistent in the environment. RMP monitoring data indicate that in the water column PCBs exceed non-promulgated U.S. EPA water quality criteria throughout the estuary. This is most probably due to resuspension from the sediments, although ongoing sources may still contribute a significant amount of PCBs. BPTCP monitoring has shown that, except for a few areas, PCBs are fairly well mixed in the sediments of the estuary where they provide an ongoing source to organisms in the food chain.

Although the use of PCBs has been banned there are historic deposits in the sediment and on land. Point Potrero, at the Port of Richmond, had ten times the PCB concentration (19.9 ppm) of any other sample collected under this region's BPTCP and the highest concentration of any BPTCP sample in the state. Stormwater events can mobilize PCBs deposited on land and transport them into the estuary. Recent monitoring by the RMP has shown that there seems to be current sources contributing to PCB loads in the South Bay from Coyote Creek. In addition, a recent RMP workgroup evaluating PCBs has come to the preliminary conclusion that there are probably significant ongoing sources of PCBs to the Bay. Increased monitoring is necessary to identify and cleanup any ongoing sources.

Chlorinated Pesticides

Three chlorinated pesticides exceeded screening levels in the BPTCP fish study: DDTs, chlordanes and dieldrin. All three have similar properties in that they are extremely persistent in the environment and highly lipid soluble. Since these lipid soluble compounds are not easily metabolized or excreted, they are stored in fatty tissue and can readily bioaccumulate in fish tissue with high lipid content.

Although all three of these chemicals have been banned for use in the U.S. for approximately 20 years they are still commonly detected in sediments and in tissue. These compounds are dispersed in the sediments throughout the estuary. One large historic source of DDT, Lauritzen Canal in Richmond Harbor, has been recently cleaned up. Other sources may be detected through increased monitoring of stormwater.

Dioxins

Dioxins are released into the environment as by-products of thermal and chemical processes. These chemicals are not intentionally manufactured. Stationary sources include the incineration of municipal, hospital and chemical wastes, paper pulp chlorine bleaching, oil refining and the manufacturing of pesticides and PCBs. Mobile sources include combustion engines in cars, buses and trucks, particularly those that use diesel fuel. Since the great majority of dioxins are emitted directly to the air, their primary source to the aquatic environment is through aerial deposition and runoff. The Bay Area Air Quality Management District has estimated that 69% of the current dioxin emissions in the Bay area is from on and off road mobile sources and 15% from residential wood burning. The San Francisco Bay RWQCB staff has estimated that greater than 90% of dioxins entering the Bay are transported by stormwater runoff or result from direct deposition from the air to the Bay.

Castro Cove

Description of site

Castro Cove is a protected embayment located in the southern portion of San Pablo Bay in Richmond, California. Castro Cove is defined as the cove enclosed by a line drawn from the Point San Pablo Yacht Club breakwater to the northwest corner of the West Contra Costa Sanitary Landfill. The embayment is protected by diked margins on the west, south and most of its eastern margin. The southeastern portion, where Castro Creek enters the cove, is a salt marsh. Castro Cove is shallow with extensive mudflats and marshlands that are subject to tidal action. Castro Creek empties into a channel that is about 30 to 75 feet wide and about three to six feet deep at mean lower low water.

Historical Background

Since studies started in 1987 for Chevron's deep water outfall, petroleum hydrocarbons have been detected in Castro Cove. Several studies showed high levels of PAHs in the southwest portion of Castro Cove, the area where an historic outfall was located. The last surface sample collected in Castro Cove by the BPTCP, in 1995, had the highest concentration of PAHs measured in over 600 samples analyzed for PAHs statewide. The concentration of PAHs in this sample (227,800 ppb) was over four times the ERM and was collected in the top five centimeters of sediment. This was the highest concentration of PAHs ever collected at this site. Individual PAHs also exceeded ERMs. Several studies, including the BPTCP, also showed levels of mercury exceeding the ERM. In the last BPTCP sampling, chlordane was measured at levels exceeding the ERM and selenium and dieldrin were measured at elevated concentrations.

Toxicity tests have been conducted on sediments from Castro Cove on five separate occasions. Significant toxicity has been observed in several species of amphipods and in urchin and bivalve development tests during the five sampling events. The southwest portion of the cove always showed toxicity when sampled. The last samples collected by the BPTCP, in 1995, had 0% amphipod survival and 0% normal urchin development.

For three years, from 1988 to 1990, the State Mussel Watch Program deployed mussels in Castro Cove. Their results showed increasing concentrations of PAHs over these three years. In addition, the last sample collected had the second highest PAH concentration (40,210 ppb dry weight) of any sample measured statewide in the 20 year history of the program.

The benthic community at Castro Cove has been sampled three times, in 1989, 1990 and 1991. All three sampling events identified species in Castro Cove that were indicative of stressed or frequently disturbed environments. An evaluation of the 1991 data in the 1996 RMP Annual Report categorized this site as a moderately contaminated sub-assemblage due to the presence of species indicative of stressed environments.

As part of the PRMP gradient study conducted in Castro Cove in 1991, speckled sanddabs were exposed to Castro Cove sediment in the laboratory. Results showed increasing effects with increasing PAH concentrations. The most significant effects were seen in fish exposed to sediment from the area of the old outfall. Fish exposed to sediments collected at stations in Castro Cove showed statistically significant gill histopathology. Gill histopathology was significantly correlated with PAH concentration of the sediment, as well as with P4501A content in the gills and hepatic EROD activity, both indicators of exposure to PAHs.

To comply with State Order 86-4 and an NPDES permit requiring an investigation of sediment quality along a deep-water outfall, an E.V.S. study was undertaken in 1987. The focus was to determine the quality of the deep sediments at sites along the location of the deepwater outfall. Oil and grease and petroleum hydrocarbons were detected at one location just outside Castro Cove. The results of the amphipod survival test showed lower survival rates with sediments from Castro Cove. For the bivalve larvae bioassay, all five test samples had significantly lower rates of normal development that the sediment control.

A three-year monitoring program at Castro Cove conducted by Entrix determined that Castro Cove sediments were finer than those from Castro Creek and from San Pablo Bay. Oil and grease was detected both in Castro Cove and in offshore sediments. The greatest concentrations of oil and grease within Castro Cove were usually detected where Castro Creek enters Castro Cove. Mercury was detected at concentrations greater than the ERM in Castro Cove. Other Entrix investigations determined that Castro Cove sampling locations showed the top four species of benthic taxa, and they are considered indicators of stressed or frequently disturbed environments.

As part of the State Mussel Watch Program, bioaccumulation of contaminants was measured in Castro Cove (SWRCB, 1995). The concentration of PAHs from mussels collected on March 21, 1990 was the second highest concentration measured statewide in the 20 year history of the State Mussel Watch Program.

Castro Cove was sampled three different times under the BPTCP to determine if sediments were being naturally capped. Chemical analyses and toxicity tests were performed to determine if concentrations of contaminants or the levels of toxicity were decreasing. Samples were collected in Castro Cove under the Pilot Regional Monitoring Program (PRMP), the Reference Site Study and the Screening/Confirmation Studies.

The southwest sediment station, which was closest to the old outfall, had a PAH concentration greater that the ERM at depth and greater than the ERL on the surface. Porewater development tests for the deep core layers indicated significant toxicity at three of the four Castro Cove sites, including the southwest station, relative to the reference site. Only the southwest station exhibited toxicity in the deep core elutriate urchin larvae development test. It was determined that the benthic community at Castro Cove was representative of a moderately contaminated sub-assemblage due to the presence of species indicative of stressed environments. Castro Cove sediments showed alteration of the gills of speckled sanddabs, and indicated exposure to PAHs.

The 1995 Castro Cove sediment sample had the highest PAH concentration of the more than 600 sediment samples analyzed for PAHs statewide in the BPTCP. Mercury and chlordanes were detected at concentrations greater than the ERM. Selenium and dieldrin also had elevated concentrations. Toxicity test results showed 100% amphipod mortality and 100% abnormal development in the urchin development test.

Areal Extent

Based on the distribution of oil and grease and PAHs, two main areas of contamination can be delineated: the south/southwest and the north/northeastern portions of Castro Cove. Similar patterns in the surface distribution of mercury are also evident. The distribution of biological effects is slightly more extensive than the chemical distribution, but overlays the spatial area delineated by detection of oil and grease and PAHs. Although horizontal extent has not been bounded, the contaminated area is estimated to range between 10 and 100 acres based on past studies and the established boundaries of Castro Cove. The depth of contamination has not been determined, but in one set of core samples the depth of visible petroleum hydrocarbons seemed to extend from the surface to approximately three feet below the sediment surface, the maximum depth of the cores.

Sources

The Chevron refinery and the San Pablo Sanitary District discharged effluent directly into Castro Cove until the 1980's. Currently, the refinery and San Pablo Sanitary District discharge their waste effluent into San Pablo Bay via two separate deep-water outfalls. Contaminants may have also entered Castro Cove via Castro Creek due to urban runoff.

From the turn of the century, Chevron discharged wastewater which was only treated by an oil water separator into Castro Creek up to a rate of 50 MGD. The Chevron USA refinery discharged treated effluent into Castro Cove from 1972 until 1987. San Pablo Sanitary District discharged untreated sewage into Castro Creek near the confluence with Wildcat Creek until 1955 when construction of a municipal treatment plant was completed. From 1955 to 1981, the district discharged treated effluent directly into the cove through a channel running along the southern end of the West Contra Costa Landfill. In 1981, the district relocated its outfall to a deep-water site offshore of Point Richmond. These discharges were not associated with the Chevron Refinery effluent discharges.

Based on the historical discharge of untreated waste by the Chevron refinery and the presence of petroleum related contaminants (oil and grease and PAHs), Chevron is the most likely source of the contamination in Castro Cove.

Peyton Slough

Description of Site

Peyton Slough is located in Martinez, northern Contra Costa County, California. The slough discharges into the San Francisco estuary at the confluence of Suisun Bay and the Carquinez strait, near Bull Head Point, just east of the Benecia Bridge.

Sediments in Peyton Slough are comprised of firm clays that do not appear to erode easily. Sediments from Peyton Slough appear to have been dredged in the past with the dredge spoils deposited on the east and west shore forming levees. There are openings in the east levee downstream of the tidal gate that provide exchange between Peyton Slough and a large brackish wetland to the east of the slough.

During the winter, Peyton Slough receives fresh water discharge from the Contra Costa Canal and storm water runoff from the surrounding area. During the dry weather months, Peyton Slough receives fresh water discharge primarily from a waste water treatment plant (Mountain View Sanitary District) through a tidal gate. Some minor flow from the Contra Costa Canal may also occur during the dry months. A tidal gate had been configured such that fresh water from upstream can be released when the water level is greater on the upstream side of the gate. In 1998, this tidal gate was replaced with a newer gate which will allow water to flow from the bay into a wetland area situated upstream from Peyton Slough.

Two major historical industrial activities have taken place in the vicinity of Peyton Slough on a site currently owned and operated by Rhodia: sulfuric acid production and the smelting of copper. Currently, treated waste is discharged into Carquinez Straits via Peyton Slough by Mountain View Sanitary District. Historically, the first recorded industrial use near Peyton Slough was by the Mountain Copper Company (MOCOCO). This company used the site for a copper smelting operation from the early 1900s until 1966 at which time it was purchased by Stauffer Chemical Company. During the smelting of copper, a fused silicate slag was generated which was discharged over the north and south sides of the hillside housing the smelter. MOCOCO also roasted pyrite ore to recover its sulfur. Resulting cinders remain on site.

Cinder and slag, classified as Class B Mining Waste, from the smelting operations were stored in large piles on the site. The north cinder/slag area covers 8.3 acres, while the south cinder/slag covers 7.1 acres. Due to their weights, the cinder and slag piles subsided 30 to 35 feet into the softer bay mud below the existing ground surface. Stauffer Chemical Company bought the site from MOCOCO and removed the cinder/slag piles to the depth of the water table, but it is estimated that over 500,000 tons of waste material remains below the surface. The remaining north and south cinder/slag piles have been capped with a minimum of two feet of low permeability soil in 1978 and 1980 respectively.

In 1972, a leachate removal and containment system (LRCS) was installed in response to cease and desist order No. 71-21 issued by the RWQCB. The LRCS prevented leachate from moving to Carquinez Strait and Peyton Slough by a cut-off wall consisting of compacted bay mud along the bay shoreline. Prior to 1988, the leachate from the north cinder/slag area was pumped to a north solar evaporation pond. Leachate from the south cinder/slag piles was pumped from two deep sumps to the south solar evaporation pond. Starting in 1988, the Process Effluent Purification (PEP) system was installed and begun treating this leachate prior to discharge to a deep water outfall. Cutoff walls were not constructed along Peyton Slough. However, to date there is no evidence that leachate is being discharged into the slough.

Currently, the Contra Costa Mosquito Vector Control District (CCMVCD) is planning a restoration project in Shell marsh. This project intends to restore the marsh south of Peyton slough back to a brackish marsh with regular inputs of salt water from San Francisco Bay. As part of this project, the CCMVCD has replaced the tidal gate in Peyton Slough and is proposing to dredge Peyton Slough to allow for higher flows of saline water up the slough into Shell marsh. This project is partially funded by Caltrans to mitigate for discharge from Route 680 and to prevent flooding of the highway. Rhodia is also working with CCMVCD to coordinate the dredging of Peyton Slough. Regional Board staff has been helping to coordinate completion of the marsh restoration project in order to remediate the toxic hot spot, restore Shell marsh and alleviate flooding on Route 680.

Reason for Listing

Multiple investigations have shown that sediments from Peyton Slough have elevated concentrations of metals, especially copper and zinc. Copper and zinc concentrations in Peyton Slough were the highest from over 600 samples analyzed statewide by the BPTCP. The metal contamination can be traced to past activities at a nearby industrial site, and perhaps also to the continued presence of slag and cinder below the water table. The contaminated sediment was shown to exhibit recurrent toxicity over time to two different aquatic organisms, and the Toxicity Identification Evaluation (TIE) points to metals as the source of toxicity. In addition, although benthic community indices categorized this site as transitional, the upper and end stations rated only slightly higher than the cutoff of 0.3. Recent studies indicate that there are elevated concentrations of cadmium, copper, lead and zinc detected throughout Peyton Slough.

Areal extent

Elevated metal concentrations were detected from the mouth of Peyton Slough all the way to the tidal gate. Toxicity to aquatic organisms was found at all BPTCP locations, but recurrent toxicity was only measured at the upper sampling location. The areal extent of the channel is approximately 1.25 acres. In specific locations, vertical extent of contamination could not be determined as the deepest sample, 8 feet below the sediment surface, still showed elevated concentrations of one or more metals.

Sources

The most likely source of contaminants in Peyton Slough is the historical industrial activity associated with the creation of the cinder/slag piles. Potential current subsurface transport of metals in groundwater from the buried cinder piles to Peyton Slough is not known.

Stege Marsh

Site Description

Stege Marsh occupies approximately 23 acres on the western margin of San Francisco Bay in the City of Richmond, California. Stege Marsh is located on property currently owned by Zeneca Agricultural Products and the University of California Field Station. The cinder landfill separates east and west Stege marsh. The East Bay Parks District currently owns the land south of the historic railroad track which is now a hiking trail.

Eastern Stege marsh rests directly on the alluvial fan-deltaic deposits of Carlson Creek interspersed with Bay mud. Bedrock at the site is likely to be Franciscan Formation rocks, cretaceous and younger in age, consisting of an assemblage of marine sedimentary and volcanic, and some metamorphic rocks (The Mark Group, 1988). Western Stege Marsh is fed by Meeker Creek. Between 1947 and 1969, a railroad track was constructed just south of Stege marsh resulting in siltation and thus the extension of the tidal marsh into a previously subtidal area (May, 1995).

Stauffer Chemical Company is the prior owner of the Zeneca industrial facility and associated marsh. The site rests directly on the alluvial fan-deltaic deposits of Carlson Creek interspersed with Bay mud. Bedrock at the site is likely to be Franciscan Formation rocks, cretaceous and younger in age, consisting of an assemblage of marine sedimentary and volcanic, and some metamorphic rocks. Between 1947 and 1969, a railroad track was constructed just south of the current marsh resulting in siltation and thus the extension of the tidal marsh into a previously subtidal area.

Stauffer Chemical Company utilized the industrial portion of the site to roast pyrite ores for the production of sulfuric acid from about 1919 until 1963. This industrial process resulted in the production of cinders, which were placed on the site surface. Elevation at the bottom of the cinders is at mean sea level throughout the facility, which indicated past placement of cinders at ground level. The presence of a layer of peaty silt under the base of the cinders also supports that cinders were disposed of on the site surface. The cinder pile extends along the north and east sides of Stege marsh. The cinders were covered with a one-foot clay layer, that was itself covered by a one-foot layer of topsoil to comply with RWQCB Order No. 73-12 and its 1974 amendment.

Besides pyrite cinders, other products that have been generated or utilized on the industrial site include fuels, sulfuric acid, ferric sulfate, proprietary pesticides, solvents and alum. Until recently, Zeneca produced proprietary agricultural chemicals on the industrial portion of the site. Currently, Zeneca uses the site solely as a research laboratory. The discharges resulting from past industrial activities were treated through a series of settling, neutralization and alum mud ponds ending in two evaporation ponds situated just north of the marsh. Effluent discharge from the two evaporation ponds into the marsh occurred at two points, one in between the two evaporation ponds and the other located southeast of the evaporation ponds. The ponds were closed in the early 1970s and replaced with new lined ponds. The discharge of stream waste to the marsh ended in the 1980s. Since then, treated effluent has been discharged from the evaporation ponds into the Richmond sanitary sewer system. Under wet weather conditions, when the city of Richmond cannot handle inflow and the holding capacity of the Zeneca Facility are exhausted, discharges to the marsh are permitted. Contaminated groundwater from the industrial portion of the site is being removed by an intercept trench, treated and discharged with the treated industrial effluent.

In western Stege marsh several explosives manufacturing companies had been in production since the 1840s. During this time various areas were used for the production of mercury fulminate, manufacturing of ammunition shells and blasting caps, and storage and testing of explosives (Jonas and Associates 1990).

Historical Background

In 1991, URS Corporation performed a site investigation for U.S.EPA and found elevated concentrations of metals and metalloids (arsenic, copper, lead, mercury, selenium, and zinc) and organic contaminants (DDTs and PCBs). A follow up sediment investigation by ICF Kaiser also found elevated concentrations of metals and metalloids (arsenic, copper, lead, and zinc). Organic contaminants were not detected by ICF Kaiser, but were reported with elevated detection limits due to analytical interferences. Zeneca and the RWQCB independently analyzed a split sediment sample from the north-western section of the marsh and found elevated concentrations of metals, metalloid and organic contaminants.

The BPTCP program collected screening sediment samples at three locations: 21401 in the Richmond field station, 21402 in the north-west section of eastern Stege marsh and 21403 near outfall 002 , as well as a reference sample in Carlson Creek (21404). All three marsh samples had elevated concentrations of metals, metalloids and organic compounds, and resulted in 100% mortality of *Eohaustorius estuarius*. Locations 21401 and 21402 were resampled as part of the BPTCP confirmation sampling. Both sediment samples were toxic to *Eohaustorius estuarius* with 99 and 100% mortality respectively. The Relative Benthic Indices of 0 were measured at these two sampling locations, indicating the lack of living organisms present at the time of the sampling. Stege marsh falls in the high priority toxic hot spot category due to elevated chemistry (including the highest concentrations of arsenic, selenium and several pesticides measured by the BPTCP statewide), recurrent sediment toxicity, and impairment to in-situ benthic organisms.

A summary of investigations conducted at Stege marsh is presented in the following sections.

ICI Americas Investigations (1987)

In 1987, ICI Americas sampled 10 foot cores of sludge and the underlying soil in the neutralization pond, surge pond, carbon column pond, agriculture yard pond and both evaporation ponds. The sludge samples were analyzed for total and WET extractable metals. Elevated concentrations of arsenic, copper and zinc were found in samples from the two evaporation ponds. Soluble threshold limit concentrations (STLC) were also exceeded for arsenic and lead in samples from the evaporation ponds. Effluent from these two evaporation ponds was regularly discharged to the marsh in the past. Samples from other ponds had elevated concentrations of copper, lead, selenium and zinc. These samples also had detected concentrations greater than STLCs for copper and zinc. Metal contaminated soil below the sludge in the ponds may contribute to these concentrations since both soil and sludge were sampled and homogenized. Relevant analytical results are listed in Table D-1. This study indicates that the evaporation ponds may have been a source of contaminants to Stege marsh.

The Mark Group Investigations (1990, 1991)

These two reports present the results of an underground site investigation of the cinder area next to Stege marsh. Hydrologic data are also reported but are not discussed in this report.

These investigations resulted in the production of cross-sections depicting the horizontal and vertical extent of the cinders in upland soils. Potential presence of cinders in the marsh was not investigated, although the presence of subsurface cinders was mapped in upland soils up to the edges of Stege marsh. Also, the chemical constituents of the cinders were not reported as part of this site investigation. Cinders may have been and/or remain a potential source of contamination in or near Stege marsh.

URS Corporation Investigation (1991)

URS Corporation performed an investigation of the chemistry of the marsh sediments in 1992 for the U.S. EPA. Elevated concentrations of arsenic, copper, lead, mercury, selenium, zinc, DDTs and PCBs were detected in samples throughout Stege marsh during this investigation. This investigation indicated that Stege marsh is contaminated with multiple chemicals.

Woodward-Clyde Consultants Investigation (1993)

Woodward-Clyde Consultants performed a subsurface investigation next to Stege marsh of the extent of cinders and groundwater hydrology and chemistry. Cinders were found next to the marsh, but the marsh was not investigated for the presence of cinders. Groundwater chemistry results showed low pH and elevated solution concentrations of metals and metalloids in some monitoring wells next to Stege marsh. This investigation suggests that subsurface transport of chemicals was and/or remains a pathway for contamination in Stege marsh.

ICF Kaiser Investigation (1997)

In 1997, ICF Kaiser undertook a follow-up investigation to that by URS Corporation. Arsenic, copper, lead and zinc were again detected with elevated concentrations. Mercury and selenium concentrations were detected but at lower concentrations than in the URS Corp. investigation. Since chemical concentrations were reported on a wet weight basis in this study, comparisons to other analytical results and to screening guidelines are not possible. DDTs, DDEs and DDDs were not detected in sediment samples in this investigation likely due to the elevated detection limits reported for these compounds. Mercury concentrations were not as elevated as in the URS investigation, but the areas with elevated mercury concentrations were not sampled by ICF Kaiser. As with the URS Corporation investigation, contamination of Stege marsh by metals and metalloids was evident in these data.

Zeneca and RWQCB sediment sample (1997)

In 1997, Zeneca and SFB-RWQCB jointly collected a sediment sample in the northwest corner of Stege marsh based on a complaint received by the SFB-RWQCB of a barren area in this location. Split samples were sent to two independent laboratories for chemical analyses. Metal results show elevated concentrations of arsenic, cadmium, copper, lead, selenium and zinc. Organic compounds detected at concentrations above San Francisco Bay ambient sediment concentration include chlordanes, dieldrin, hexachlorohexanes, DDTs and PCBs. Again note that the results from the Zeneca split sample are reported on a wet weight basis. Contamination of Stege marsh is evident by the elevated concentration of chemicals reported.

Bay Protection and Toxic Cleanup Program (1998)

Under the Bay Protection and Toxic Clean-up Program, the RWQCB collected three screening and two confirmation samples from Stege marsh, as well as a reference sample from Carlson Creek. Sampling location 21401 is located in the Richmond field station in the vicinity of the cinder pile. Sampling location 21402 is situated in the barren portion of the Stege marsh on Zeneca property. This is in the vicinity of the SFB-RWQCB sample discussed in the previous section. Sample location 21403 is situated in Stege marsh south of evaporation pond 1 near outfall 002. Reference samples (location 21404) were also collected from Carlson Creek during both screening and confirmation sampling events.

The three screening samples were analyzed for chemical constituents. As with the URS Corp. study, elevated concentrations of arsenic, copper, mercury, selenium, zinc and DDTs were detected at concentrations much greater than both ERM and ambient concentrations. Arsenic and selenium concentrations were the highest measured in 544 samples collected statewide in the BPTCP. In these samples, PCBs were also detected at concentrations much greater than both ERM and ambient concentrations. Also, multiple chlorinated pesticides were detected at elevated concentrations. Dieldrin, endosulfan sulfate, mirex, oxadiazon and toxaphene were detected in Stege marsh at the highest concentrations from over 600 samples collected statewide by the BPTCP. The mean ERM quotients were 2.7 (21401), 0.61 (21402) and 2.59 (21403). Mean ERM quotients greater than 0.5 are believed to represent elevated concentrations of mixtures of chemical compounds. These chemicals are detected at concentrations in Stege marsh that are believed to pose a threat to waters of the state.

Exposure to all three sediment samples from Stege marsh resulted in 100 percent mortality to *Eohaustorius estuarius* in the 10-day solid phase bioassay. The two confirmation samples also exhibited high mortality (99 and 100 percent) for the same bioassay. Urchin development bioassays using a sediment-water interface exposure resulted in 100 percent abnormal development for the two sediment screening samples. These results denote a significant impact of the sediments to these test species.

Benthic community analysis of the two confirmation samples from Zeneca marsh found no living individuals. The measured Relative

Benthic Index was zero denoting the total absence of benthic organisms in these sediments. This represents a significant impact to the marsh biota.

Pacific Eco-Risk Laboratories

In 1998, Zeneca Agricultural performed a site investigation in sloughs and the northwest corner of eastern Stege marsh. The results showed elevated concentrations of arsenic, copper, lead, mercury, selenium and zinc in the sediments. Toxicity to the bivalve embryo *Mytilus edulis* was found at multiple locations in the sloughs and in the northwest corner of eastern Stege marsh (Table D-10). Toxicity to *Eohaustorius estuarius* was found at all locations sampled in Stege marsh. The pH of sediment and porewater samples at this site was, in general, unusually low. The pH of several highly acidic sediment and porewater samples was adjusted to a normal pH and toxicity tests were repeated. Although pH adjustment lowered the toxicity of most samples, high levels of toxicity remained in all undiluted porewater samples and in 1 out of the 2 sediment samples in which pH was successfully adjusted. In addition, there was toxicity at stations with normal pH. Low pH seems to contribute to toxicity at some stations at this site, however, it is clear that other factors play a significant role. Benthic community analyses showed decreased populations in the northwest corner of eastern Stege marsh.

<u>Areal extent</u>

Based on the distribution of elevated concentrations of metals, metalloids and organic compounds, three areas of contamination can be seen. The first is near evaporation pond 1 and outfall 2. This area has elevated concentrations of arsenic, mercury, zinc and DDTs. The second area is in the north-west corner of eastern Stege marsh and is characterized by low pH measurements, elevated concentrations of arsenic, copper, zinc and DDTs, aquatic toxicity, and is devoid of benthic organisms. The third area is located in the U.C. Richmond Field Station. This location is characterized by elevated concentrations of arsenic, mercury, selenium, zinc, DDTs and aquatic toxicity, and is devoid of benthic organisms. Further study may show that these areas are continuous rather than discrete. Regardless, the areal extent of the THS is greater than 10 acres. The entire marsh encompasses an area of 23 acres.

Sources

Oxidation of pyrite cinders in the presence of sulfides is the most likely source of the low pH at the site. Leaching of metal at this low pH is a probable source of toxicity. Subsurface transport of metals from upland cinders may also be a source of contaminants to Stege marsh. Effluent discharge from the two evaporation ponds is also a likely source of contaminants to Stege marsh. Contaminants may have also entered the marsh via Carlson or Meeker Creeks in urban runoff or from upland industrial facilities. In western Stege Marsh munitions manufacturing is a possible source.

Point Potrero/Richmond Harbor

Site Description

The site designated Point Potrero/Richmond harbor is a 400 foot long intertidal embayment, the Graving Inlet, on the western side of the Shipyard #3 Scrap Area at the Port of Richmond. The Shipyard is currently used as a parking lot, but in the past the site has been used for shipbuilding, ship scrapping, sand blasting and metal recycling. The geographic feature identified with the site is Point Potrero, although the original configuration of the point has been modified by quarrying of a bedrock hillside and filling of intertidal mudflats.

The embayment known as the Graving Inlet was excavated in 1969 to allow ships to be beached in shallow water for final scrapping operations. Site investigations have shown that the sediments in the Inlet have the same types of contaminants found in the adjacent Shipyard #3, including heavy metals, PCBs and PAHs. While the most heavily contaminated sediments are in the intertidal zone and shallow subtidal zone within the Inlet, elevated levels of PCBs and metals are also found in the subtidal zone outside of the inlet.

Historical Background

Point Potrero has been listed as a candidate toxic hot spot due to the extremely high levels of bioaccumulative contaminants, including the highest levels of PCBs and mercury found by the BPTCP in over 600 samples collected statewide. These contaminants are listed in the San Francisco Bay/Delta Fish Advisory as primary chemicals of concern to human health due to fish consumption. In addition, there is a site-specific health advisory for the Richmond Harbor Channel area based on PCBs and DDTs that was issued by the Office of Environmental Health

Hazard Assessment (OEHHA) and published by the California Department of Fish and Game. Lauritzen Canal, the source of the DDT was cleaned up, under CERCLA, by the summer of 1997.

Levels of contaminants found in the Inlet exceed ERMs in most cases. For example, PCBs exceed ERMs by up to 110 times and mercury by over 10 times. Attempts have been made to associate sediment concentrations of particular contaminants in fish tissue. Concentrations of PCBs at Point Potrero exceed the Washington State Department of Ecology proposed human health based sediment quality criteria by more than 3 orders of magnitude.

Regulatory agencies became involved with the onshore portion of the site in 1984, starting with investigations of leaking and/or unlabeled drums. PCBs, metals and oil and grease were identified in the soils and sandblast waste at the site. Between 1987 and 1988, preliminary remedial actions occurred onshore (removal of drums, sand blast waste and underground storage tanks), the site was graded, storm drains were installed and up to two feet of road base aggregate was added to the site.

Areal Extent

The area that has the highest levels of contaminants (Graving Inlet) has a well-characterized boundary and comprises about one acre. This area is surrounded on three sides by land and the open end of the inlet has been defined by five cores with subsamples at 0 to 0.5 feet, 0.5 to 2.5 feet and 2.5 to 4.5 feet. Other areas along the waterfront have elevated levels of metals (including mercury), PCBs and PAHs, but there is conflicting data on the concentrations and extent of contamination. It is possible that contaminants may extend over one or two additional acres.

Sources

The contaminants found in the sediments near Point Potrero are the same as those found on the adjacent upland: metals, PCBs and PAHs. These areas were the site of shipbuilding operations during World War II and later ship scrapping activities. The sediments with the highest chemical concentrations are found in the Graving Inlet.

Industrial activities that have taken place at the site in the past include: shipbuilding, ship scrapping, and metal scrap recycling. Prior to 1920 the site consisted of unimproved marshland and tidal flats at the foot of the Point Potrero hills. During World War II, the U.S. government appropriated much of the waterfront for wartime ship construction. The two finger piers on the west side of the site were constructed between 1942 and 1949. From the end of World War II until 1964 the site was leased to Willamette Iron and Steel for use as a ship repair, construction, scrapping and steel fabrication facility. After 1964 the shipbuilding and steel fabrication ended when Levin Metals took over the site, but scrapping and recycling continued until 1987. In 1969, the Graving Inlet was excavated into the northwest shoreline of the property to allow final dismantling of the keels of scrapped ships. These activities are the most probable source of sediment contamination at the Graving Inlet and around Point Potrero.

Mission Creek

Site Description

Mission Creek is a 0.75 mile long arm of the Bay in the eastern side of the San Francisco waterfront. Formerly, the estuary of Mission Creek reached back a couple of miles. It was filled to roughly its present dimension before the turn of the century. Currently, the creek is 100 to 200 feet wide in most sections and narrower at the two bridges at 3rd and 4th Streets. Concrete rip rap and isolated bands of vegetation line Mission Creek's banks.

Ten to fifteen houseboats are docked at the Mission Creek Harbor located between 5th and 6th Streets along the south shore of the creek. Many of the houseboats have year round on-board residents.

The City and County of San Francisco operates seven combined sewer overflow structures in Mission Creek from 3rd Street to the upper end at 7th Street. Light industrial and urban development line the shores of Mission Creek. A new baseball stadium will soon open on the north shore at the mouth of Mission Creek near 2nd Street in China Basin. Currently, demolition debris cover the remainder of the north shore. According to City plans, new retail development will occupy this area in the near future. Along the south shore, there is a golf driving range near 6th Street, warehouse facilities, and a sand and gravel operation near the mouth of the Creek. Finally, Interstate Freeway 280 crosses over Mission Creek between 6th and 7th Streets.

Reason for listing

The upper end of Mission Creek in the vicinity of 6th Street meets the definition of a toxic hot spot due to impacts on aquatic life resulting from contaminated sediment. The primary basis for the determination is the BPTCP data. Also, data from a 1979 study the City and County of San Francisco commissioned support the determination. Below is a summary of these data and the specific reason for listing.

The BPTCP data show that the upper end of Mission Creek has recurrent sediment toxicity, elevated concentrations of chemicals, and an impacted benthic community. The report, Sediment Quality and Biological Effects in San Francisco Bay (Hunt et al., 1998a), contain details of these data. Also, the 1979 study the City and County of San Francisco commissioned to assess the impacts of their wastewater overflows (CH2M Hill, 1979) provides support that there are elevated metals and an impaired benthic community at this site.

The BPTCP results show recurrent toxicity to both the amphipod and sea urchin tests at a station located in the upper end of Mission Creek. The amphipod survival was 5 and 19 percent, in the screening and confirmation phases, respectively. Sea urchin larvae development was zero percent normal in the pore water and 11 percent normal in the sediment-water interface exposure. All of these results were lower than the respective reference envelope limits for that test, less than 90% the appropriate minimum significant difference (MSD), and significantly different than controls.

This toxicity is associated with mean ERM quotients of 0.51 for the screening phase and 3.93 for the confirmation phase. The value of 3.93 is the highest of all the BPTCP stations in the Bay. The chemicals consistently found above the ERM values are chromium, lead, and chlordane. Mercury, copper, silver, zinc, dieldrin, PCBs, phenanthrene, and PAHs were also found above the ERM values during confirmation sampling. In addition, chlorpyrifos and mirex levels were in the top 10% of samples in the statewide BPTCP database.

The 1979 study supports the conclusion that there are elevated metals in the sediments at this site. Data from a station 20 yards upstream of 6th Street show metals in the sediment above the ERM levels for copper, lead, mercury, nickel, silver, and zinc.

The BPTCP benthic community analysis for this site shows a Relative Benthic Index (RBI) of zero. A RBI of less than or equal to 0.3 is an indicator that pollutants or other factors are negatively impacting the benthic community.

The 1979 study found no benthic organisms with the exception of one invertebrate, an oligochaeta, in one out of five sampling events between February and April.

During the reference site study a large composite sediment sample was collected from Mission Creek for a Phase I TIE. This sample was toxic to the amphipod *Eohaustorius*. There were high levels of unionized ammonia and hydrogen sulfide in the sample. After the ammonia and hydrogen sulfide were removed toxicity remained. This residual toxicity had to be due to toxicants other than ammonia and sulfide, since those two compounds were reduced to non-toxic levels. However, the residual cause of the toxicity could not be determined (S.R. Hansen & Assoc., 1996).

Areal extent

Our best estimate of the areal extent of the toxic hot spot at this time is approximately 9 acres. This includes the entire width of Mission Creek from its upper end at 7th Street down to the 4th Street bridge. This is a rough estimate based on data from the BPTCP, as discussed below. The precise areal extent is unknown at this time because there are insufficient sampling locations. Additional sampling is necessary to define the actual areal extent, however, it is estimated that it may range from 5 to 12 acres.

The BPTCP collected samples at three stations along Mission Creek: one at the upper end near 6th Street, another near the mouth and a third (added during the confirmation phase) located midway between the two near 4th street. It is data from the upper end station that forms the primary basis for determining that this area is a toxic hot spot.

For the western boundary of the toxic hot spot, we assumed that the upper end station is representative of the sediments upstream to the end at 7th Street. This is a conservative assumption and accurate if the primary source of pollutants is from the combined sewage overflow discharge points located at 6th and 7th Streets. Data from a 1979 study also supports this assumption. The data show elevated metals and impaired benthic community in sediment collected upstream of 6th Street (CH2M Hill, 1979).

We believe the eastern boundary of the toxic hot spot may extend to the 4th Street bridge based on data from the BPTCP midway station. The data show that the sediments here are somewhat impacted though not as impacted as at the upper end station.

Sources

The most likely source of pollutants are the combined sewer overflows (CSO) operated by the City and County of San Francisco. Other sources may include deposition from air emissions from vehicles traveling the Interstate 280 overpass and surrounding streets. PAHs are associated with fossil fuel combustion and mercury along with other metals are a contaminant in diesel exhaust. However, compared to the CSO contribution, these are expected to be minor sources.

The City and County of San Francisco operates seven CSO discharge points into Mission Creek. The largest one is located at the upper end near 7th Street (often referred to as the Division Street overflow structure). The City reports that this CSO structure receives approximately 95% of the overflows. Other CSO structures are located along Mission Creek at 6th, 5th, 4th and 3rd Streets.

CSO discharges consist of sanitary sewage, industrial wastewaters, and storm water runoff from the City's combined sewer system. Currently, CSO discharges occur when storm water and wastewater flows exceed the treatment capacity of the City's treatment plants. The City is currently permitted to overflow an average of ten times per year to the structures in Mission Creek. Before about 1988, the overflows were untreated and occurred anytime rainfall exceeded 0.02 inches per hour. After 1988, newly constructed storage and consolidation facilities provided treatment of the overflows equivalent to primary treatment standards. Primary treatment involves removal of a significant portion of settleable and floatable solids from the wastewaters.

Although there is sparse data on the quality of the historic overflows to Mission Creek, data from recent discharges and other similar sources support the conclusion that the CSOs are the most likely source of the pollutants. These data show that most if not all the pollutants exceeding ERMs in the sediment at this site are also present in urban runoff and/or sewage. Additionally, a 1979 study commissioned by San Francisco concluded that the accumulative impact of the CSOs on the sediments was evident (CH2M Hill, 1979).

Islais Creek

Site Description

Islais Creek is a one mile long channel of the Bay running east-west on the San Francisco waterfront near the foot of Potrero Hill and Caesar Chavez Street. Formerly, the estuary of Islais Creek reached back a couple of miles as far as Bayshore Boulevard, and was fed by a creek that ran down what is now Alamany Boulevard. Before the turn of the century, the area was filled to roughly its present size.

A bridge at Third Street forms a narrow 100-foot wide constriction that physically divides the channel into two segments. The eastern segment is approximately 400 to 500 feet wide; the western, 250 to 300 feet wide.

The City and County of San Francisco operates four wet weather overflow structures that discharge into the western segment. San Francisco also operates a sewage treatment plant effluent outfall that discharges into the western segment at Quint Street.

The banks of Islais Creek are covered with concrete rip-rap with narrow bands of vegetation in small isolated areas. Long stretches of creek bank in the eastern segment are under pier structures. Old pier pilings dot the southern shore of the western segment.

Light industrial and urban development surround Islais Creek. On the shores of the eastern segment are a sand and gravel facility, grain terminal, oil and grease rendering facility, warehouse, and container cargo terminal. Auto dismantlers and auto parts dealers, scrap metal recyclers, and warehouses make up the bulk of the current activities surrounding the western segment. Interstate 280 passes over the western end of Islais Creek.

Reason for listing

The western segment of Islais Creek meets the definition of a toxic hot spot due to impacts on aquatic life resulting from contaminated sediment. The primary basis for our determination is the BPTCP data. Data from various other studies also support our determination. Below is a summary of these data and the specific reasons for listing.

The BPTCP data show that the western segment of Islais Creek has sediment toxicity, elevated concentrations of chemicals, and an impacted benthic community. The report Sediment Quality and Biological Effects in San Francisco Bay (Hunt et al., 1998a) contain these data. The BPTCP report Evaluation and Use of Sediment Reference Sites and Toxicity Tests in San Francisco Bay (Hunt et al., 1998b) contain additional details. Also, a research study in 1987 and a study MEC conducted for San Francisco provide supporting data for our determination that this site is a toxic hot spot. Below are summaries of the data related to each of the three factors.

Recurrent Toxicity

The BPTCP results show recurrent toxicity to both the amphipod and sea urchin tests at a station located in the western segment of Islais Creek. The BPTCP collected sediment samples from this station during the reference site study in 1995 (which served as the screening for this site), and two years later during a confirmation phase.

The amphipod survival was 57% and 0%, in the screening and confirmation phase, respectively. The sea urchin larvae development was 0% normal in the pore water and sediment-water interface during the screening phase. In the confirmation phase, there was only 8% normal development. All of these results were lower than the respective reference envelope limits for that test, less than 90% of the appropriate minimum significant difference (MSD), and significantly different than controls.

During the reference site study, a large composite sediment sample was collected for a Phase I Toxicity Identification Evaluation (TIE). The results of the Phase I Characterization procedures indicated that the sediments from Islais Creek were toxic to the urchin *Strongylocentrotus p*). Sediments were high in unionized ammonia and hydrogen sulfide. When the ammonia and hydrogen sulfide were removed there was still toxicity remaining. The residual toxicity had to be due to toxicants other than ammonia and hydrogen sulfide since those two compounds were reduced to non-toxic levels. The cause of the remaining toxicity was not identified but may have been due to polar organics (S.R. Hansen & Assoc., 1996).

Data from a research study in 1987 supports the finding of toxicity in sediments in the western segment of Islais Creek. This study found toxicity to amphipods and mussel larvae (Chapman et al., 1987).

A study MEC conducted for the City and County of San Francisco in 1996 shows toxicity to amphipods compared to controls in four out of fifteen samples in the western segment (MEC, 1996). Although this study did not find toxicity at all locations in the western segment, the results still support recurrent toxicity and may suggest sediment quality is dynamic in this segment.

Elevated Chemicals

The toxicity described above is associated with a mean ERM quotient of 1.18 for the confirmation phase. This quotient is calculated from the concentrations of a list of metals and organic compounds divided by an average of sediment quality guideline values (ERMs) for those compounds. Sediments with a quotient of greater than 0.5 are considered to have elevated chemical concentrations. The chemicals found above the ERM values are chlordane, dieldrin, PCBs, and low molecular weight PAHs. In addition, endosulfan sulfate was in the top 10% of samples in the statewide BPTCP database.

Data from a 1979 study by CH2M Hill and another research study in 1987 support the conclusion that there are elevated PCBs in the sediments in the western segment. The 1979 study found a mean of 500 ug/kg total Aroclor; the 1987 study found total PCBs at 255 ug/kg (Chapman et al., 1987). Furthermore, the 1987 study found sediments with elevated low and high molecular weight PAHs.

These studies also found metals in the western segment sediments above ERM values. The metals include lead, mercury, and silver. Sediment monitoring in the western segment of Islais Creek by the City and County of San Francisco from 1990 to 1993 show levels of mercury exceeding the ERM in every year except 1990. The ERM value for lead was also exceeded in 1991 (CCSF, 1990-1993).

Impacted Benthic Community

The BPTCP benthic community analysis of the western segment of Islais Creek shows a RBI of 0.22. A RBI of less than or equal to

0.3 is an indicator that pollutants or other factors are negatively impacting the benthic community.

The 1979 study found few to no benthic organisms in five sampling events between February and April in the western segment of Islais Creek. There were a total of only eleven species, six of which the report's authors noted as being unusual because they were freshwater organisms or fly larvae common at sewage treatment plants.

A 1987 research study concluded that this area of Islais Creek was the most depauperate compared to other sites in the study, in terms of taxa richness and total abundance (Chapman et al., 1987).

Areal extent

At this time, our best estimate of the areal extent of the hot spot is approximately 11 acres, comprising the entire width of Islais Creek from its upper end at Selby Street down to Third Street. This is a rough estimate based on data from the BPTCP, as discussed below. The precise areal extent is unknown at this time because there are insufficient sampling locations. Additional investigation is necessary to determine the actual areal extent which may range from 5 to 35 acres.

The BPTCP collected samples at three stations along Islais Creek: one at the upper end near Selby Street, and the other two down stream about 200 feet west (mid-gradient) and 400 feet east (lower end) of the Third Street Bridge. The last two were added during the confirmation phase. It is data from the upper end station that forms the primary basis for determining that that area is a toxic hot spot. Therefore, the western boundary for the toxic hot spot is the upper end of Islais Creek at Selby Street.

The eastern boundary of the toxic hot spot extends out to the Third Street Bridge and probably farther east towards the Bay. The BPTCP data show that the sediments at the mid-gradient station are impacted though not as highly impacted as at the upper end station. The sediment at this station was toxic to sea urchin larvae with 47% normal development, had elevated chemicals with an ERM quotient of 0.6, and had a Relative Benthic Index (RBI) of 0.25.

Support for the statement that the toxic hot spot extends farther east of the Third Street Bridge comes from the last BPTCP station and other studies. These other studies show that the quality of sediments in the eastern segment of Islais Creek has high variability either spatially or temporally. These studies include one by the National Oceanic and Atmospheric Administration in 1992 (Long et al., 1992), another by the Lawrence Berkeley National Laboratory in 1995 (Anderson et al., 1995), and two others by Advanced Biological Testing in 1998 (ABT, 1998a and 1998b).

In 1997, the sediments at the BPTCP lower end station appear impacted. The sediment was toxic to amphipods with 49% survival, and had elevated chemicals with an ERM quotient of 0.62. However, the benthos was less impacted than the other two BPTCP stations with a RBI of 0.43.

A 1992 study collected sediments from Islais Creek at stations further east of the BPTCP stations. These data show mercury, PAHs, and PCBs at concentrations above ERM levels (Long et al., 1992). There was also observed cytogenetic effects on mussel and sea urchin larvae exposed to sediments at these stations compared to controls (Long et al. 1992). The 1995 study also found sediment in this vicinity to be toxic to sea urchins and mussels compared to a reference site (Anderson et al., 1995).

Studies conducted in 1998 for the Port of San Francisco sampled sediments midway along the north shore of the eastern segment of Islais Creek (ABT, 1998a; 1998b). The purpose of the studies was to characterize the sediments for maintenance dredging. The data did not show elevated concentrations of chemicals although several samples were toxic to mussel larvae and one sample was toxic to amphipods.

<u>Sources</u>

The most likely source of pollutants are the CSO operated by the City and County of San Francisco. Another likely source is San Francisco's treatment plant discharge outfall at Quint Street. Because of recent improvements in the quality of the discharges from these sources in the past two years, historic discharges are probably more of a factor. Other sources may also contribute. Additional description of all these sources and potential sources are below.

CSOs

The City and County of San Francisco operates four CSO discharge points into Islais Creek. Two are at the upper end near

Selby Street (referred to as the Selby Street and Marin Street overflow structures). The other two CSO structures are at Third Street.

CSO discharges consist of sanitary sewage, industrial wastewaters, and storm water runoff from the City's combined sewer system. CSO discharges occur when storm water and wastewater flows exceed the treatment capacity of the City's treatment plants. The City is currently permitted to overflow an average of four times per year to the structures in Islais Creek. Newly constructed storage and consolidation facilities provide treatment of the overflows equivalent to primary treatment standards. Primary treatment involves removal of a significant portion of settleable and floatable solids from the wastewaters. However, prior to the completion of these consolidation facilities in 1996, the overflows were untreated and occurred anytime rainfall exceeded 0.02 inches per hour.

Although there is sparse data on the quality of the historic overflows to Islais Creek, data from recent discharges and other similar discharges support the conclusion that the CSOs are the most likely source of the pollutants. Most if not all the pollutants exceeding ERMs in the sediment at this site are or were pollutants in urban runoff and/or sewage. Additionally, a 1979 study commissioned by San Francisco concluded that the accumulative impact of the CSOs on the sediments was evident (CH2M Hill, 1979).

Quint Street Outfall

This outfall is at the south shore of Islais Creek at Quint Street just west of the Third Street Bridge. San Francisco uses this outfall when wastewater flows from the Southeast Wastewater Treatment Plant exceed the capacity of the main deep water discharge outfall to the Bay. The capacity of the deep water outfall is 100 million gallons per day.

After completing a re-piping project and increasing the secondary treatment capacity of the plant in 1997, San Francisco discharges only secondary treated wastewater to the outfall. Prior to 1997, the Quint Street outfall received a blend of primary and secondary treated wastewaters from the treatment plant.

Secondary treatment is a higher level of treatment than primary. Primary treatment relies on physical separation and removal of settleable and floatable solids. Secondary involves using biological treatment technologies which can remove dissolved pollutants. Secondary treatment standards require removal of at least 80% of the suspended solids and oxygen consuming matter from the sewage.

As is the case for the CSO, most if not all the pollutants exceeding the ERMs in the sediment at this site are or were pollutants in treated sewage. Therefore, the discharges from the Quint Street Outfall are or were a likely source.

Other Potential Sources

Other sources of pollutants to Islais Creek may include sheet runoff or any past discharges from auto dismantlers and metal recycling facilities bordering Islais Creek. Deposition from air emissions from vehicles traveling the Interstate 280 overpass and surrounding streets may also contribute. PAHs are associated with fossil fuel combustion. Mercury and other metals are contaminants in diesel exhaust. However, compared to the CSO and Quint Street outfall contributions, these are estimated to be minor sources.

Central Coast Region (Region 3)

Moss Landing and Tributaries

Site Description

Moss Landing and the surrounding vicinity has special importance for both the State and Nation. Because of the unique nature of the marine environment within the area, the National Oceanic and Atmospheric Administration (NOAA) established the Monterey Bay National Marine Sanctuary in 1992. Elkhorn Slough is a NOAA National Estuarine Research Reserve. These designations reflect the high resource values found within the area.

Moss Landing Harbor receives drainage water from Elkhorn Slough watershed, Moro Cojo Slough watershed, Tembladero Slough watershed, the Old Salinas River, and the Salinas River.

The watershed areas include only the lower portions of the Salinas watershed. Some Salinas River water drains to the Old Salinas River and then to Moss Landing Harbor. A slide gate near the mouth of the Salinas River permits approximately 250 cubic feet per second to pass to the Old Salinas River (Gilchrist et al., 1997). Other watercourses such as the Blanco Drain and the Salinas

Reclamation Canal also drain either directly or indirectly to Moss Landing Harbor.

Because of a "high" ranking for impacts to aquatic life due to sediment toxicity with confirming chemistry and tissue bioaccumulation, the areal extent of the problem, and the sensitive nature of the area, "high priority toxic hot spot" status is warranted for the Moss Landing area. The area was given a moderate ranking for Human Health because of pesticide levels in tissue repeatedly exceeding federal standards. It was not given a "high" ranking for Human Health because health advisories have not been issued recently.

Sediments from Moss Landing Harbor have been shown for a number of years to contain high levels of pesticides, in some cases at levels which cause concern for human and aquatic life. Concentrations of a number of pesticides in fish and shellfish tissue have exceeded National Academy of Sciences (NAS) Guidelines, USEPA Screening Values, and Food and Drug Administration (FDA) Action Levels.

In addition to pesticides, PCBs have also been identified as a concern in the Harbor and its watershed; they have been detected in shellfish tissue by the State Mussel Watch Program at elevated concentrations for many years.

High levels of Tributyltin exceeding EPA Screening Values have been detected in mussel tissue at several locations in the Harbor. The Harbor's watershed supports substantial agricultural and urban activities, which are sources of pesticides and other chemicals. Several chemicals detected by the program have been banned for many years. Although chemical types and usages have changed, banned chemicals, particularly chlorinated hydrocarbons, are still mobilized through eroding sediments. Actions to alleviate this problem consist of proper disposal of dredged materials, source control management measures for the chemicals of concern, and management of erosion of associated sediment.

Moss Landing was given a moderate "remediation potential" ranking according to BPTCP guidelines, since improvements may or may not occur over time without intervention. Although concentrations of persistent chemicals which have been banned will eventually decrease without action in aquatic systems, the time involved in significant reductions in the Harbor would have to be measured in decades. Reducing land erosion and implementing Best Management Practices in urban, agricultural and harbor areas will remediate the problem more rapidly and provide other benefits for both the land and Harbor. Both chemical concentrations and the volumes of sediment which must be dredged from the Harbor will be reduced, improving aquatic habitat and reducing problems with dredge spoil disposal. Implementation of appropriate erosion control practices will serve to restore and protect the status of beneficial uses including navigation, aquatic life, and human health.

Background and most likely sources of pollutants

The majority of chemicals found at excessive concentrations in the Harbor and its tributaries are pesticides, and most have already been banned. Chemical exceedances of State Mussel Watch and Toxic Substances Monitoring Program guidelines have been detected from fish and shellfish data collected within the Moss Landing watershed in the past ten years (Rasmussen 1991, 1992, 1993, 1995a, 1995b, 1995c, 1996, 1997). Tissue data (Rasmussen, 1995, 1996, 1997) shows that total DDT values in the southern Harbor increased dramatically after the end of the drought of the mid and late 1980's. Other pesticides follow a similar trend. Nesting failure of the Caspian Tern (a bird species of special interest) in Elkhorn Slough in the heavy rain year of 1995 was attributed to high tissue levels of DDT resulting from storm-driven sediments (Parkin, 1998). High flow events carry large amounts of chemical-laden sediments into sensitive aquatic habitats and the Moss Landing Harbor. Soil erosion from numerous sources is a major transport mechanism for a variety of chemicals impacting the Harbor (Kleinfelder, 1993).

Agricultural Activities

Past and present storage and use of agricultural biocides is a primary source of chemicals found in Moss Landing Harbor. Fine sediment in runoff from agricultural land is the primary transport mechanism for many chemicals (Kleinfelder, 1993; NRCS, 1994; AMBAG, 1997). Erosion from farm land is a concern for private landowners and the public alike. Though most of the chemicals of concern are no longer applied to agricultural land, they are still present in soils· Banned chemicals found in soils tested on agricultural land in the Elkhorn Slough watershed include DDT and its breakdown products, Dieldrin, Endrin, Chlordane and Heptachlor Epoxide (Kleinfelder, 1993, RWQCB, raw data 1998). Though PCBs were used extensively in industrial applications, prior to 1974 they were also components of pesticide products and may originate from agricultural as well as industrial sources (U.S. EPA Envirofacts, 1998). Several currently applied chemicals have been detected at various sites in the watershed, including Chlorpyrifos, Diazinon, Dimethoate and Endosulfan (Ganapathy et al., draft).

River and Stream Maintenance Activities

Local agency personnel indicate DDT was used for mosquito control in the sloughs draining to Moss Landing in past years (Stillwell, pers. comm., 1997). This must have introduced large amounts of DDT and its breakdown products directly into the river and estuarine systems.

River systems in the area have been treated for riparian plant control for a number of years in order to increase water supply and channel capacity (Anderson-Nichols & Co., 1985). Vegetation removal, which increases flow velocities and consequent sediment transport, may exacerbate erosion and transport of chemicals of concern.

Urban Activities

Large amounts of certain pesticides are used in the urban environment. These have included chlordane and dieldrin for treatment of termites and other wood boring insects, and diazinon and other chemicals for household and garden use.

PCBs were widely used in industrial applications prior to 1974, when their use was confined to transformers and capacitors. They have not been used in any application since 1979. Because of their diverse past use and extreme persistence, they are still present at many sites throughout the watershed.

Polyaromatic Hydrocarbons (PAHs) are petroleum related chemicals. These are common pollutants in urban runoff, from improperly handled waste oil, street and parking lot runoff, and other sources.

Sampling conducted in Tembladero Slough for BPTCP found highest levels of dieldrin below the City of Salinas, exceeding Effects Range Median (ERM) values by six-fold. Concentrations of this chemical generally decreased with distance below the City. Other concentrations for nearly all measured pesticides and PAHs were higher here than anywhere else measured in the drainage. Both sediment and water toxicity were found at this site. (SWRCB et al., 1998). Because agricultural activity occurs above the City of Salinas and no sampling site was placed upstream of the City, it is not possible to discriminate between agricultural and urban sources at this time. However, the decrease in concentrations in downstream agricultural areas indicate that urban sources may be significant contributors and should be the subject of further study.

Harbor Activities

Tributyltin has been documented over the years at several sites in Moss Landing Harbor. This chemical was the active ingredient in antifouling paint for boat bottoms. Its use has been banned for many years, but it is persistent in the environment. Other chemicals associated with Harbor activities include PAHs, copper, zinc, and other metals.

Cañada de la Huerta – Shell/Hercules Site

Site Description

The Shell Western/Hercules Gas Plant site (now owned by Aera Energy LLC (Aera)) is located adjacent to Cañada de la Huerta, approximately 18 miles west of Goleta in Santa Barbara County. The plant was constructed in 1963 and operated until 1988. It processed natural gas from offshore wells for pipeline transport. The site is located in a canyon (known as Cañada de la Huerta) that is approximately 3600 feet in length (from the headwaters of the canyon to the ocean) and approximately 1200 feet wide (from ridge to ridge). This canyon can be divided into four zones described as follows:

Sea Cliff - This zone is approximately 400 feet in length and includes the canyon's point of discharge from a three-foot diameter culvert to the sea wall and into the ocean. The culvert inlet is located on the north side of Highway 101 and runs beneath the highway and the Union-Pacific Railroad right-of-way.

Lower Canyon – This zone is approximately 700 feet in length and includes a riparian area with a perennial surface water flow fed by groundwater seepage.

Fill Pad – This zone is approximately 600 feet in length and was the former location of Shell Western E&P Inc.'s gas plant. Shell constructed a terraced fill pad, involving three levels, through this zone. The Fill Pad was constructed from soils excavated at the head of this canyon. A four-foot diameter culvert is located beneath and along the full length of this zone. The culvert's inlet is located in a sediment retention basin, described below, and terminates at the head of the Lower Canyon.

Upper Canyon – This zone is approximately 1500 feet in length and includes riparian areas along an ephemeral stream. There is a sediment retention basin at the south end of this zone. As indicated, the head of the Upper Canyon was the borrow site for constructing the Fill Pad.

In 1986 soils at the site were discovered to contain PCBs and other chemicals, due to operations and maintenance at the plant, and storage of a heat transfer fluid onsite. In 1988, a remedial investigation was initiated, as a result of a Consent Agreement between Shell Western and the Department of Toxic Substances Control. The investigation found soils containing PCBs in concentrations exceeding 50 parts per million (ppm). The soil was excavated from the site and removed to a landfill for disposal. A Human Risk Assessment comprised a large part of the analysis associated with the Remedial Action Plan. The analysis only considered individuals in direct contact with the site. Cleanup at 50 ppm was deemed appropriate to protect Human Health given a "Reasonable Maximum Exposed" individual. This corresponds to the Toxic Substances Control Act Protection Level for PCBs, but is considerably less protective than other suggested protection levels as published in the National Sediment Quality Survey (U.S. EPA, 1997).

Data collected as part of the post-remediation monitoring program in 1997- 98 indicate that PCB levels at the site still violate USEPA, Ocean Plan, and Basin Plan standards in both surface and ground water by orders of magnitude. Toxicity has been documented in both water and sediment. Sediment PCB levels from post-remediation sampling have ranged at some sites between 3,000 and 20,000 ppb (wet weight). These values are orders of magnitude higher than numerous protective levels referenced in the 1997 U.S. EPA document which are intended to provide protection for various beneficial uses.

A number of different species still show elevated tissue levels of PCBs, with many exceedances of EPA Screening levels (10 ppb), FDA Action Levels (2,000 ppb), and/or NAS Guidelines for protection of wildlife (500 ppb). Worm tissue collected at the site is particularly high in PCBs. Tissue from marine species, including mussels and shore crabs, are also elevated above EPA Screening levels and Maximum Tissue Residual Levels.

It was assumed at the onset of post-remediation monitoring that the site could take a year or more to stabilize following treatment. The first year of monitoring data indicates both water quality violations and tissue bioaccumulation concerns. In spite of prior remediation efforts, the site appears to qualify at this time as a high priority toxic hot spot based on Bay Protection and Toxic Cleanup Program guidelines; we recommend that it be included as a "known toxic hot spot".

Aera (formerly Shell) owns 56 acres of this canyon (a portion of the Lower Canyon, the Fill Pad and Upper Canyon). Four acres of Aera's property was used as the gas plant site area (essentially the Fill Pad zone). It is unclear to what extent the remediation effort reduced the areal extent of contamination at the site, but it is likely that the areas remediated are still a source of contamination (e.g., soils were taken from a sediment retention basin onsite to fill the excavated area in the lower canyon). At least ten acres may still require additional remediation in order to fully protect beneficial uses. We are proposing amending the Post-Remediation Monitoring Program to address this issue.

Background and most likely sources of pollutants

The Shell Western E & P Inc. Hercules Gas Plant used a heat transfer fluid, Therminol oil, as part of the treatment process while in operation from 1963 to 1989. This fluid contained PCB. PCBs were released to site soils, ground waters and surface waters from Shell's various practices at this site. In addition to PCBs, activities at the plant caused releases to the environment of benzene, toluene, xylenes, ethylbenzene, total petroleum hydrocarbons and polynuclear aromatic hydrocarbons, along with many other chemicals and some metals.

Some pollution, though probably minimal, may possibly also originate from Highway 101 and railroad right-of-way stormwater runoff, which discharges to the seawall culvert onsite.

Los Angeles Region (Region 4)

Region Description

The Los Angeles Region encompasses all coastal drainages flowing to the Pacific Ocean between Rincon Point (on the coast of western Ventura County) and the eastern Los Angeles County line, as well as the drainages of five coastal islands (Anacapa, San Nicolas, Santa Barbara, Santa Catalina and San Clemente). In addition, the region includes all coastal waters within three miles of the continental and island coastlines.

The region contains two large deepwater harbors (Los Angeles and Long Beach Harbors) and one smaller deepwater harbor (Port Hueneme). There are small craft marinas within the harbors, as well as tank farms, naval facilities, fish processing plants, boatyards, and container terminals. Several small-craft marinas also occur along the coast (e.g., Marina del Rey, King Harbor, Ventura Harbor); these contain boatyards, other small businesses and dense residential development.

Several large, primarily concrete-lined rivers (e.g., Los Angeles River, San Gabriel River) lead to unlined tidal prisms which are influenced by marine waters. Salinity may be greatly reduced following rains since these rivers drain large urban areas composed of mostly impermeable surfaces. Some of these tidal prisms receive a considerable amount of freshwater throughout the year from publicly-owned treatment plants discharging tertiary-treated effluent. Lagoons are located at the mouths of other rivers draining relatively undeveloped areas (e.g., Mugu Lagoon, Malibu Lagoon, Ventura River Estuary, Santa Clara River estuary). There are also a few isolated coastal brackish water bodies receiving runoff from agricultural or residential areas.

Santa Monica Bay, which includes the Palos Verdes Shelf for the purposes of the Bay Protection and Toxic Cleanup Program, dominates a large portion of the open coastal waters in the region. The region's coastal waters also include the areas along the shoreline of Ventura County and the waters surrounding the five offshore islands in the region.

Santa Monica Bay/Palos Verdes Shelf

The contaminated sediments on the Palos Verdes Shelf appear to significantly impact the marine community and may pose a serious threat to individuals who regularly consume fish from the area. Currently, elevated levels of DDT and PCBs are found in the organisms that live in the area of the contaminated sediments, including bottom feeding fish such as white croaker, and water column feeders such as kelp bass. Marine mammals and birds may be affected through the consumption of contaminated fish (Ecological Risk Evaluation Report for the Palos Verdes Shelf, Draft report prepared by SAIC for United States Environmental Protection Agency, September 1998).

The ongoing release of these hazardous substances from the sediment into the environment and the resulting accumulation of DDT and PCB in food chain organisms may persist if no action is taken. Commercial fishing and recreational fishing have been affected by the contamination. The State of California has published recreational fishing advisories for most areas offshore of Los Angeles and Orange Counties and has closed commercial fishing for white croaker on the Palos Verdes Shelf.

Areal Extent of the Toxic Hot Spot

In July 1996, the United States Environmental Protection Agency initiated a response action under Superfund site and began an evaluation to address the large deposit of DDT and PCB contaminated sediments on the Palos Verdes Shelf. The contaminated sediment footprint identified as the study area for this evaluation was defined as the boundary for one part-per-million (mg/kg) sediment DDT concentration described by the United States Geological Survey (USGS), covering portions of the continental shelf and continental slope between Point Vicente in the northwest and Point Fermin to the southeast. This entire area is proposed as a candidate known toxic hot spot. Studies by the U.S. Geological Survey in 1992 and 1993 indicated that this layer of contaminated sediments is about two inches to two feet thick and covers an area of more than 15 square miles, with the highest concentrations located in a 3-square mile band near the outfall pipes. The total volume of contaminated sediments on the Palos Verdes Shelf is approximately 9 million cubic meters and covers a surface area of approximately 40 square kilometers, with approximately 70% of this volume present on the continental slope in water depths less than 100 meters. The total mass of p,p'-DDE in the contaminated sediments is estimated to be greater than 67 metric tons.

In samples collected for the Bay Protection and Toxic Cleanup Program sediment concentrations at stations exceeded the ERM thresholds for Total DDT and Total PCB. Samples collected at other stations also exceeded the ERM thresholds for Total DDT and Total PCB. Porewater toxicity to abalone was recorded, as was a degraded benthic community at other stations in the area.

Sources of Pollutants

From 1947 to 1983, the Montrose Chemical Corporation of California, Inc., manufactured the pesticide dichloro-diphenyl-trichloroethane (DDT) at its plant in Los Angeles. Wastewater containing significant concentrations of DDT was discharged from the Montrose plant into the sewers, flowed through the Los Angeles County Sanitation Districts' wastewater treatment plant and was discharged to the Pacific Ocean waters on the Palos Verdes Shelf through subsurface outfalls offshore of Whites Point. Montrose's discharge of DDT reportedly stopped around 1972, and the plant was shut down and dismantled in 1983.

Polychlorinated biphenyls (PCBs) also were present in the wastewater discharged from the LACSD wastewater treatment plant and are found along with DDT in the effluent-effected deposits on the ocean floor along the Palos Verdes Shelf. Historically, PCB contamination entered the sewer system as the result of discharges from several industrial sources.

Although DDT and PCBs were banned in the early 1970s, resuspension of historically deposited sediments continues to be a source of these toxic chemicals. Concentrations of total DDT and p,p'-DDE (the predominant metabolite of DDT) in the surface sediments have remained relatively high since the late 1980s. This suggests that historical deposits are brought to the sea floor surface by a combination of natural physical, chemical or biological processes.

Besides DDT and PCB, there has been little evidence that the concentrations of other toxic organic compounds, such as PAHs and heavy metals (including copper, cadmium, chromium, nickel, silver, zinc and lead), discharged from the LACSD wastewater treatment plant have caused impacts to marine organisms. However, the concentrations of heavy metals in the sediments on the Palos Verdes Shelf are significantly higher than the background levels found in most parts of Santa Monica Bay and other parts of the Southern California Bight.

Mugu Lagoon/Calleguas Creek Tidal Prism

Monitoring of Mugu Lagoon and the lower Calleguas Creek watershed has identified the following problems: (1) impaired reproduction in the light-footed clapper rail, a resident endangered species inhabiting the lagoon, due to elevated levels of DDT and PCBs; (2) fish and shellfish tissue levels exceeded National Academy of Sciences guidelines for several pesticides; (3) possible exceedances of U.S. Environmental Protection Agency water quality criteria for the protection of saltwater biota for nickel, copper and zinc at some locations; (4) possible impacts to sediment and water quality, as well as aquatic community health, from operations at the Naval Air Base over many years. Several pesticides whose use has been discontinued still are found at high concentrations in the sediment and biota; (5) excessive sediment loading.

The Point Mugu Naval Air Base is located in the immediate vicinity of Mugu Lagoon. The surrounding Oxnard Plain supports a large variety of agricultural crops. These fields drain into ditches which either enter the lagoon directly or through Calleguas Creek and its tributaries. The lagoon borders on an Area of Special Biological Significance and supports a great diversity of wildlife, including several endangered birds and one endangered plant species. Except for the military base, the Oxnard Plain portion of the watershed is relatively undeveloped.

Calleguas Creek and its major tributaries (Revolon Slough, Conejo Creek, Arroyo Conejo, Arroyo Santa Rosa and Arroyo Simi) drain an area of 343 square miles in southern Ventura County and a small portion of western Los Angeles County. This watershed is about 30 miles long and 14 miles wide.

The Calleguas Creek watershed exhibits some of the most active and severe erosion rates in the country. Although erosion rates are naturally high in this tectonically active area, land use also is a factor in erosion and sedimentation problems. Channelization of Calleguas Creek was initiated by local farmers in Somis and downstream areas beginning about 1884, and around Revolon Slough in 1924. Following complete channelization, eroded sediment generated in the higher reaches of the Calleguas Creek watershed has begun to reach Mugu Lagoon even during minor flood events. At current rates of erosion, it is estimated that the lagoon habitat could be filled with sediment within 50 years.

Urban developments generally are restricted to the city limits of Simi Valley, Moorpark, Thousand Oaks and Camarillo. Although some residential development has occurred along the slopes of the watershed, most upland areas still are open space. Agricultural activities (primarily cultivation of orchard and row crops) are spread out along valleys and on the Oxnard Plain. The U.S. Navy maintains a Naval Air Base on much of the area around Mugu Lagoon.

The main surface water system drains from the mountains and toward the southwest, where it flows through the flat, expansive Oxnard Plain before emptying into the Pacific Ocean through Mugu Lagoon. Mugu Lagoon, situated at the mouth of the Calleguas Creek system, is one of the few remaining salt marshes in southern California along the Pacific Flyway. Threatened and endangered species that are supported by valuable habitats in Mugu Lagoon include the peregrine falcon, least tern, light-footed clapper rail and brown pelican. In addition to providing one of the last remaining habitats on the mainland for harbor seals to pup, Mugu Lagoon is a nursery ground for many marine fish and mammals.

The Eastern Arm of Mugu Lagoon is somewhat removed from the rest of the lagoon and tends to receive water from and drain directly into the lagoon mouth. The arm empties and fills rather quickly, leaving a considerable amount of sand near its western end, but moving towards finer sediments further east. The water tends to be marine in character the majority of the time.

The Main Lagoon and Western Arm are the areas most heavily used by birds (including endangered species). The Western Arm, with its slight gradient and slow water flow, has the most widespread freshwater influence during dry weather, receiving water from several drains. The Main Lagoon is affected primarily by Calleguas Creek, which may carry a considerable amount of fresh water during storms, although this flow generally is funneled into a channel which leads to the lagoon mouth.

Areal Extent of the Toxic Hot Spot

Sediment contamination clearly exists throughout Mugu Lagoon and within the Calleguas Creek Tidal Prism. Problems appear to be worst in the Western Arm of Mugu Lagoon, particularly near the Rio de Santa Clara, which drains neighboring agricultural lands, and parts of the Eastern Arm. Although sediment contamination problems occur in the Main Lagoon, it appears that the large volume of this waterbody and good flushing is helping to keep contamination and associated effects at a lower level than might otherwise be expected. It is estimated that approximately 20% of the Western Arm and approximately 10% of the Eastern Arm of Mugu Lagoon contain contaminated sediments. The total volume of contaminated sediments is estimated to be approximately 725,000 cubic yards (based on approximately 150 acres with 3-foot depth of contamination).

Twenty-two miles of Calleguas Creek are listed as impaired due to high sediment concentrations of pesticides and accumulation in fish and shellfish. However, the area with the greatest contamination problem is estimated to cover approximately 3 miles. The total volume of contaminated sediments is estimated to be approximately 50,000 to 100,000 cubic yards.

In samples collected for the BPTCP on February 6, 1997, sediment concentrations at stations 48013.0, 48014.0, 48015.0, 48016.0, 48017.0 and 48018.0 exceeded the ERM Thresholds for p,p'-DDE and Total DDT. Station 44054.0 also exceeded the p,p'-DDE threshold on June 19, 1996. No sediment chemistry data was collected during sediment toxicity screening surveys conducted on January 12, 1993 and April 14, 1994.

Amphipod toxicity with whole sediment was observed at stations 44016.0, 44050.0, 44051.0, 44052.0, 44053.0 and 44054.0 on January 15, 1993. Amphipod toxicity was observed at stations 44053.0 and 44054.0 on April 18, 1994, and station 48015.0 on February 10, 1997. A degraded benthic community was found at all of the stations analyzed (48013.0, 48014.0, 48015.0, 48016.0, 48017.0 and 48018.0) on February 10, 1997.

Fish were collected from Mugu Lagoon for bioaccumulation analyses. Shiner surfperch exceeded the EPA guidelines for total PCB, but not for total DDT. Topsmelt did not exceed the EPA screening guidelines for total DDT or total PCB.

Sources of Pollutants

Pesticides are of concern in Mugu Lagoon at the mouth of the Calleguas Creek watershed. The primary source of pesticides probably is agricultural runoff, both during dry weather and wet weather. Water-soluble pesticides currently in use, such as diazinon and chlorpyrifos, may be occurring in sediment porewater at high enough concentrations to be causing observed porewater toxicity. These pesticides are likely involved with observed upstream ambient toxicity. Historical discharges of pesticides, such as DDT, PCBs, toxaphene, chlordane and others, probably has contributed to the existing sediment contamination problem. Erosion from unlined channels in the watershed and from agricultural lands probably contributes to the excessive sediment loading in Mugu Lagoon. Metals may originate from non-point source runoff during dry and wet weather conditions.

The RWQCB has issued 37 permits for discharges of wastewater from point sources into the Calleguas Creek watershed. Of the 22 permitted discharges under the NPDES program, 7 are for municipal wastewaters from publicly-owned treatment works, accounting for a combined permitted discharge of 36.7 million gallons per day (98% of the total permitted discharges). Of the remaining NPDES permits, 11 are for discharges of treated groundwater from hydrocarbon or other contamination, and 5 are general permits for discharges of either well development water or ground water from dewatered aquifers at construction sites. In addition, 88 releases of stormwater from major municipalities, certain industrial activities and construction projects are now permitted under the Regional Board's NPDES program for storm water.

Only one landfill, the Simi Valley Landfill, is active in the watershed. Simi Valley Landfill began operating in 1970. Hazardous wastes were accepted until 1983; since that time, only Class III wastes (municipal solid waste) have been discharged at this landfill. Since operations at the landfill predate current regulations for siting waste management units, only a portion of the Simi Valley Landfill is lined in accordance with current regulations. Leaks from unlined portions of the landfill have contaminated ground water in an underlying sandstone aquifer; corrective actions are underway by the operator under the direction of the Regional Board.

Los Angeles/Long Beach Harbors

The Los Angeles and Long Beach Harbors are located in the southeastern portion of the Los Angeles Basin. Along the northern portion of San Pedro Bay, there is a natural embayment formed by a westerly extension of the coastline which contains both harbors, with the Palos Verdes Hills as the dominant onshore feature. Offshore, a generally low topographic ridge is associated with the eastern flank of the Palos Verdes uplift and adjacent Palos Verdes fault zone, and extends northwest across the San Pedro shelf nearly to the breakwater of the Los Angeles Harbor.

The port and harbor areas have been modified over the course of more than one hundred years to include construction of breakwaters, landfills, slips and wharves, along with channelization of drainages, dredging of navigation channels and reclamation of marshland. The inner harbor includes the Main Channel, the East and West Basins, and the East Channel Basin. The outer harbor is the basin area located between Terminal Island and the San Pedro and Middle Breakwaters. Los Angeles and Long Beach Harbor are considered to be a single oceanographic unit, and share a common breakwater across the mouth of San Pedro Bay. The outer harbor areas reflect the conditions of the coastal marine waters of the Southern California Bight, while the inner harbor areas typically have lower salinities.

In the presence of the strong currents and rocky habitat of the outer harbor, aquatic life communities are similar to those of the nearby coast, while the inner harbor supports biota generally found in bays and estuaries. The inner harbor has a mostly soft bottom character.

The major surface drainages in the area include the Los Angeles River, which flows in a channel and drains parts of the San Fernando Valley, as well as downtown and south Los Angeles, into eastern San Pedro Bay at Long Beach. The Dominguez Channel drains the intensely urbanized area west of the Los Angeles River into the Consolidated Slip of the Los Angeles Inner Harbor, carrying with it mostly urban runoff and non-process industrial waste discharges. A major source of both freshwater and waste in the outer harbor is secondary effluent from the Terminal Island Treatment Plant. Waste discharges to the inner harbor area of Los Angeles Harbor consist of both contact and non-contact industrial cooling wastewater and stormwater runoff. Fuel spills and oil spills from marine vessel traffic or docking facilities also contribute pollutants to the inner harbor.

Los Angeles Outer Harbor/Cabrillo Pier

Areal Extent of the Toxic Hot Spot

The site's toxic hot spot status is based on several factors, including a fish advisory warning against human consumption of white croaker, which resulted from an OEHHA study released in 1991 which cited elevated DDT and PCB levels in a number of fish species caught in the area. Sediment DDT levels in some BPTCP samples collected from the site were elevated above that found elsewhere in the harbor, while sediment PCB levels were comparable to other sites. Sediment toxicity fluctuated widely. This is a heavily used sustenance and sportfishing pier. It is unclear whether fish caught there are contaminated from DDT found locally or from sources outside of but close to the harbor. It is estimated that 25,000 to 50,000 cubic yards of contaminated sediments exist within the Cabrillo Pier area (based on 1 to 2 foot depth of contaminants).

Based on samples collected for the BPTCP, sediment concentrations exceeded the ERM Threshold for Total DDT at every station (40010.1, 40010.2, 40010.3, 49001.0, 49002.0, 49003.0) on each occasion that sediment chemistry analyses were conducted (August 18, 1992; September 16, 1992; August 19, 1993; May 19, 1994; February 15, 1994; May 13, 1997). Sediment concentrations also exceeded the ERM for copper at station 40010.1 (Replicates 1, 2 and 3) on February 14, 1994. Amphipod toxicity with whole sediments was observed at station 40010.1 on May 28, 1993, and again at stations 40010.1, 40010.2 and 40010.3 on February 14, 1994. A degraded benthic community was observed at station 40010.2 (Replicate 2) on August 17-19, 1993.

Fish were collected on May 12, 1997, to assess bioaccumulation of DDT and PCB. Total DDT and total PCB in white croaker muscle tissue samples exceeded EPA screening values at stations 49001.0, 49002.0 and 49003.0. Total PCB in white surfperch muscle tissue also exceeded the EPA screening value at all three stations, although total DDT concentrations fell below the EPA screening value. Clams (Macoma) collected at station 49002.0 also exceeded the EPA screening value for total PCB.

Sources of Pollutants

Historical discharges of DDT, PCBs and metals are the probable cause of sediment contamination in the Cabrillo Pier area. Discharge of wastewater effluent from the Terminal Island Treatment Plant is a potential source of pollutants, especially metals. Nonpoint sources of pollutants include spills from ships and industrial facilities, as well as stormwater runoff. Many areas of the port have experienced soil and/or groundwater contamination, which may result in possible transport of pollutants to the harbor's surface waters.

<u>Los Angeles Inner Harbor/Dominguez Channel, Consolidated Slip</u>

Areal Extent of the Toxic Hot Spot

A reservoir of polluted sediment in Consolidated Slip (moving down from Dominguez Channel) probably is continuing to contaminate a large part of Los Angeles Inner Harbor. It is estimated that approximately 30,000 cubic yards of contaminated sediments exist in Consolidated Slip and approximately 20,000 cubic yards in Dominguez Channel (based on 6 miles of channel contaminated to an average depth of 1 foot).

In limited sampling conducted on July 30, 1992, sediment samples from stations 40006.1 and 40006.2 exceeded ERM thresholds for zinc, total chlordane and total PCB; in addition, station 40006.1 also exceeded the ERM for mercury. Amphipod toxicity with whole sediments, as well as porewater toxicity with the abalone test, were observed at both stations. A degraded benthic community was observed at station 40006.1.

In limited sampling conducted on February 3, 1994, sediment samples from station 40006.1 (Replicates 1, 2 and 3) exceeded ERM thresholds for zinc, total chlordane, total PCB and high molecular weight PAH; in addition, Replicate 3 from this station also exceeded the ERM for mercury. Amphipod toxicity was observed in Replicates 1 and 2 from station 40006.1. Benthic samples were not analyzed on this occasion.

A more extensive survey was conducted at several stations on July 22, 1996, including the collection of surface samples and subsurface samples. Sediment samples from stations 47001.0, 47002.0, 47003.0, 47004.0, 47005.0, 47010.0, 47007.0, 47008.0 and 47009.0 all exceeded at least one ERM threshold, and sometimes exceeded several, including those for cadmium, copper, lead, mercury, zinc, dieldrin, total PCB, low molecular weight PAH, high molecular weight PAH and total PAH. Amphipod toxicity with whole sediment was observed at stations 47001.0 (surface and depth 2), 47002.0 (surface), 47003.0 (surface and depth 2), 47004.0 (surface and depth 2), 40005.0 (surface and depth 2), 47007.0 (surface), 47008.0, 47009.0 (surface) and 47010.0 (surface). A degraded benthic community was found at stations 47002.0, 47003.0, 47009.0 and 47010.0.

When average ERM Quotient exceeds 1.00, the probability of amphipod toxicity was found to be 71% (Long et al., 1995). When average PEL Quotient exceeds 1.00, probability of significant amphipod toxicity was found to be 56% (McDonald, 1996). Consolidated Slip exceeded both of these effect thresholds at several stations (47004.0, 4006.1, 47002.0, 47009.0, 47003.0, 47008.0, 47001.0, 40006.2, 40007.0). When sediment concentrations were found to exceed 11 or more of the ERM thresholds, 85% of the samples have been found to be significantly toxic to amphipods. When sediment concentrations exceeded 21 or more of the PEL thresholds, 100% of the samples have been found to be significantly toxic to amphipods. One of the Consolidated Slip stations exceeded the ERM threshold (47004.0), but not the PEL threshold.

Sources of Pollutants

Historical discharges of DDT, PCBs and metals probably caused much of the existing contamination. Current point source discharges of process water and other waste streams from refineries located along Dominguez Channel may be contributing to the contamination problem. Numerous nonpoint sources, such as spills, vessel discharges, leaching of pollutants from boat anti-fouling paints, and storm drains, also are present in the area.

Central Valley Region (Region 5)

Mercury

Site Description

The Central Valley Region covers the entire area included in the Sacramento and San Joaquin River drainage basins. The two basins cover about one fourth of the total area of the State and include over 30% of the State's irrigable land. Waters from the Sacramento and San Joaquin River drainages meet to form the Delta which ultimately drains to San Francisco Bay. The Delta is a maze of river channels and diked islands covering roughly 1,150 square miles, including 78 square miles of water area.

Background

Mercury has been identified in the cleanup plan as responsible for creating a candidate BPTCP hot spot in the Sacramento-San Joaquin Delta Estuary. In January 1998 the Central Valley RWQCB adopted a revised 303(d) list, ranked mercury impairments in the lower Sacramento River, Cache Creek, Sulfur Creek , Lake Berryessa, Clear Lake and the Sacramento-San Joaquin Delta Estuary as high priority because of elevated concentrations in fish tissue and committed to the development of a load reduction program by the year 2005. The widespread distribution of mercury contamination emphasizes the regional nature of the problem and the need for regional solutions.

In 1970 a human health advisory was issued for the Sacramento-San Joaquin Delta Estuary advising pregnant women not to consume striped bass. In 1994 an interim health advisory was issued by the OEHHA for San Francisco Bay and the Delta recommending no consumption of large striped bass and shark because of elevated mercury and PCB concentrations.

In California mercury was historically mined in the Coast Range both north and south of San Francisco Bay and transported across the Valley for use in placer gold mining in the Sierra Nevadas. Both operations caused widespread mercury sediment contamination in water courses in the Coast Range, Sierra Nevada Mountains, Valley floor, and Sacramento-San Joaquin Delta Estuary.

The limited mercury work undertaken so far in the Central Valley has concentrated on estimating mercury loads to the Estuary and on determining *in situ* mercury bioavailability in valley waterways. A loading study conducted by Larry Walker and Associates (1997) estimated that 640 kg of mercury were exported by the Sacramento watershed to the Estuary between October 1994 and September 1995. Most of the material was contributed during winter high flow periods. Surprisingly, the Feather and American River watersheds, sites of intensive historical placer gold mining activity, only accounted for about 25 percent of the total load. The majority of mercury appeared to originate from the Sacramento watershed above the confluence of the Feather River. The Sacramento Regional Wastewater Treatment Plant, the largest NPDES discharger in the Region, accounted for less than 2 percent of the total load.

In a companion study mercury concentration in aquatic invertebrates and fish in the historic gold mining region of the Sierra Nevada Mountains was evaluated (Slotton *et al.*, 1997a). Concentrations of mercury in aquatic indicator organisms increased in a predictable fashion with increasing trophic feeding level. A clear signature of mine derived mercury was found associated with the most intensively worked river stretches. Mercury concentrations were lower in non-hydrologically mined reaches of the Feather and American Rivers.

Foothill reservoirs were found to operate as traps for both bioavailable and sediment associated inorganic mercury (Slotton *et al.*, 1997a; Larry Walker and Associates, 1997). Significantly lower levels of mercury were found in aquatic organisms below reservoirs as compared to concentrations both in and above them. Similarly, bulk loads of mercury entering foothill reservoirs were greater than the amount exported. This suggests that foothill reservoirs in placer gold mining districts may act as interceptors of mercury, trapping and preventing downstream transport to the Estuary. This may explain the lower than expected loads measured by Larry Walker and Associates (1997) in the Feather and American Rivers.

Between 1993 and 1995 the Central Valley RWQCB also conducted a bulk mercury loading study to the Estuary from the Sacramento watershed. The study differed from that of Larry Walker and Associates (1997) in that the RWQCB study also included an assessment of loads from the Yolo Bypass during high flows. During flood conditions the Bypass receives overflow from the Sacramento River and significant input from several coastal watersheds.

The RWQCB estimated that the Sacramento Watershed (Sacramento River at Greene's Landing plus Yolo Bypass at Prospect Slough) exported 800 kg of mercury to the Estuary between May 1994 and April 1995 (Foe and Croyle, 1998). Staff found, like Larry Walker and Associates, that most of the mercury was transported into the Estuary during high flow periods. High mercury concentrations in the Yolo Bypass suggested possible local inputs. Follow up studies demonstrated that Cache Creek was exporting about 1,000 kg of mercury during the year. Half of the mercury appeared to be trapped by the Cache Creek Settling Basin at the confluence with the Bypass while the remainder was exported to the Estuary.

In the spring of 1996 a one time benthic invertebrate survey was conducted in the upper Cache Creek basin to determine local mercury bioavailability (Slotton *et al.*, 1997b). All invertebrate tissue samples with mercury concentrations greater than background were associated with known mercury mines or geothermal hot springs. These included Sulfur and Davis Creeks, Harley Gulch, and the discharge from Clear Lake. The highly localized nature of these sites was demonstrated by the lower biotic tissue concentrations in adjacent streams without historic mercury mining activity. Invertebrates collected in the upper mainstem of Cache Creek away from all historic mining had tissue concentrations comparable to similar indicator organisms obtained from mainstem Sierra Nevada river gold mining activity indicating that Coast Range mercury is at least as bioavailable as that in the Sierras. However, tissue concentrations in Cache Creek decreased downstream suggesting that much of the large bulk loads of mercury observed by the RWQCB might not be very biologically available in the lower watershed.

Limited fish tissue sampling has occurred in Cache Creek. Most sampling has been conducted in the lower watershed between Woodland and the Settling Basin. Mean mercury concentrations in fish of a size eaten by people ranged between 0.2 and 0.4 ppm for benthic predators (channel and white catfish) and between 0.4 and 0.9 ppm composite fillet wet weight for water column predators (squawfish, crappie, small and large mouth bass, Davis, 1998; Slotton *et al.*, 1997b). Concentrations in small fish (2-4 inches) suitable for consumption by wildlife ranged between 0.1 and 0.3 ppm whole body wet weight. Sufficient data have not yet been collected to warrant evaluating the Cache Creek watershed for a possible human health fish consumption advisory.

Estuarine bioavailability of Cache Creek mercury is not known. However, the Creek serves as the major water source for the recently created Yolo Wildlife Refuge. In addition, the CALFED Bay Delta Program is proposing to purchase large areas downstream in the Yolo Bypass and further out in the Estuary for conversion to shallow water wildlife habitat. Follow up studies are needed to ascertain the methylation potential of mercury at such sites and also to compare the methylation potential of mercury from sources in the Coast Range to that from the Sierra Nevada Mountains.

Areal Extent

There is a human health advisory in effect in the Delta and in San Francisco Bay because of elevated mercury levels in striped bass and other long lived fish. The entire area of the Delta is therefore considered a hot spot. The Delta is a maze of river channels and diked islands covering roughly 78 square miles of open water and about 1,000 linear miles of channel.

Cache Creek is a 1100 square mile watershed in the Coast Range with about 150 linear miles of mercury impacted waterways. The watershed also contains Clear Lake, the largest natural lake in California at 43,000 acres. A human health advisory has been posted in Clear Lake because of elevated mercury concentrations in fish tissue. The source of the mercury is Sulphur Bank Mine, a U.S. EPA Superfund site.

Sources

Four major bulk sources of mercury have been identified for the Sacramento-San Joaquin Delta Estuary. They are: (1) exports from the placer gold mining regions of the Sierra Nevada Mountains, (2) mercury mining in the Coast Range, (3) resuspension of estuarine sediment, and (4) effluent from municipal and industrial discharges to surface water. Not known, but critically important, is the relative methylation potential of mercury from each source once in the estuary. The four sources are briefly reviewed below.

1. Sierra Nevada Mountains It has been estimated that over 3 million kg of mercury were lost in the Sierra Nevada Mountains during the gold rush (Montoya, 1987). All this mercury was initially in an elemental form (quicksilver) and most of it is probably still highly oxidized. Foothill reservoirs appear to trap most of the bioavailable and total mercury entering them. Therefore, only the mercury presently located in water courses below the foothill reservoirs appear available for transport into the estuary, unless major flooding events move large volumes of sediment downstream from behind reservoirs. This needs evaluation.

2. Coast Range Some of the largest historic mercury mines in the world were located in the Coast Range both north and south of

San Francisco Bay. Most of the mercury in the Coast Range is as mercuric sulfide (cinnabar) and is probably emanating from abandoned mine portals and deposits around retorts and slag piles, geothermal springs and seeps, and erosion of mercury rich landforms. The Coast Range is drier than the Sierra Nevada Mountains and therefore has fewer reservoirs and permanently flowing waterways. Off site movement of mercury from the Coast Range appears to occur mostly in the winter after large rainstorms although evidence from Clear Lake indicates it may be occurring year-round. Cache Creek has been identified as a major source of mercury to the Estuary. Sites in the Cache Creek watershed with highly bioavailable loads include runoff from Sulfur Creek, Harley Gulch, Schneider Creek and Clear Lake.

3. Sediment Potentially the largest source of mercury is already present in the Estuary buried in sediment. Mercury from sediment is potentially available through natural fluxing, bioturbation, scour and erosion from wave action, dewatering and beneficial reuse of dredge spoils on levees, and creation of intertidal shallow water habitats by breaking levees and reflooding Delta agricultural land. Potential bioavailability of mercury from each action depends on, among other things, the chemical form of the metal in sediment and environmental conditions in the Estuary which influence biological processes at the time of release to the food chain.

4. Municipal and Industrial Discharges Undoubtedly, the smallest source of mercury to the Estuary is from permitted municipal and industrial discharges to surface water. Load estimates are only available for the Sacramento Regional Wastewater Treatment Plant, the largest discharger in the Central Valley. The facility was estimated to have discharged 9.9 kg of mercury during water year 1995 (Larry Walker and Associates, 1997). This represents less than 2 percent of the total annual load from the Sacramento Basin. More recent mercury effluent data indicates that the annual mass discharge from the Regional Plant may be as low as 2 kg/yr. This contribution represents less than one percent of the total mercury load from the Sacramento watershed at Rio Vista (Grovhoug, personal communication).

San Joaquin River Dissolved Oxygen

Background

Low dissolved oxygen concentrations in the San Joaquin River in the vicinity of the City of Stockton has been identified in the cleanup plan as constituting a candidate BPTCP hot spot. In January 1998 the Central Valley RWQCB adopted a revised 303(d) list which identified low dissolved oxygen levels in Delta Waterways in the lower San Joaquin River as a high priority problem and committed to developing a waste load allocation (TMDL) by the year 2011. The purpose of the Cleanup Plan is to develop a strategy to collect the information necessary to implement the TMDL.

The San Joaquin River near the City of Stockton annually experiences violations of the 5.0 and 6.0 mg/l dissolved oxygen standard[10]. Violations are variable in time but usually occur over a ten mile River reach between June and November. Dissolved oxygen concentrations in the mainstem River can be chronically below the water quality objective and can reach below 2.5 mg/l.

In 1978 the RWQCB adopted more stringent biochemical oxygen demand (BOD) and total suspended solid (TSS) effluent limits for the Stockton Regional Wastewater Control Facility (RWCF) with the intent of reducing or eliminating the low dissolved oxygen conditions in the San Joaquin River. The plant has constructed the necessary additional treatment facilities and has complied with the more stringent effluent limitations. Despite the Cities best efforts, the low dissolved oxygen conditions persist.

The City completed a river model (Schanz and Chen, 1993) assessing the impact of the Stockton RWCF on receiving water quality. Water quality parameters considered included TSS, BOD, ammonia, nitrate and dissolved oxygen. The model suggested that: (1) low dissolved oxygen conditions occur in the fall and spring due to a high mass loading of BOD and ammonia, (2) the current Stockton RWCF contributions are a significant portion of the oxygen demand of the River during critical low dissolved oxygen periods, (3) addition of activated sludge/nitrification units to provide a carbonaceous biochemical oxygen demand (CBOD) of 5 mg/l and ammonia of 0.5 mg/l would increase dissolved oxygen

[10]The 5.0 mg/l standard applies between 1 December and 30 August while the 6.0 mg/l standard is for the period of 1 September through 30 November.

levels in the River at the station most proximate to the RWCF from 2.5 to 3.0 mg/l during critical periods, and (4) the San Joaquin River would not meet the receiving water dissolved oxygen standards even if the entire discharge from the Stockton RWCF were eliminated from the River.

Taking these facts into consideration, the RWQCB adopted a stricter permit in 1994 requiring the Stockton RWCF to further reduce CBOD and ammonia concentrations. Stockton appealed the permit to the State Board on a variety of grounds including that hydraulic conditions had changed in the River since the RWQCB had considered the permit. The State Board remanded the permit back to the RWQCB for consideration of new Delta flow standards.

In the interim the Stockton RWCF refined the dissolved oxygen model for the River (Chen and Tsai, 1997). The model suggests that the principal factors controlling in-stream oxygen concentration are temperature, flow, upstream algal production, sediment oxygen demand (SOD), and discharge from the Stockton RWCF. Obviously, only one of these factors is within the ability of the Stockton RWCF to control. Solutions to the dissolved oxygen problem will require a more holistic watershed approach. Each factor is described briefly below.

Dissolved oxygen problems are most acute at high temperature in the San Joaquin River in late summer and early fall. Temperature is important because the oxygen carrying capacity of water decreases with increasing temperature while biotic respiration rates increase. Water temperature is controlled by air temperature and reservoir releases.

Flow of the San Joaquin River at Stockton is regulated by upstream reservoir releases and pumping at the state and federal pumping facilities at Tracy. Net flows at the City of Stockton are often zero or negative in late summer. The lowest dissolved oxygen levels in the River occur during prolonged periods of no net flow.

Algal blooms occasionally develop in the faster moving shallow upper River and are carried down past the City to the deeper slower moving deep water ship channel. Respiration exceeds photosynthesis here resulting in net oxygen deficits. Upstream algal blooms are controlled by turbidity and nutrient inputs from other NPDES dischargers, the dairy industry, erosion, stormwater runoff, and agricultural inputs.

Finally, the new model identified discharge from the Stockton RWCF as contributing to the dissolved oxygen problem. The model indicates that improvements in effluent quality would increase dissolved oxygen levels in the River during critical periods. However, the model confirmed that exceedance of the dissolved oxygen water quality objective would persist if the entire discharge of the Stockton RWCF were removed from the River. The City of Stockton has expressed the concern that the estimated costs for the additional treatment are disproportionate to the benefits and that more cost-effective improvements in dissolved oxygen levels are possible.

Adult San Joaquin fall run chinook salmon migrate up river between September and December to spawn in the Merced, Tuolumne, and Stanislaus Rivers (Mills and Fisher, 1994). The Basin Plan dissolved oxygen water quality objective was increased from 5.0 to 6.0 mg/l between 1 September and 30 November to aid in upstream migration. The San Joaquin population has experienced severe declines and is considered a "species of concern" by the U.S. Fish and Wildlife Service. Low dissolved oxygen may act as a barrier preventing upstream spawning migration. Also, low dissolved oxygen can kill or stress other aquatic organisms present in this portion of the Delta.

In conclusion, the San Joaquin River near the City of Stockton annually experiences dissolved oxygen concentrations below the Basin Plan water quality objective in late summer and fall. A model has been developed which identifies river flow and temperature, upstream algal blooms, SOD, and discharge from the Stockton RWCF as controlling variables. Only the latter variable is within the ability of the plant to influence. Fall run chinook salmon migrate upstream during this critical time period.

Areal Extent

The areal extent of the water quality exceedance is variable but may in some years be as much as 10 miles of mainstem River. The temporal extent is also variable but can be for as long as 4 months. Dissolved oxygen concentrations are often less than 2.5 mg/l in the mainstem River.

Sources

A computer model developed for the Stockton RWCF identified ammonia and BOD as the primary cause of the low dissolved oxygen concentration. The sources are discharges from the Stockton RWCF and surrounding point and nonpoint source discharges. River flow and water temperature were identified as two other variables strongly influencing oxygen concentrations.

Pesticides

Background

"Diazinon in orchard dormant spray runoff" was identified in the Central Valley Cleanup Plan as constituting a candidate hot spot in the Sacramento-San Joaquin Delta Estuary. Staff briefed the Central Valley RWQCB on 23 October 1998 on pesticide detection patterns in the Central Valley and requested guidance on whether these should be considered "frequent" as required by the BPTCP in order to be considered as a candidate high priority toxic hot spot. In addition, guidance was sought on whether to prepare cleanup plans under Bay Protection or seek a variance and prepare a control program under section 303(d) of the Clean Water Act as the same pesticide excursions were also listed as a high priority 303(d) impairment. The RWQCB unanimously determined that the pattern of pesticide detections observed in the Sacramento and San Joaquin Rivers and in the Bay-Delta were frequent and merited consideration as a high priority candidate toxic hot spot. The RWQCB also directed staff to seek a variance and regulate pesticides under the Clean Water Act. Outlined below are all required elements of the Bay Protection Clean Up Plan except sections D through G which address the assessment of the necessary control actions and their associated cost. The activities covered by these latter sections will be addressed by the RWQCB as it develops a waste load allocation program under section 303(d) of the Clean Water Act.

About a million pounds of insecticide active ingredient are applied each January and February in the Central Valley on about half a million acres of stonefruit and almond orchards to control boring insects (Foe and Sheipline, 1993). The organophosphate insecticide diazinon accounts for about half the application. Numerous bioassay and chemical studies have measured diazinon in surface water samples in the Central Valley during winter months at toxic concentration to sensitive invertebrates (Foe and

Connor, 1991; Foe and Sheipline, 1993; Ross 1992; 1993; Foe, 1995; Domagalski, 1995; Kratzer, 1997). The typical pattern is that the highest concentrations and longest exposures are in small water courses adjacent to high densities of orchards. However, after large storms in 1990 and 1992 diazinon was measured in the San Joaquin River at the entrance to the Delta at toxic concentrations to the cladoceran invertebrate *Ceriodaphia dubia* in U.S. EPA three species bioassays (Foe and Connor, 1991; Foe and Sheipline, 1993). Following up on these findings, the U.S. Geological Survey and RWQCB traced pulses of diazinon from both the Sacramento and San Joaquin Rivers across the Estuary in 1993 (Kuivila and Foe, 1995). Toxic concentrations to *Ceriodaphnia* were observed as far west in the Estuary as Chipps Island, some 60 miles downstream of the City of Sacramento and the entrance to the Delta.

Concern has been expressed that other contaminants might also be present in winter storm runoff from the Central Valley and contribute to invertebrate bioassay mortality. Therefore, in 1996 TIEs were conducted on three samples testing toxic in *Ceriodaphnia* bioassays from the San Joaquin River at Vernalis (Foe *et al.*, 1998). The results confirm that diazinon was the primary contaminant although other unidentified chemicals may also have contributed a minor amount of toxicity. The study was repeated in 1997 with the exception that samples were taken further upstream in the Sacramento and San Joaquin watersheds in the hope of collecting water with greater concentrations of unknown toxicants thereby facilitating their identification. TIEs were conducted on samples from Orestimba Creek in the San Joaquin Basin on 23 and 25 January and from the Sutter Bypass on 23, 25, and 26 January. Again, diazinon was confirmed as the primary toxicant (Foe *et al.*, 1998). No evidence was obtained suggesting a second contaminant.

No biological surveys have been undertaken to determine the ecological significance of toxic pulses of diazinon. However, Novartis, the Registrant for diazinon, has completed a diazinon probabilistic risk assessment for the Central Valley (Novartis Crop Protection, 1997). Little data were available for the Delta. The risk assessment, like chemical and bioassay studies, suggest that the greatest impacts are likely to occur in water courses adjacent to orchards. Lower concentrations are predicted in mainstem Rivers. The report predicts that the Sacramento and San Joaquin Rivers will experience acutely toxic conditions to the 10% of most sensitive species 0.4 and 11.6% of the time in January and February, the period of most intensive diazinon off site movement[11]. Novartis concludes that the risk of diazinon alone in the Sacramento-San Joaquin River basin is limited to the most sensitive invertebrates, primarily cladocerans. Furthermore, the report notes that cladocerans reproduce rapidly and their populations are therefore predicted to recover rapidly. Also, the report predicts that indirect effects on fish through reductions in their invertebrate prey are unlikely as the preferred food species are unaffected by the diazinon concentrations observed in the rivers. The study recommends though, that the population dynamics of susceptible invertebrate species in the basin be evaluated along with the feeding habits and nutritional requirements of common fish species.

In conclusion, the only major use of diazinon in the Central Valley in January and February is on stonefruit and almond orchards. In 1990, 1992, 1993, and 1996 diazinon was observed entering the Estuary from either the Sacramento or San Joaquin Rivers at toxic concentration in *Ceriodaphnia* bioassays. In 1993 the chemical was followed at toxic concentrations across the Estuary. On each occasion diazinon was confirmed as being present in toxic water samples by GC/MS analysis. In 1996 and 1997 TIEs implicated diazinon as the primary contaminant responsible for the toxicity. Finally, sensitive organisms like *Ceriodaphnia* are predicted to experience acutely toxic conditions in the Sacramento and San Joaquin Rivers about 0.5 and 12 percent of the time in January and February of each year. These frequencies translate to about 1 day every four years in the Sacramento River and 7-8 days per year in the San Joaquin River.

BPTCP guidance recommends that a site or situation be considered a candidate toxic hot spot for pesticides if toxicity in bioassays can be demonstrated, bioassay results are collaborated by both chemical analysis and TIEs, and the pesticide residues reoccur in a pattern of frequent pulses. On 23 October 1998 the Central Valley RWQCB reviewed the dormant spray data and unanimously concluded that the Sacramento and San Joaquin Rivers and Delta-Estuary fit the recommended criteria for listing as a high priority candidate toxic hot-spot.

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[11] Unfortunately, many agricultural pesticides are applied in the Central Valley and measured in the Rivers. When the risk assessment is repeated with multiple chemicals, the mainstem San Joaquin River is predicted to experience acutely toxic conditions about 20 percent of the year to the 10 percent of most sensitive species. Diazinon is only one of the chemicals present in the River at toxic concentrations.

Areal Extent

Studies demonstrate that the potential areal extent of diazinon water column contamination from orchard runoff is variable by year but may include in some years the entire Sacramento San Joaquin Delta Estuary. The Delta Estuary is a maze of river channels and diked islands covering some 78 square miles of water area and 1,000 linear miles of waterway.

Sources

The only major use of diazinon in agricultural areas in the Central Valley in winter is as a dormant orchard spray. Virtually every study investigating off site movement into the Rivers and Estuary have concluded that the primary source of the chemical is from agriculture (Foe and Connor, 1991; Foe and Sheipline, 1993; Ross, 1992; 1993; Domagalski, 1995; Kratzer, 1997).

Farmers must obtain a permit to apply diazinon as a dormant spray and their names and addresses are available through the County Agricultural Commissioner's Office. However, not known at this time is the relative contribution of each application to total offsite movement. More information is needed on the primary factors influencing off site movement and the relative contribution of different portions of the Central Valley watershed. Such information is essential not only for assessing responsibility but also for successful development and implementation of agricultural Best Management Practices (BMPs).

Urban Stormwater Pesticide Cleanup Plan for the Delta

Background

"Diazinon and chlorpyrifos in urban stormwater runoff" was identified in the Cleanup Plan as constituting a candidate toxic hot spot in several Delta backsloughs. Staff briefed the Central Valley Regional Board on 23 October 1998 on pesticide detection patterns in the Central Valley and requested guidance on whether these should be considered "frequent" as required by the BPTCP to be considered as a candidate high priority toxic hot spot. In addition, guidance was sought on whether to prepare cleanup plans under Bay Protection or seek a variance and prepare a control program under section 303(d) of the Clean Water Act as the same pesticides excursions were also listed as a medium priority 303(d) impairment. The RWQCB unanimously determined that the pattern of pesticide detections observed in urban runoff around the Delta were frequent and merited consideration as high priority candidate Bay Protection Hot Spots. The RWQCB also directed staff to seek a variance and regulate pesticides under the Clean Water Act. Outlined below are all required elements of the Bay Protection Cleanup Plan except sections D through G which address the assessment of the necessary control actions and their associated cost. The activities covered by the latter sections will be addressed by the RWQCB as it develops a waste load allocation program under section 303(d) of the Clean Water Act.

Three hundred and forty thousand pounds of diazinon and 775 thousand pounds of chlorpyrifos active ingredients were used in reported landscape and structural pest control in California in 1994 for control of ants, fleas and spiders (Scanlin and Cooper, 1997; Department of Pesticide Regulation, 1996). The figure likely underestimates by about half the total use as it does not include unreported homeowner purchases. In February and again in October 1994 *Ceriodaphnia* bioassay mortality was reported in Morrison Creek in the City of Sacramento and in Mosher Slough, 5 Mile Slough, Calaveras River, and Mormon Slough in the City of Stockton (Connor, 1994; 1995). All these water bodies are within the legal boundary of the Delta. A modified phase I TIE was conducted on samples from each site which implicated metabolically activated pesticide(s) (such as diazinon and chlorpyrifos). Chemical analyses demonstrated that diazinon and occasionally chlorpyrifos was present at toxic concentrations. A phase III TIE was conducted on water collected from Mosher Slough on 1 May 1995 which confirmed that the primary cause of acute toxicity was a combination of diazinon and chlorpyrifos.

It was not known at the time that the Bay Protection samples were being collected that an assessment of the frequency of pesticide excursions would be needed to determine whether a location should be considered as a candidate toxic hot spot. Therefore, no intensive sampling was conducted at Mosher, Five Mile, and Mormon Sloughs, or the Calaveras River or Morrison Creek. However, in other testing 230 samples were collected from urban dominated waterways in the Sacramento and Stockton areas (Bailey *et al.*, 1996). These sites are thought to exhibit water quality similar to those locations being considered here as candidate hot spots. All 230 samples were analyzed for diazinon. Eighty-five percent of the measured values (195 samples) exceeded Fish and Game recommended acute hazard criteria. Ninety samples were analyzed for chlorpyrifos. Eighty percent of the values (72 samples) also exceeded the recommended chlorpyrifos acute hazard criteria. Finally, *Ceriodaphnia* bioassays were run on 47 samples. Seventy-seven percent of these (36 samples) produced total mortality within 72 hours. Modified Phase I TIEs suggested that the toxicity was due to metabolically activated pesticides, such as diazinon and chlorpyrifos. Chemical analysis was consistent with these conclusions suggesting that the two organophosphate insecticides were the major contaminants.

In a second set of data, the Sacramento River Watershed Program has monitored Arcade Creek in Sacramento monthly since 1996 for toxicity. Arcade Creek was selected to represent a typical urban creek. In the 1996-97 sampling period, Arcade Creek was monitored 13 times during 12 months. Seventy-seven percent of those samples exhibited significant *Ceriodaphnia* mortality. Diazinon and chlorpyrifos concentrations were measured in the seven samples causing 100% mortality. TIEs and pesticide detections in the seven samples confirm that both pesticides contributed to the observed toxicity. Toxicity was detected during both wet and dry weather (Larson *et al.*, 1998a). The 1997-98 sampling period data has been summarized for only five dates. In four of the five samples (eighty percent), 100% *Ceriodaphnia* mortality was detected and linked through TIEs to the presence of diazinon and chlorpyrifos. Again, toxicity was detected during wet and dry periods (Larson *et al.*, 1998b).

Background concentrations of diazinon in urban stormwater runoff in the Central Valley increase after application on orchards in January and February suggesting that urban use might not be the sole source of the chemical at this time (Connor, 1996). Volatilization following application is known to be a major diazinon dissipation pathway from orchards (Glotfelty *et al.*, 1990) and a number of dormant spray insecticides have previously been reported in rain and fog in the Central Valley (Glotfelty *et al.*, 1987). Therefore, composite rainfall samples were collected in South Stockton in 1995 which demonstrated that diazinon concentrations in rain varied from below detection to about 4,000 ng/l (ten times the acute *Ceriodaphnia* concentration). The rainfall study was continued through March and April of 1995 to coincide with application of chlorpyrifos on alfalfa for weevil control. Chlorpyrifos concentrations in composite rainfall samples increased, ranging from below detection to 650 ng/l (again 10 times the acute *Ceriodaphnia* concentration). However, unlike with diazinon, no study was conducted to ascertain whether chlorpyrifos concentrations in street runoff increased suggesting that agricultural inputs might be a significant urban source.

Similar invertebrate bioassay results coupled with TIEs and chemical analysis from the San Francisco Bay Area suggest that diazinon and chlorpyrifos may be a regional urban runoff problem (Katznelson and Mumley, 1997). This finding prompted the formation of an Urban Pesticide Committee (UPC). The UPC is an *ad hoc* committee formed to address the issue of toxicity in urban runoff and wastewater treatment plant effluent due to organophosphate insecticides, in particular diazinon and chlorpyrifos. The UPC is composed of staff from the U.S. EPA, the San Francisco Bay and Central Valley Regional Water Quality RWQCBs, the Department of Pesticide Regulation, Novartis and Dow Elanco, municipal storm water programs, the Bay Area Stormwater Management Agencies Association, County Agricultural commissions, Wastewater treatment plants, the University of California, and Consultants. The members of the UPC are committed to working in partnership with the various stakeholders to develop effective measures to reduce the concentrations of organophosphate insecticides in urban runoff and wastewater treatment plant effluent.

In conclusion, a combination of bioassay, chemical, and TIE work demonstrate that diazinon and chlorpyrifos are present in urban stormwater runoff discharged to urban creeks and back sloughs around the Cities of Sacramento and Stockton at concentrations toxic to sensitive invertebrates. The source of the diazinon appears to be primarily from urban sources although agricultural orchard use may also be important. Chlorpyrifos appears to be predominately of urban origin but the impacts from agricultural use need to be evaluated. Finally, bioassay and chemical analysis suggest that about 75 percent of the samples collected from urban runoff dominated water bodies will test toxic in *Ceriodaphnia* bioassays while eighty to eighty-five percent of the samples will contain diazinon and chlorpyrifos at concentrations exceeding the acute California Department of Fish and Game Hazard Assessment criteria.

BPTCP Guidance recommends that a site or situation be considered a candidate toxic hot spot for pesticides if toxicity in bioassays can be demonstrated, bioassay results are collaborated by both chemical analysis and TIEs, and the pesticide residues reoccur in a pattern of frequent pulses. On 23 October 1998 the Central

Valley RWQCB reviewed the data and unanimously concluded that pesticides in urban runoff dominated backsloughs around the Delta fit the recommended criteria for listing as a high priority candidate toxic hot spot.

Areal Extent

The potential threat posed by diazinon and chlorpyrifos in urban storm runoff is localized to Morrison Creek in the City of Sacramento and Mosher Slough, 5 Mile Slough, the Calaveras River, and Mormon Slough in the City of Stockton. Together the areal extent of impairment may be up to 5 linear miles of back sloughs within the legal boundary of the Delta.

Sources

Detailed information on urban sources are not available for the Central Valley. However, source information has been obtained for the Bay Area and the conclusions are thought to also apply in the Valley with the caveat that the Bay area does not receive significant amounts of diazinon in rainfall as appears to occur in the Central Valley (personal communication, Connor). Confirmatory studies are needed to verify that the Bay Area conclusions also apply in the Valley.

The primary source of diazinon and chlorpyrifos in Bay Area creeks is from urban runoff. Sampling in urbanized areas in Alameda County indicated that residential areas were a significant source but runoff from commercial areas may also be important (Scanlin and Feng, 1997). It is not known what portion of the diazinon and chlorpyrifos found in creeks is attributable to use in accordance with label directions versus improper disposal or over application. However, a preliminary study of runoff from residential properties suggest that concentrations in creeks may be attributable to proper use (Scanlin and Feng, 1997).

Irrigation Return Flow Pesticide Cleanup Plan For the Delta

Background

"Chlorpyrifos in irrigation tailwater" has been identified in the Cleanup Plan as constituting a candidate hot spot in various agriculturally dominated backsloughs within the Delta. Staff briefed the Central Valley RWQCB on 23 October 1998 on pesticide detection patterns in the Central Valley and requested guidance on whether these should be considered "frequent" as required by the Bay Protection Program to be considered as a candidate high priority toxic hot spot. In addition, guidance was sought on whether to prepare cleanup plans under Bay Protection or seek a variance and prepare a control program under section 303(d) of the Clean Water Act as pesticide excursions in the San Joaquin River and Delta-Estuary were also listed as a high priority 303(d) impairment. The Board unanimously determined that the pattern of pesticide detections observed in various Delta backsloughs from irrigated agriculture was frequent and merited consideration as a high priority candidate Bay Protection Hot Spot. The RWQCB also directed staff to seek a variance and regulate pesticides under the Clean Water Act. Outlined below are all required elements of the Bay Protection Clean Up Plan except sections D through G which address the assessment of the necessary control actions and their associated cost.

One and a half million pounds of chlorpyrifos active ingredient were used in the Central Valley on agriculture in 1990 (Sheipline, 1993). Major uses in March are on alfalfa and sugarbeets for weevil and worm control and between April and September on walnuts and almonds for codling moth and twig borer control. Two minor uses are on apples and corn. A bioassay study was conducted in agriculturally dominated waterways in the San Joaquin Basin in 1991 and 1992. Chlorpyrifos was detected on 190 occasions between March and June of both years, 43 times at toxic concentrations to *Ceriodaphnia* (Foe, 1995). Many of the crops grown in the San Joaquin Basin are also cultivated on Delta Tracts and Islands. Not known was whether these same agricultural practices might also contribute to instream toxicity in the Delta. BPTCP resources were used between 1993 and 1995 to conduct a bioassay monitoring program in the Delta. Chlorpyrifos toxicity was detected on nine occasions in surface water from four agriculturally dominated backsloughs (French Camp Slough, Duck Slough, Paradise Cut, and Ulatis Creek; Deanovic *et al.*, 1996;1997). In each instance the *Ceriodaphnia* bioassay results were accompanied by modified phase I and II TIEs and chemical analysis which implicated chlorpyrifos. On four additional occasions phase III TIEs were conducted (Ulatis Creek 21 March 1995, Paradise Cut 15 March 1995, Duck Slough 21 March 1995, and French Camp Slough 23 March 1995). These confirmed that chlorpyrifos was the primary chemical agent responsible for the toxicity. Analysis of the spatial patterns of toxicity suggest that the impairment was confined to backsloughs and was diluted away upon tidal dispersal into main channels. The precise agricultural crops from which the chemicals originated are not known because chlorpyrifos is a commonly applied agricultural insecticide during the irrigation season. However, the widespread nature of chlorpyrifos toxicity in March of 1995 coincided with applications on alfalfa and subsequent large rainstorms. Follow up studies are needed to conclusively identify all responsible agriculture practices.

It was not known at the time that the Bay Protection samples were being collected that an assessment of the frequency of pesticide excursions would be needed to determine whether a location should be considered as a candidate toxic hot spot. Therefore, no intensive sampling was conducted in French Camp and Duck Sloughs or in Paradise Cut or Ulatis Creeks to determine the precise frequency of irrigation induced pesticide toxicity. However, as has been previously mentioned, the same agricultural crops and pesticide application patterns occur in the Delta as in the San Joaquin Basin. Novartis (1997) conducted an ecological risk assessment using all the available pesticide data and concluded that the mainstem San Joaquin River should experience acutely toxic conditions about 20 percent of the time (approximately 70 days/year) from a mixture of insecticides but predominately diazinon and chlorpyrifos. Diazinon was most commonly observed during the dormant spray season (January and February) while chlorpyrifos explained most of the toxicity during the irrigation season (March through September). It has previously been calculated that the mainstem San Joaquin River is expected to experience acutely toxic conditions for about 7 days in January and February from off site movement of diazinon. Therefore, it is estimated that acute toxicity will occur for about 63 days during the remaining year (70-7=63). Most of this toxicity is predicted to be from chlorpyrifos excursions.

In a more recent study, Dow AgroSciences, the primary registrant for chlorpyrifos, monitored diazinon and chlorpyrifos concentrations daily in Orestimba Creek for one year (1 May 1996-30 April 1997). Orestimba Creek is about 25 miles south of the Delta in the San Joaquin Basin. The water body was selected for study as its water quality is thought to be typical of a local agriculturally dominated watershed. Diazinon and chlorpyrifos were measured at acutely toxic conditions to sensitive organisms like *Ceriodaphnia* for 50 days during the irrigation season (15 March-30 September; Dow AgroSciences, 1998). Forty-four of the fifty events (88%) were from elevated chlorpyrifos concentrations.

In conclusion, the frequency of toxicity from pesticides was not measured in agriculturally dominated back sloughs in the Delta. However, estimates of the frequency of toxicity from chlorpyrifos excursions in similar nearby watersheds range between 44 and 63 days per irrigation season. Similar frequency rates are expected in Delta backsloughs.

BPTCP guidance recommends that a site or situation be considered a candidate toxic hot spot for pesticides if toxicity in bioassays can be demonstrated, bioassay results are collaborated by both chemical analysis and TIEs, and the pesticide residues reoccur in a pattern of frequent pulses. On 23 October 1998 the Central Valley RWQCB reviewed the above data and unanimously concluded that Ulatis Creek, Paradise Cut, French Camp and Duck Sloughs fit the recommended criteria for listing as a high priority candidate toxic hot spot because of elevated concentrations of chlorpyrifos.

Areal Extent

The potential aquatic threat posed by chlorpyrifos in agricultural return flow is confined to the four previously named Creeks and Sloughs. The areal extent of the impairment may be up to 15 linear miles of waterway within the legal boundary of the Delta.

Sources

The only major use of chlorpyrifos in these four drainage basins is on agriculture. Detailed follow up studies are needed to determine the crop and precise agricultural practice which led to the off site movement.

Santa Ana Region (Region 8)

Lower Newport Bay Rhine Channel

Site Description

Newport Bay is one of the largest small craft harbors in southern California. It is adjacent to the cities of Newport Beach, and Corona Del Rey and it is divided into an upper and a lower portion, and Upper Newport Bay is owned and managed by the State Department of Fish and Game as a State Ecological Reserve. Lower Newport Bay is heavily developed with housing, hotels, restaurants, marinas, and light marine industry such as boatyards and fuel docks. The Bay harbors approximately 10,000 small craft. Tributaries draining into the system include the San Diego Creek, and among other smaller tributaries, the Santa Ana-Delhi Channel and Big Canyon Wash. The entire Newport Bay watershed encompasses 154 square miles.

Background

The pollutants of concern found at the site are Arsenic, Copper, Lead, Mercury, Zinc, DDE, PCB, and TBT.

The area was historically a small inlet in the larger marsh system of Lower Newport Bay. In 1918, the first boat yard was built on the channel. A fish cannery was built in 1919, but was used predominately after 1935. The dredging of Lido Channel South occurred in 1920, with large scale dredging of Lower Newport Bay occurring in 1934-35 to provide safe harbor navigation. During the 1940's and 1950's the channel supported boat building activity for both the US Navy and the Mexican Navy during World War II and the Korean War. The boat yards produced midsize boats, mainly mine sweepers, subchasers, and rescue boats in the 45 to 135 feet length range. In 1964, there were 19 boat yards operating in the Lower Bay. Currently six boat yards operate along Rhine Channel The boat yards are currently regulated by General Waste Discharge Requirements. Historic practices at the boat yards are the most likely source of pollutants in Rhine Channel, although a thorough characterization of the depth of pollution has never been undertaken. An investigation of the extent of pollution depth and area would help to either eliminate or include likely historic sources.

The RWQCB currently regulates the discharge of process wastewater and stormwater from all boat yard facilities in Lower Newport Bay and Huntington Harbor through General Waste Discharge Requirements (Order No. 94-26, as amended by Order No. 95-60 and 96-52). The boat yards were initially issued individual NPDES permits beginning in 1975. The main feature of Order No. 94-26, as amended, is the elimination of the discharge of process wastewater in accordance with the requirement of the Water Quality Control Policy for the Enclosed Bays and Estuaries of California. Process wastewater is defined by the Order to include the first one tenth of an inch of rain that is proceeded by seven days of dry weather. This permit requirement was to be implemented by April, 1996. Presently, five of the six boat yards in Rhine Channel have complied with this requirement.

The Newport Bay watershed is one of two watersheds within the Santa Ana Region that are the focus of intensive watershed management activities. The expected outcomes of this planning and management effort includes a further refinement of water quality problems, both in the Bay and watershed, the development and implementation of a watershed management plan that addresses these problems, and mechanisms for measuring the success of the plan and improvements in water quality.

Additionally, Lower Newport Bay is currently listed as water quality limited for metals and pesticides pursuant to Section 303(d) of the Clean Water Act. A TMDL for metals and pesticides will be developed by the RWQCB to address this impairment. The control of pollutant sources occurring in Rhine Channel will be a component of the TMDLs.

Areal Extent

The areal extent of the Toxic Hot Spot (THS) is assessed to be between 1.5 to 2.5 acres.

Source

The source of the problem are pesticides, and toxicants associated with sedimentation from urban and agricultural erosion entering the system from the tributary creeks. Other pollutant sources include boatyard and fueling operations of small craft discharges and stormwater runoff.

San Diego Region (Region 9)

Seventh Street Channel, National City

Site Description

The San Diego Region is located along the coast of the Pacific Ocean from the Mexican border to north of Laguna Beach in Orange County. The Region is rectangular in shape and extends approximately 80 miles along the coastline and 40 miles east to the crest of the mountains. The Region includes portions of San Diego, Orange, and Riverside Counties. The population of the Region is heavily concentrated along the coast.

In the southern portion of the Region two harbors, Mission Bay and San Diego Bay, support major recreational vessel and ship traffic. San Diego Bay is long and narrow, 15 miles in length averaging approximately one mile across. A deep-water harbor, San Diego Bay has experienced waste discharge from former sewage outfalls, industries, and urban runoff. Up to 9,000 vessels may be moored in the Bay. San Diego Bay also hosts four major U.S. Navy bases with approximately 50 surface ships and submarines home-ported in the Bay.

Areal Extent of the THS

Approximately three acres appear affected in San Diego Bay (Stations 90009, 93227, 93228); however, the area affected could be substantially larger or smaller. Dredging activities could have occurred in this area since San Diego Bay was sampled during the period 1992 to 1994. If so, this area or parts of this area may no longer be considered for designation as a candidate toxic hot spot.

Most Likely Sources of Pollutants (Potential Discharger)

Because benthic community analysis does not directly measure cause and effect relationships between chemicals and fauna living in the sediment, it is possible that some of the degraded benthic communities could have been caused by physical disturbance of the bottom from tug and ship propellers, or from disturbance caused by recent dredging.

Persistent chemicals, such as PAHs and Chlordane, could also have caused benthic community degradation and sediment toxicity at the Seventh Street Channel. Possible sources include industrial activities, atmospheric fallout, pesticides from lawns, streets, and buildings, and runoff from pest control operations.

PROPOSED REMEDIATION APPROACH AND ALTERNATIVES AT TOXIC HOT SPOTS

The RWQCBs and their staff have developed Regional Toxic Hot Spots Cleanup Plans that present preliminary lists of actions necessary to begin improvement of the identified toxic hot spots.

The remediation alternatives for each proposed known toxic hot spot is formatted consistently to provide the SWRCB with a summary of the actions proposed by the RWQCBs as well as alternatives for their action on the sites. A complete listing of the preliminary actions is listed in Appendix B.

For each high priority known toxic hot spot the following information is provided:

Site: The name of the Region where the proposed toxic hot spot is located and the name of the site as used in the list of known toxic hot spots.

Site Description: A brief description of the site including the actions initiated by the RWQCB and descriptions of any related programs.

Approach/Alternatives: For each site, the approach proposed by the RWQCB is presented. For sites where a discharger has been identified, the RWQCB approach for addressing the site using its existing Water Code authorities is presented. Where no discharger is identified, alternatives for addressing the site is presented.

In each case, the costs of remediation, costs recoverable from potential dischargers and an expenditure plan are presented.

Staff Recommendation: A suggestion is made for combination of alternatives or approaches that should be adopted by the SWRCB.

Site 1.1: North Coast region, G&R Metals at the foot of "H" Street between First street and the Humboldt Bay shore

Site Description: The North Coast RWQCB identified one high priority toxic hot spot in their Regional Toxic Hot Spots Cleanup Plan. The RWQCB has identified several actions that are underway at the site.

Description of the Site

The candidate toxic hot spot site is located on the shore of Humboldt Bay and has been used for industrial activities since the early part of the century. It has been operated as a scrap metal facility since the early 1950s. All industrial activities have ceased at the site but the historic uses have resulted in an area polluted with PCBs, PAHs, lead, arsenic, chromium, cadmium, cobalt, copper, mercury, zinc and Methoxychlor. The areal extent of the toxic hot spot has been estimated to be 3.5 acres with an average depth of pollution of 2 feet. The total polluted soil quantity is about 10,000 cubic yards.

Summary of actions initiated by the RWQCB

The site has not been used since 1980. On-going activity is limited to site assessment work to determine the extent of the pollution and the appropriate remediation needed to clean up the site. The RWQCB issued a draft Cleanup and Abatement Order on June 4, 1998 requiring cleanup of the site. The final order will be issued sometime in fiscal year 1998-99.

Approach/Alternatives: The cleanup alternatives are limited to the removal of highly polluted soils and capping of the site to prevent migration of metals to ground and surface waters. Dredging of the offshore area may be necessary for a complete cleanup.

Estimate of the total cost to implement the Cleanup Plan.

It is estimated that the cost to implement the chosen cleanup plan will be between $500,000 and $5 million dollars. These costs are based on a $500 per ton cost for hauling and tipping fees at a hazardous waste disposal site. The exact amount of material that will be removed from the site will be determined at a later date when the assessment work is completed.

Estimate of recoverable costs from potential Dischargers.

The responsible parties will be required to pay for the cleanup. It appears that the responsible parties have the ability to pay for the entire cleanup effort.

Recommendation: Adopt the cleanup action as presented.

Site 2.1: San Francisco Bay Region, San Francisco Bay

Site Description: The San Francisco Bay RWQCB identified several high priority toxic hot spots in their Regional Toxic Hot Spots Cleanup Plan.

Description of the Site

San Francisco Bay is part of an estuarine system which conveys the waters of the Sacramento and San Joaquin rivers to the Pacific Ocean. This is a highly complex system that includes large brackish marshes, tidal lagoons and freshwater rivers and creeks. The diversity of these ecosystems support a wide variety of organisms. While the upper part of the estuary has been widely used for mining and agricultural activities the San Francisco Bay region has been heavily urbanized and is the site of many industrial activities and ports.

The San Francisco estuary has high concentrations of metals due to contributions from numerous sources, both natural and anthropogenic. Natural sources include drainage of water from formations that are naturally enriched in some metals, such as the Franciscan Formation that is exposed throughout the Bay area, and the rocks that make up the Sierra Nevada Mountains. This drainage flows into the streams that empty into the Bay. Localized concentrations of these metals were exploited in a great wave of mining activity from the 1820's continuing, in some cases, into the 1970s.

Mercury was mined at numerous locations in the Coastal Range and then transported to the Sierra Nevada foothills to be used in the amalgamation of gold in placer and hydraulic mining. Drainage from natural mercury deposits, mine tailings, and directly from mining activities have had a major impact on the San Francisco Bay and estuary.

San Francisco Bay is an extremely dynamic depositional environment. Sediments flow from the major river systems and are deposited in the Bay. Strong winds and tidal currents resuspend and redeposit these sediments resulting in a system where sediments are well mixed. Bioaccumulative contaminants attach to sediments and are distributed and mixed by the same physical processes. Therefore, the sediment acts as a sink for contaminants. The sediment, however, is also a source of contaminants to organisms in the aquatic food chain and ultimately to humans.

Although the San Francisco estuary extends from the ocean up through the river systems, the jurisdiction of the San Francisco Bay RWQCB only extends to the area just west of Antioch. The Central Valley RWQCB includes the Delta and extends through the river systems. Since the health advisory on fish consumption effects both Regions, it is important that a coordinated strategy is developed, especially in regard to mercury contamination.

Actions Initiated at the Site

Mercury

The RWQCB has developed a draft regulatory policy and program for mercury in the Region. The proposed strategy would, in the long term, reduce mercury concentrations in the estuary. It is not feasible to clean up the diffuse, historic sink of mercury in Bay sediments. Natural processes such as outflow through the Golden Gate and capping by the natural deposition of cleaner sediments may effectively isolate this mercury. Therefore, the proposed mercury strategy emphasizes the need to control all controllable sources. The two goals of the strategy are to: (1) reduce the inflow of controllable sources so that natural cleanup rates will be maximized and (2) identify human activities that may increase the rate of mercury methylation in the system and to prevent the creation of environments that may increase that rate.

To ensure that controllable sources are controlled, the strategy sets up a process to focus on the most cost-effective measures first. A preliminary evaluation indicates that the most cost-effective measures are to: (1) remediate abandoned mine sites on the western side of the Central Valley and the New Almaden district in the South Bay, (2) step up recycling programs for mercury users such as miners on the east side of the Central Valley, dentists and hospitals, (3) improve household product substitution such as laundry bleach and thermometers and (4) verify the status of the use of scrubber systems on sludge incinerators. Many permitted entities in the San Francisco and Sacramento Regions have already implemented these measures. In addition, as part of the mercury strategy dischargers are implementing clean sampling and analytical techniques. This will result in improved loading estimates and improve the evaluation of the most cost-effective remedial alternatives.

The RWQCB has worked with dischargers to set up programs for pollution prevention and source control of mercury and other chemicals of concern. The Palo Alto Regional Water Quality Control Plant and the City and County of San Francisco have devoted significant resources in their service areas into identifying sources of these contaminants and determining methods of decreasing loads to their facilities.

In addition to these control measures, the draft strategy includes a provision for a pilot offset program for point source dischargers. If successful, the pilot offset program would create an administrative tool that can help direct regulatory efforts toward cost-effective measures first.

The second goal of the proposed mercury strategy, to minimize the environmental risk associated with existing levels of mercury in the Bay system, requires a better understanding of the processes that control mercury methylation and the subsequent bioavailability of mercury to the food chain. This understanding is necessary in order to determine whether methylation can be managed. The proposed regional pollutant policy includes provisions for defining water quality based effluent limits for point source discharges, and a series of actions to be taken by nonpoint source control agencies and entities. These provisions may serve as a TMDL for all segments of San Francisco Bay except possibly the extreme South Bay where a separate TMDL may be developed. Adequate funding to complete both the TMDL Basin Planning process and the methylation research and management efforts has not been identified.

In order to identify and cleanup mercury sources under the jurisdiction of the Central Valley RWQCB, interregional coordination is necessary. Because these sources contribute such a high proportion of the load to the estuary, control of these sources as part of the San Francisco Bay Region's mercury strategy is essential. However, due to liability issues the State and interested private parties are limited in their ability to clean up mines in which there are no responsible parties. An amendment to the Federal Clean Water Act is needed in order to resolve this issue.

In April 1998, the RWQCB completed a survey of all of the region's abandoned mines. In total, 41 mines were surveyed and mines that had actual or potential impacts to water quality were identified. The survey documented conditions at the mines through field inspections, photographs and chemical analyses. Five mercury mines with drainages to the San Francisco estuary were identified as having actual or potential impacts to water quality. The New Almaden mine was one of these mines and was by far the largest with the highest water quality impact. Recommendations were made for monitoring or controlling waste in these mines. The RWQCB is currently monitoring all of the North Bay tributaries to the Bay to identify areas with elevated mercury concentrations.

The New Almaden mercury mine was the second largest mercury mine in the world during its operation. The mine consists of several mines: those located within Santa Clara Almaden Quicksilver Park and those located outside the Park. Those mines located within Santa Clara County Almaden Quicksilver Park are currently being remediated under CERCLA. The Department of Toxic Substances Control is the lead agency, while the RWQCB provides input on water quality issues on this project.

Remediation of the mines within Santa Clara Almaden Quicksilver Park was divided into two phases: Phase 1: remediation of Hacienda Furnace Yard, and Phase 2: remediation of the rest of the Park. The Hacienda Furnace Yard was identified as the highest priority area, from a water quality perspective, of six areas in need of cleanup. In this location mine tailings were eroding directly into Los Alamitos Creek, a tributary to San Francisco Bay. Cleanup of this area began in the spring of 1996 and was completed in December 1997. Phase 2 of the project, which includes remediation of Mine Hill, San Francisco Open Cut, Enriquita Mine, San Mateo Mine, and Senator Mine was started in August 1998 and is scheduled to be completed January 1999. Mine Hill, San Francisco Open Cut and Enriquita Mine were identified as potential sources of mercury laden sediment that flow directly to Guadalupe and Almaden Reservoirs with surface runoff. Because mercury strongly binds to particulates, these reservoirs may be serving as a sink for mercury, therefore minimizing fluxes to the Bay. However, these reservoirs are currently posted with a health advisory on consuming fish because of mercury contamination.

With the completion of Phase 2 of the project, all known mine waste piles located within Santa Clara County Almaden Quicksilver Park will be either capped in place or moved to somewhere else in the Park and capped. However, other remaining sources of potential mercury contamination, i.e. those mines located outside the Park and mercury laden sediment from the overburden natural formations within the greater watershed areas of Guadalupe and Almaden Reservoirs, are yet to be addressed.

PCBs

PCBs are ubiquitous and diffuse in the sediments throughout San Francisco Bay. Although several areas have been identified that have elevated sediment concentrations (see Sites of Concern and Candidate Toxic Hot Spots in Appendix B), these levels do not approach sediment concentrations that have been measured in the Great Lakes or many East Coast harbors. Yet, the mass of PCBs in the estuary's sediment and possible ongoing sources have contributed to levels in fish that are a potential threat to human health. Sites with historically elevated levels of PCBs should be evaluated for cleanup, however, identification and cleanup of ongoing sources is extremely important.

The RWQCB has been working with dischargers, both point and nonpoint, and the RMP to identify sources of PCBs to the estuary. An article in the 1996 RMP annual report (SFEI, 1997) indicates that ongoing sources of PCBs are discharging to the Bay. To further this evaluation a RMP workgroup has been set up to evaluate PCB data from the Bay, perform a preliminary model of loadings and come up with conclusions and recommendations for future monitoring and studies. Preliminary results indicate that there may be significant ongoing sources. Results of a 1997 RMP fish pilot study indicate that fish from Oakland Harbor have distinctly higher levels of contaminants than at other areas monitored in the Bay. This was particularly true for mercury, PCBs, DDTs and dieldrin. Additional monitoring needs to be conducted in Oakland Harbor, particularly of stormwater runoff, to identify sources of these contaminants. A study was recently conducted by SFEI, with funds from an ACL from the Port of Oakland, in San Leandro Bay, a toxic hot spot just south of Oakland Harbor. Contaminants from San Leandro Bay may accumulate in the fish from Oakland Harbor that were sampled. The purpose of the study was to identify the extent and general sources of contamination. The results of this study are not yet available.

Chlorinated Pesticides

Lauritzen Canal is an area in Richmond Harbor that had extremely elevated levels of DDT. This site was recently cleaned up under CERCLA. Although U.S. EPA was the lead agency, the RWQCB coordinated with U.S. EPA and other agencies to implement the cleanup.

As with the other chemicals previously discussed, it is important to monitor discharges (both point and nonpoint) to the estuary for the identification and cleanup of sources of chlorinated pesticides. The Regional Board is working with dischargers and the RMP to identify sources of these contaminants. However, as was discussed under Future Needs, increased resources for watershed monitoring and assessment are needed to address this issue in a significant manner.

Dioxins

The RWQCB has requested the assistance of the California Environmental Protection Agency in addressing the problem of dioxin contamination, due to the cross-media issues that are involved in identifying and controlling any ongoing dioxin sources. Coordination with the Bay Area Air Quality Management District and the State Air Resources Board is essential in addressing this issue since the predominant source of this contaminant is through aerial deposition. A meeting was held in 1997 for scientists to present information on dioxin to the RWQCB. Since the majority of dioxins in the Bay Area is likely generated by fixed and mobile combustion of diesel fuel and emission into the air, regulation of point source discharges into the Bay is unlikely to have an impact on the concentration of dioxin in sediment or organisms. Since even areas removed from sources contain background levels of dioxins that are potentially harmful to humans and other organisms, and since this group of contaminants are very persistent and can be spread great distances through aerial deposition, a global strategy is truly needed. This will probably require that the U.S. EPA take the lead in cooperation with the California Environmental Protection Agency in addressing this problem including instituting any additional control measures.

Summary of actions by government agencies in response to health advisory

Due to the large reservoir of mercury and PCBs in the estuary it may take decades for contaminant levels in fish to reach acceptable levels, even with full implementation of the cleanup plan. Therefore, interim measures should be taken to: (1) determine the rate of change in chemical concentrations in fish to determine if natural processes and required cleanup measures are having an effect, and over what time scale, (2) determine the risk of consuming fish from the Bay and identify high risk populations and (3) conduct public outreach and education programs, especially to high risk populations, in order to minimize their risk.

The RWQCB has been leading an effort through the RMP to conduct studies to address the first two issues. Several committees have been put together with representatives from State and Federal agencies, environmental groups and dischargers (who fund the program). A five year plan has been developed to: (1) measure contaminant levels in fish throughout the Bay every three years, (2) conduct special studies on specific species, organs or chemicals of concern and (3) conduct a consumption study to quantify the parameters that would go into a risk assessment for San Francisco Bay and to identify high risk populations for public outreach and education.

The second monitoring study of contaminant levels in fish tissue in the Bay, after the BPTCP study, was carried out through the RMP in the summer of 1997 by the Department of Fish and Game. Results will be published in the RMP's 1997 Annual Report. A special study was conducted in the spring of 1998 to measure contaminant levels in resident clams that are collected by clammers. A special study will be conducted in the spring of 1999 to measure contaminant levels in crabs. The State Department of Health Services has been hired to conduct the consumption study and this study is currently underway.

The Department of Health Services has been chairing a committee for Public Outreach and Education on Fish Contamination. As a result, County Health Departments and the East Bay Regional Parks District have posted signs at public fishing areas in six different languages describing the advisory. Currently, the committee is developing a strategy to more effectively educate the public on this issue. This strategy, however, is limited due to the lack of funding for this effort and the fact that there is no legal mandate that requires any agency to address this issue. Environmental groups have been using various forums to educate people who eat Bay fish on how to decrease their risk, but their funding is also very limited.

Approach/Alternatives:

1. <u>Finish the cleanup of the New Almaden Mine.</u>

2. <u>Clean up sediment at Point Potrero that is high in PCBs</u> (see Issue 5.2.2).

3. Finalize the Basin Plan amendment process to add the proposed TMDL, pilot permit offset program, and regional requirements for ongoing mercury sources.

Once adopted, implement the two main components of the Region-wide Mercury Strategy. The first component is controlling ongoing, controllable sources, thereby enhancing the natural cleanup process and accelerating mine remediation work. The second component involves developing new technical information about mercury methylation and sediment fate and transport within different zones of the estuary. This information is needed to enable the Regional Board to manage methylation and bioaccumulation to the greatest extent possible.

4. Increase investigations into ongoing sources of mercury and PCBs and develop remediation plans for those sources.

This action would require an increase in watershed monitoring and assessment (see Future Needs) and in the case of mercury would require coordination with the Central Valley RWQCB. PCBs should be fingerprinted to distinguish the difference between historic and ongoing sources. Biomarker methods could be used to more inexpensively screen for PCBs. The highest priority for monitoring should be in areas where fish contain higher levels of contaminants (Oakland Harbor), areas where sources of PCBs or mercury have been identified, and areas where these chemicals are or were used or produced.

5. Continue RMP studies on fish contamination issues.

6. Increase public education to:

    a. Inform people who consume San Francisco Bay fish, especially high risk populations, about the health advisory and ways to decrease their risk and,

    b. Inform the public on product use and replacement in order to decrease concentrations of chemicals of concern. This could include the use of dioxin free paper, the substitution or conservation of diesel fuel, limiting the use of fireplaces and wood stoves and the substitution of mercury containing products such as thermometers.

Endangered species consultations will take place for any part of this plan for which it is required.

Estimate of the total cost to implement the cleanup plan

1. Cleanup of New Almaden Mine - $10 million (includes the amount already spent for cleanup, $5 million, and the additional amount expected to be needed to complete the cleanup).

2. Point Potrero cleanup - $800,000 - $3,000,000

3. Implement Mercury Strategy - $10-20 million

   a. Finalize and implement Basin Plan amendment

   b. Technical studies including:
      Fate and transport of particle-bound mercury in Bay system
      Mercury methylation studies

4. Ongoing sources

   a. Watershed investigations to identify ongoing sources of the chemicals of concern in the San Francisco Bay and Central Valley Regions - $4 million over 5 years

   b. Costs of cleanup once sources are identified - Unknown

5. RMP studies (including monitoring of contaminant levels in fish every three years and special studies) - Average $75,000/year (1998-99 special studies and consumption study are already funded)

6. Public Education

   a. Outreach and education to people consuming fish from the Bay to reduce their health risk (including DHS staff, translations, training and educational materials) - $150,000 for first two years then $50,000/year

   b. Educational efforts on source control and product substitution - $50,000

Total to Implement Plan--Approximately $25 to $45 million (not including cleanup of ongoing sources that have not yet been identified)

Although there are costs to implementing this plan there are also benefits. Currently, beneficial uses are being impacted by high concentrations of mercury and PCBs in San Francisco Bay that are accumulating in fish. These concentrations have lead to a human health advisory on consuming fish but probably also impact other higher trophic organisms, such as marine mammals and birds that have a much higher consumption rate than humans, as well as possibly the fish themselves. The beneficial uses that are impacted are OCEAN, COMMERCIAL AND SPORTFISHING (COMM), MARINE HABITAT (MAR), ESTUARINE HABITAT (EST), WATER CONTACT RECREATION (REC1), NONCONTACT WATER RECREATION (REC2) and probably WILDLIFE (WILD) and SHELLFISH HARVESTING (SHELL). Implementation of this plan is intended to lower concentrations of these chemicals in fish and minimize or eliminate the impacts on beneficial uses.

Estimate of recoverable costs from potential dischargers

Ongoing RMP studies are currently funded by dischargers at approximately $75,000/year. Cleanup of the New Almaden Mine in Santa Clara Almaden Quicksilver Park ($5 million) and Point Potrero ($0.8 - $3.0 million) will be paid for in full by the responsible parties. The total equals approximately $5.8 million to $8 million plus $75,000/year for RMP studies.

Two-year expenditure schedule identifying funds to implement the plans that are not recoverable from potential dischargers

Although funding is available for continuation of the RMP studies and the cleanup of Point Potrero and the part of New Almaden Mine in Santa Clara Almaden Quicksilver Park there is little or no funding for the other parts of the cleanup plan.

Recommendations: Adopt each alternative, cost estimates and expenditure plans into the cleanup plan.

Site 2.2: San Francisco Bay Region, Peyton Slough

Site Description: The San Francisco Bay RWQCB identified several high priority toxic hot spots in their Regional Toxic Hot Spots Cleanup Plan. The RWQCB has identified several actions that are underway at Peyton Slough. A potential discharger has been identified as being responsible for this site.

Description of site

Peyton Slough is located in Martinez, northern Contra Costa County, California. The slough discharges into the San Francisco estuary at the confluence of Suisun Bay and the Carquinez strait, near Bull Head Point, just east of the Benicia Bridge.

Sediments in Peyton Slough are comprised of firm clays that do not appear to erode easily (CH2MHILL, 1986). Sediments from Peyton Slough appear to have been dredged in the past with the dredge spoils deposited on the east and west shore forming levees. There are openings in the east levee downstream of the tidal gate that provide exchange between Peyton Slough and a large brackish wetland to the east of the slough.

During the winter, Peyton Slough receives fresh water discharge from the Contra Costa Canal and stormwater runoff from the surrounding area. During the dry weather months, Peyton Slough receives fresh water discharge primarily from a waste water treatment plant (Mountain View Sanitary District) through a tidal gate. Some minor flow from the Contra Costa Canal may also occur during the dry months. A tidal gate had been configured such that fresh water from upstream can be released when the water level is greater on the upstream side of the gate. In 1998, this tidal gate was replaced with a newer gate which will allow water to flow from the bay into a wetland area situated upstream from Peyton Slough.

Two major historical industrial activities have taken place in the vicinity of Peyton Slough on a site currently owned and operated by Rhodia: sulfuric acid production and the smelting of copper. Currently, treated waste water is discharged into Carquinez Straits via Peyton Slough by Mountain View Sanitary District. Historically, the first recorded industrial use near Peyton Slough was by the Mountain Copper Company (MOCOCO). This company used the site for a copper smelting operation from the early 1900s until 1966 at which time it was purchased by Stauffer

Chemical Company. During the smelting of copper, a fused silicate slag was generated which was discharged over the north and south sides of the hillside housing the smelter. MOCOCO also roasted pyrite ore to recover its sulfur. Resulting cinders remain on site.

Cinder and slag, classified as Class B Mining Waste, from the smelting operations were stored in large piles on the site. The north cinder/slag area covers 8.3 acres, while the south cinder/slag covers 7.1 acres. Due to their weights, the cinder and slag piles subsided 30 to 35 feet into the softer bay mud below the existing ground surface. Stauffer Chemical Company bought the site from MOCOCO and removed the cinder/slag piles to the depth of the water table, but it is estimated that over 500,000 tons of waste material remains below the surface. The remaining north and south cinder/slag piles have been capped with a minimum of two feet of low permeability soil in 1978 and 1980 respectively.

In 1972, a leachate removal and containment system (LRCS) was installed in response to a cease and desist order No. 71-21 issued by the RWQCB (The MARK Group, 1988b). The LRCS prevented leachate from moving to Carquinez Strait and Peyton Slough by a cut-off wall consisting of compacted bay mud along the bay shoreline. Prior to 1988, the leachate from the north cinder/slag area was pumped to a north solar evaporation pond. Leachate from the south cinder/slag piles was pumped from two deep sumps to the south solar evaporation pond. Starting in 1988, the Process Effluent Purification (PEP) system was installed and began treating this leachate prior to discharge to a deep water outfall. Cutoff walls were not constructed along Peyton Slough. However, to date there is no evidence that leachate is being discharged into the slough.

Currently, the Contra Costa Mosquito Vector Control District (CCMVCD) is planning a restoration project in Shell marsh. This project intends to restore the marsh south of Peyton Slough back to a brackish marsh with regular inputs of salt water from San Francisco Bay. As part of this project, the CCMVCD has replaced the tidal gate in Peyton Slough and is proposing to dredge Peyton Slough to allow for higher flows of saline water up the slough into Shell marsh. This project is partially funded by Caltrans to mitigate for discharge from Route 680 and to prevent flooding of the highway. Rhodia is also working with CCMVCD to coordinate the dredging of Peyton Slough. Regional Board staff has been helping to coordinate completion of the marsh restoration project in order to remediate the toxic hot spot, restore Shell marsh and alleviate flooding on Route 680.

Summary of actions initiated at the site

In 1972, a leachate removal and containment system (LRCS) was installed in response to a cease and desist order No. 71-21 issued by the RWQCB (The MARK Group, 1988b). The LRCS prevented leachate from moving to Carquinez Strait and Peyton Slough by a cut-off wall consisting of compacted bay mud along the bay shoreline. Prior to 1988, the leachate from the north cinder/slag area was pumped to a north solar evaporation pond. Leachate from the south cinder/slag piles was pumped from two deep sumps to the south solar evaporation pond. Starting in 1988, the Process Effluent Purification (PEP) system was installed and began treating this leachate prior to discharge to a deep water outfall. Cut-off walls were not constructed along Peyton Slough, however, to date there is no evidence that leachate is being discharged into the slough.

Waste Discharge Requirements for Rhodia have been regulated under the National Pollution Discharge Elimination System (NPDES) Permit No. CA 0006165 and Order 93-060 in June 1993, which was amended by order 96-033 in March 1996. Recently, the SFB-RWQCB reissued Waste Discharge Requirements, under Order No. 97-121, which rescinded previous Orders. Leachate from the onsite cinder and slag piles are mixed with the treated process waste water. Until recently, this discharge was located in the tidal section of Peyton Slough about 800 yards upstream of its confluence with Carquinez Strait and 200 feet downstream of the tidal gate. Currently, this discharge goes to a deepwater outfall located in the Carquinez Strait. Another source of discharge from the Rhodia site originates from storm water runoff from the Caltrans I-680 and Benecia bridge, and from the western highlands drain collection system located on this property. This runoff flows via a pipeline into a usually submerged discharge point in Peyton Slough.

As part of the reissuance of Waste Discharge Requirements in Order No. 97-121, Rhone Poulenc, now Rhodia, was asked to submit a workplan, including a detailed schedule, for investigation of metal contamination in Peyton Slough sediments. The workplan has been submitted, and a site investigation is being completed. Results of this site investigation are provided in a previous section

(Reason for Listing). The RWQCB has asked Rhodia to provide a remedial workplan based on these results.

Mountain View Sanitary District (MVSD) discharges an average of 1.47 million gallons per day MGD to 21 acres of intensively managed marsh ponds at a location 1,000 yards upstream of the tidal gate under NPDES Permit No. CA 0037770, Order 93-001. Wet weather flows have been approximately 3.5 MGD, with wet weather peaks of 11.1 MGD allowed. Effluent in Peyton Slough backs up onto 68 acres of wetland also managed by the discharger.

Approach/Alternatives: The CCMVCD Shell marsh restoration project needs to deepen Peyton Slough in order to enhance salt water flow into Shell marsh. Rhodia is currently coordinating their remediation plan for Peyton Slough with this project, and is studying the feasibility of various other activities. Dredging of contaminated sediments to three feet below needed depth and back filling with clean materials has been proposed for Peyton Slough since contamination has been shown to extend to at least 8 feet below the sediment surface. Dredging and capping with clean compatible fill seem to be the most feasible alternative since contamination is so deep and the slough is so narrow removal of all contaminated sediment would cause instability of the sidewalls. Follow-up monitoring would be required to make sure that the cap stays in place and is effective. Contaminated sediments to be dredged are estimated at 12,000 cubic yards and will be disposed at a regulated off site landfill. An endangered species consultation with all appropriate agencies is currently in progress.

<u>Estimate of the total cost to implement the cleanup plan</u>

Based on the proposed remediation, the estimated cost is for 12,000 cubic yards of sediments to be dredged and disposed, and for a three-foot cap to be put in place in the entire slough. The range of costs are approximately $400,000 to $1,200,000 depending on the methodology followed for the cleanup, and other potential activities such as building a subsurface cut-off wall or a cap on the sidewall along the slough to control groundwater discharge. Follow-up monitoring would cost approximately $5,000-$10,000/year. RWQCB staff costs are estimated at $10,000 to $50,000 over the entire course of the project.

Although there are costs to implementing this plan there are also benefits. Currently, beneficial uses are being impacted by high concentrations of chemicals at this site. The beneficial use that is impacted is ESTUARINE HABITAT (EST). Sediments from this site cause toxicity to test organisms and may have an impact on the benthos. Since Peyton Slough will be the main conduit of water from Carquinez Strait to the restored Shell marsh, cleanup of this site will prevent other marsh organisms from being exposed to chemicals from the slough. Implementation of this plan will minimize or eliminate this impact on the beneficial use.

Estimate of recoverable costs from potential dischargers

The responsible party or parties are accountable for all costs incurred as a result of site cleanup at Peyton Slough as well as the cost for RWQCB and other regulatory staff oversight. However, Caltrans has budgeted $300,000 toward the CCMVCD restoration project which can be partially used to defray the cost of dredging.

Two-year expenditure schedule identifying funds to implement the plans that are not recoverable from potential dischargers

The responsible party or parties are accountable for all costs incurred as a result of site investigations and cleanup at Peyton Slough as well as the cost for RWQCB and other regulatory staff oversight.

Recommendation: Adopt the alternative as presented.

Site 2.3: San Francisco Bay Region, Castro Cove

Site Description: The San Francisco Bay RWQCB identified several high priority toxic hot spots in their Regional Toxic Hot Spots Cleanup Plan. The RWQCB has identified several actions that are underway at Castro Cove. A potential discharger has been identified as being responsible for this site.

Description of site

Castro Cove is a protected embayment located in the southern portion of San Pablo Bay in Richmond, CA. Castro Cove is defined as the cove enclosed by a line drawn from the Point San Pablo Yacht Club breakwater to the northwest corner of the West Contra Costa Sanitary Landfill. The embayment is protected by diked margins on the west, south and most of its eastern margin. The southeastern portion, where Castro Creek enters the cove, is a salt marsh. Castro Cove is shallow with extensive mudflats and marshlands that are subject to tidal action. Castro Creek empties into a channel that is about 30 to 75 feet wide and about three to six feet deep at mean lower low water.

Summary of actions initiated at the site

RWQCB actions regarding Castro Cove have been to control the sources of contamination through NPDES permitting and ACLs. All municipal and industrial point source discharges to Castro Cove were eliminated by 1987. Process effluent discharge from the Chevron refinery into Castro Cove was prohibited after July 1, 1987 under NPDES permit CA0005134, thereby eliminating the source of contaminated effluent into Castro Cove. This NPDES permit regulates discharges from the deep-water outfall. Discharges regulated by this NPDES permit include: thermal waste, cooling tower blowdown, gas scrubber blowdown from an incinerator, treated process wastewater, cooling water, and storm water. As stated previously, the San Pablo Sanitary District discharge was relocated to an offshore deep-water site which is also under permit. The City of Richmond is required by its municipal stormwater permit to implement and document the effectiveness of best management practices to reduce or prevent pollutant discharge through the city's stormwater runoff collection system.

The RWQCB has also conducted sampling and analysis of sediments in Castro Cove as discussed in the previous section.

State Order 86-4 required Chevron to evaluate the quality of the sediments in Castro Cove resulting in the Entrix and EVS studies. In June 1998, RWQCB staff requested, under Section 13267 of the California Water Code, that Chevron submit a workplan and schedule for characterization of sediment contamination in Castro Cove due to sources from the refinery. Specific items that RWQCB staff requested the workplan to address included: (1) a delineation of sediment contamination gradients originating from refinery-related source areas, (2) an evaluation of the effects of the bioavailable layer of sediment on aquatic organisms by means of concurrent toxicity and chemistry testing, (3) a characterization of the vertical extent of sediment contamination in conjunction with an estimation of sediment deposition and erosion rates, and (4) an evaluation of the bioaccumulation/biomagnification potential for contaminants in the sediment.

Chevron submitted a workplan in August 1998 that proposed a tiered ecological risk assessment consisting of a new round of surficial sediment sampling and chemical analysis with subsequent comparison of the resulting chemical concentrations to established ecological benchmarks. If chemicals likely associated with refinery releases exceed the proposed benchmarks and complete exposure pathways exist, Chevron proposed conducting a second tier risk assessment to address specific ecological concerns. This second tier may contain bioassays and a bioaccumulation/ biomagnification evaluation in addition to a refined predictive risk assessment. The workplan also proposed conducting a bathymetric survey and comparing the results to a previous survey made in 1989 to evaluate sediment accretion or erosion rates in Castro Cove. RWQCB staff conditionally approved the workplan in September 1998 with the provision that additions would be made to the plan. RWQCB staff collected five core samples in Castro Cove in November 1998 to begin characterization of the vertical contaminant profile. In December 1998 Chevron took deep core samples in Castro Cove.

Approach/Alternatives: Corrective actions for Castro Cove sediments will require the following phases:

1. Preparation of a Sampling and Analysis Plan (SAP) in order to delineate vertical and horizontal extent of contamination,

2. Completion of a Site Investigation to complete goals of SAP,

3. Preparation of a Feasibility Study (FS) based on the findings of the Site Investigation (at a minimum the following cleanup options will be considered: natural recovery, in-place containment, dredging with various disposal options and dredging and capping),

4. Sediment clean up following option(s) selected from the FS and,

5. Follow-up monitoring to make sure that the site has been cleaned up.

An endangered species consultation with all appropriate agencies will be conducted before remediation plans are finalized.

<u>*Estimate of the total cost to implement the cleanup plan*</u>

The uncertainty regarding the horizontal and vertical extent of sediment contamination results in a range of potential cleanup costs. All options including natural recovery, dredging, dredging with upland disposal and capping will be considered for remediation. The cost is estimated based on a contaminated area ranging from a minimum of 10 acres to a maximum of 100 acres. Sediments will be assumed to be contaminated to a depth of at least three feet below the sediment surface. The cost of performing a full site investigation and feasibility study is estimated at $2,000,000. The cost of remediating Castro Cove, depending on the chosen remedial alternative, and follow-up monitoring is estimated at $1,000,000 to $20,000,000. Follow-up monitoring will be required regardless of the chosen remedial alternative. RWQCB staff costs are estimated at $200,000 over the entire course of the project.

Although there are costs to implementing this plan there are also benefits. Currently, beneficial uses are being impacted by high concentrations of chemicals at this site. The beneficial use that is impacted is ESTUARINE HABITAT (EST). Implementation of this plan will minimize or eliminate this impact on the beneficial use.

<u>Estimate of recoverable costs from potential dischargers</u>

The responsible party or parties are accountable for all costs incurred as a result of site investigation and cleanup at Castro Cove as well as the cost for RWQCB and other regulatory staff oversight.

Two-year expenditure schedule identifying funds to implement the plans that are nor recoverable from potential dischargers

The responsible party or parties are accountable for all costs incurred as a result of site investigation and cleanup at Castro Cove as well as the cost for RWQCB and other regulatory staff oversight.

Recommendation:	Adopt the approach, estimated costs and expenditure plan as presented.

Site 2.4: San Francisco Bay Region, Stege Marsh

Site Description:

The San Francisco Bay RWQCB identified several high priority toxic hot spots in their Regional Toxic Hot Spots Cleanup Plan. The RWQCB has identified several actions that are underway at Stege Marsh. A potential discharger has been identified as being responsible for this site.

Description of site

Stege marsh occupies approximately 23 acres on the western margin of San Francisco Bay in the City of Richmond, California. Eastern Stege marsh is located on property currently owned by Zeneca Agricultural Products. Western Stege marsh is currently owned by the University of California Field Station. The cinder landfill separates east and west Stege marsh. The East Bay Parks District currently owns the land south of the historic railroad track which is now a hiking trail.

Eastern Stege marsh rests directly on the alluvial fan-deltaic deposits of Carlson Creek interspersed with Bay mud. Bedrock at the site is likely to be Franciscan Formation rocks, cretaceous and younger in age, consisting of an assemblage of marine sedimentary and volcanic, and some metamorphic rocks (The Mark Group, 1988). Western Stege Marsh is fed by Meeker Creek. Between 1947 and 1969, a railroad track was constructed just south of Stege marsh resulting in siltation and thus the extension of the tidal marsh into a previously subtidal area (May, 1995).

Stauffer Chemical Company is the prior owner of the Zeneca industrial facility and associated marsh. Stauffer Chemical Company utilized the industrial portion of the site to roast pyrite ores for the production of sulfuric acid from about 1919 until 1963. This industrial process resulted in the production of cinders, which were placed on the site surface. Elevation at the bottom of the cinders is at mean sea level throughout the facility, which indicates past placement of cinders at ground level. The presence of a layer of peaty silt under the base of the cinders also supports that cinders were disposed of on the site surface. The cinder pile extends along the north and east sides of eastern Stege marsh. The cinders were covered with a one-foot clay layer, with a permeability of 10^{-7} cm/sec or less, that was itself covered by a one-foot layer of topsoil to comply with RWQCB Order No. 73-12 and its 1974 amendment.

Besides pyrite cinders, other products that have been generated or utilized on the site include fuels, sulfuric acid, ferric sulfate, proprietary pesticides, solvents and alum. Until recently Zeneca produced proprietary agricultural chemicals on the industrial portion of the site.

Summary of actions initiated at the site

RWQCB actions regarding Stege marsh have been to control the sources of contamination through NPDES permitting. NPDES permit No. CA0006157 (Order No. 95-008) requires that wastewater from the evaporation ponds be discharged into the City of Richmond sanitary sewer. Discharge to Stege marsh is only allowed during storm events when the sanitary sewer capacity and on-site storage capacity have been exhausted. A prior NPDES permit requested that the cinders be capped and that an interceptor trench be built to limit discharges from the pyrite cinders.

Other actions by the RWQCB have included a request to Zeneca Agricultural products for sampling and analyses of sediments. In December 1996, the RWQCB requested, under section 13267 of the California Water Code, that Zeneca Agricultural Products perform sediment studies in order to propose a conceptual site model to evaluate potential impacts of contaminants including ecological and human health impacts. The studies by ICF Kaiser and Pacific Eco-Risk Laboratories were in response to this request. However, these studies are just the beginning of studies that will be required to develop a full conceptual site model.

Approach/Alternatives:

1. Completion of a Sampling and Analysis Plan (SAP) in order to finish delineating vertical and horizontal extent of contamination (in progress);

2. Completion of a Site Investigation to complete goals of SAP including development of a conceptual site model and ecological and human health risk assessments (in progress);

3. Preparation of a Feasibility Study (FS) based on the findings of the Site Investigation (at a minimum the following cleanup options will be considered: natural recovery, in-place containment, dredging with various disposal options, and dredging and capping);

4. Sediment clean up following option(s) selected from the FS and,

5. Follow-up monitoring to ensure that the site has been cleaned up to agreed levels.

An endangered species consultation with all appropriate agencies will be conducted before remediation plans are finalized.

Estimate of the total cost to implement the cleanup plan

The uncertainty regarding the horizontal and vertical extent of sediment contamination, the potentially varied nature of the sources of contamination and the cleanup options results in a range of potential clean-up costs. The cost is estimated based on a minimum of 10 acres and a maximum of 23 acres being remediated. The range of costs are $1,500,000 to $10,000,000 depending on the range of clean-up options selected and the areal extent remediated. RWQCB staff costs are estimated at $100,000 to $200,000 over the entire course of the project.

Although there are costs to implementing this plan there are also benefits. Currently, beneficial uses are being impacted by high concentrations of chemicals at this site. The beneficial use that is impacted is ESTUARINE HABITAT (EST) at a minimum. Due to high concentrations of bioaccumulative compounds, such as selenium, WILDLIFE HABITAT (WILD) and PRESERVATION OF RARE AND ENDANGERED SPECIES (RARE) may also be impacted.

Implementation of this plan will minimize or eliminate these impacts on beneficial uses.

Estimate of recoverable costs from potential dischargers

The responsible party or parties are accountable for all costs incurred as a result of site investigation and site cleanup at Stege marsh as well as the cost for RWQCB and other regulatory staff oversight.

Two-year expenditure schedule identifying funds to implement the plans that are not recoverable from potential dischargers

The responsible party or parties are accountable for all costs incurred as a result of site investigation and cleanup at Stege marsh as well as the cost for RWQCB and other regulatory staff oversight.

Recommendation: Adopt the approaches, cost estimates and expenditure plan as presented.

Site 2.5: San Francisco Bay Region, Point Potrero/Richmond Harbor

Site Description: The San Francisco Bay RWQCB identified several high priority toxic hot spots in their Regional Toxic Hot Spots Cleanup Plan. The RWQCB has identified several actions that are underway at Point Potrero/Richmond Harbor. A potential discharger has been identified as being responsible for this site.

Description of site

The site designated Point Potrero/Richmond Harbor is a 400 foot long intertidal embayment, the Graving Inlet, on the western side of the Shipyard #3 Scrap Area at the Port of Richmond. Shipyard #3 is currently used as a parking lot, but in the past the site has been used for shipbuilding, ship scrapping, sand blasting and metal recycling. The geographic feature identified with the site is Point Potrero, although the original configuration of the point has been modified by quarrying of a bedrock hillside and filling of intertidal mudflats.

The embayment known as the Graving Inlet (Inlet) was excavated in 1969 to allow ships to be beached in shallow water for final scrapping operations. Site investigations have shown that the sediments in the Inlet have the same levels and types of contaminants found on the adjacent Shipyard #3, including heavy metals, PCBs and PAHs. While the most heavily contaminated sediments are in the intertidal zone and shallow subtidal zone within the inlet, elevated levels of PCBs and metals are also found in the subtidal zone outside of the inlet.

Summary of actions initiated at the site

RWQCB staff, in cooperation with staff of the Department of Toxic Substances Control, have overseen the design and implementation of a Remedial Investigation (Hart Crowser, 1993) and a Feasibility Study (Hart Crowser, 1994) for the onshore area that recommended capping of the upland source of the contaminated sediments. Placement of dredged material on the site was completed in December 1997 and the dredged material will be capped with asphalt when it has completed drying (projected for the summer of 1999).

RWQCB staff have written Waste Discharge Requirements (WDRs) for the onshore portion of the site. The WDRs serve to regulate the placement of dredged material on top of the upland source material to isolate it from human contact and provide a base for an asphalt surface.

Staff approved Supplemental Sediment Characterization in January 1997 and the preliminary results were made available in December 1997. The results provided better documentation of the horizontal and vertical extent of contamination at the mouth of the Graving Inlet. The data indicates that the areas of greatest contamination are limited to the Inlet and a smaller area at the southern extent of the property. Regional Board staff have provided comments on a draft Remedial Action Workplan (Terra Verde, 1998) that described five remedial action alternatives and participated in meetings with the Port of Richmond, Bay Conservation and Development Commission, and Department of Toxic Substances Control.

Approach/Alternatives:

Actions at this site to date have defined the horizontal and vertical extent of contaminants and shown that beneficial uses of waters of the state are impaired by the levels of contaminants in the Graving Inlet. A draft Remedial Action Workplan (RAP) has been submitted and is being finalized by the Port. Remedial action alternatives described in the RAP include: (1) No action, (2) Sheetpile Bulkhead, Capping and Institutional Controls, (3) Rock Dike Bulkhead, Capping and Institutional Controls, (4) Excavation and Off-Site Disposal, and (5) Excavation and Reuse or Disposal Onsite. Excavation or capping would require restoration of the site or restoration of an offsite location to mitigate for the loss of intertidal habitat.

The Sheetpile Bulkhead, Capping and Institutional Controls alternative is preferred by the Port, since it has a relatively low cost and would provide additional flat property that can be used by the Port. While this would provide a financial benefit to the landowner, it would require mitigation for loss of habitat and for filling of the Bay. This mitigation would probably require more than one acre of habitat restoration and/or public access improvements to be acceptable to the San Francisco Bay RWQCB and the San Francisco Bay Conservation and Development Commission. Any requirement for endangered species consultation will be completed before finalization of the remediation plan.

Estimate of the total cost to implement the cleanup plan

Preliminary cost estimates for the remedial action alternatives described in the RAP include: (1) No action ($0), (2) Sheetpile Bulkhead, Capping and Institutional Controls ($792,000), (3) Rock Dike Bulkhead, Capping and Institutional Controls ($1,344,000), (4) Excavation and Off-Site Disposal ($3,010,000), and (5) Excavation and Reuse or Disposal Onsite ($881,000). RWQCB staff costs are estimated at $30,000 ($10,000/yr for 3 years). There may be additional costs for mitigation of wetlands.

Although there are costs to implementing this plan there are also benefits. Currently, beneficial uses are being impacted by high concentrations of mercury and PCBs in San Francisco Bay that are accumulating in fish. These concentrations have lead to a human health advisory on consuming fish but probably also impact other higher trophic organisms, that have a much higher consumption rate than humans, as well as possibly the fish themselves. The beneficial uses that are impacted are OCEAN COMMERCIAL AND SPORTFISHING (COMM), MARINE HABITAT (MAR), ESTUARINE HABITAT (EST), NONCONTACT WATER RECREATION (REC 1), WATER CONTACT RECREATION and possibly WILDLIFE HABITAT (WILD). Point Potrero has the highest concentrations of mercury and PCBs in over 600 samples collected statewide in the BPTCP. Implementation of this plan would contribute to lowering concentrations of these chemicals in fish and minimize the impacts on beneficial uses.

Estimate of recoverable costs from potential dischargers

The responsible party or parties are accountable for all costs incurred as a result of site investigation and cleanup at Point Potrero, as well as costs for RWQCB staff oversight.

Two-year expenditure schedule identifying funds to implement the plans that are not recoverable from potential dischargers

The responsible party or parties are accountable for all costs incurred as a result of site investigation and cleanup at Point Potrero, as well as costs for RWQCB staff oversight.

Recommendation: Adopt the approaches, cost estimates, and expenditure plan as presented.

Site 2.6: San Francisco Bay Region, Mission Creek

Site Description:

The San Francisco Bay RWQCB identified several high priority toxic hot spots in their Regional Toxic Hot Spots Cleanup Plan. The RWQCB has identified several actions that are underway at Mission Creek. A potential discharger has been identified as being responsible for this site.

Description of site

Mission Creek is a 0.75 mile long arm of the Bay in the eastern side of the San Francisco waterfront. Formerly, the estuary of Mission Creek reached back a couple of miles. It was filled to roughly its present dimension before the turn of the century. Currently, the creek is 100 to 200 feet wide in most sections and narrower at the two bridges at 3rd and 4th Streets. Concrete rip rap and isolated bands of vegetation line Mission Creek's banks.

Ten to fifteen houseboats are docked at the Mission Creek Harbor located between 5th and 6th Streets along the south shore of the creek. Many of the houseboats have year round on-board residents.

The City and County of San Francisco operates seven combined sewer overflow structures in Mission Creek from 3rd Street to the upper end at 7th Street. Light industrial and urban development line the shores of Mission Creek. A new baseball stadium will soon open on the north shore at the mouth of Mission Creek near 2nd Street in China Basin. Currently, demolition debris cover the remainder of the north shore. According to City plans, new retail development will occupy this area in the near future. Along the south shore, there is a golf driving range near 6th Street, warehouse facilities, and a sand and gravel operation near the mouth of the Creek. Finally, Interstate Freeway 280 crosses over Mission Creek between 6th and 7th Streets.

Summary of actions initiated at the site

Since 1967, the RWQCB has issued resolutions and orders prescribing requirements on the discharges from the CSO structures. One of the more significant ones is Cease and Desist Order No. 79-119 in 1979 requiring San Francisco to construct overflow consolidation structures to reduce wet weather overflow frequencies to allowable levels. San Francisco completed the consolidation structures for the CSOs into Mission Creek around

1988. These consolidation structures also provided settleable and floatable solids removal treatment for the overflows.

More recently in June 1998, the RWQCB issued a draft Water Code Section 13267 letter requiring San Francisco to define the extent of the sediment contamination, and determine if the CSOs are continuing to cause the contamination or acting to resuspend contaminated sediments already there. Section 13267 is a legal administrative tool with enforcement powers for the RWQCB to require collection of technical information. The RWQCB followed up with three more letters in August and September 1998 and march 1999 to further define and formalize the requirements of the investigation. San Francisco submitted a Sampling and Analysis Plan, and in October 1998 started the investigation.

Approach/Alternatives:

Corrective actions for Mission Creek sediments will require the following phases:

1. Completion of a site investigation that delineates the vertical and horizontal extent of contamination, and whether and to what extent the CSOs are continuing to contribute pollutants.

2. Preparation of a Feasibility Study based on the findings of the Site Investigation. At a minimum the following cleanup options will be considered, if the CSOs are not contributing pollutants:

   a. natural recovery,
   b. dredging with disposal and capping, and
   c. dredging with disposal of sediments.

   If the CSOs are continuing to contribute pollutants, the cleanup options will include those listed above plus, at a minimum, the following:

   d. reduce or eliminate the number of overflows by changing the operation or the storage and treatment capacity of the current system, and/or
   e. implement upstream measures that reduce the volume or intensity of runoff. An example of this would be a program to encourage increasing permeable cover.

3. Implement the remediation option(s) selected from the Feasibility Study.

4. Follow-up monitoring to make sure that the site has been cleaned up and remains clean.

An endangered species consultation with all appropriate agencies will be conducted before remediation plans are finalized.

<u>Estimate of the total cost to implement the cleanup plan</u>

We estimate that the cost of performing a full site investigation and feasibility study will be $1 million; the cost of remediation and follow-up monitoring will be $800,000 to $1,800,000 with dredging options; if option (d) is added and significant structural changes are needed the cost could increase to approximately $75 million. Regional Board staff costs will be $100,000 to $200,000 over the entire course of the project.

In estimating the remediation cost, we used an areal extent of 5 acres as a minimum and 12 acres as a maximum, and contamination to a depth of at least 3 feet below the sediment surface. Furthermore, we used dredging as the preferred option for cleanup, with sediment disposal in an upland facility, either a Class I landfill or a reuse site based on the degree of contamination. Following dredging, we also assume that the area would be backfilled with clean sediment.

Although there are costs to implementing this plan there are also benefits. Currently, beneficial uses are being impacted by high concentrations of chemicals at this site. The beneficial uses that are impacted are ESTUARINE HABITAT (EST), WATER CONTACT RECREATION (REC 1) AND NONCONTACT WATER RECREATION (REC 2). Implementation of this plan will minimize or eliminate these impacts on beneficial uses.

<u>Estimate of recoverable costs from potential dischargers</u>

The responsible party or parties are accountable for all costs for the site cleanup. Costs for Regional Board and other regulatory staff oversight are recoverable from the responsible party after the RWQCB issues a Cleanup and Abatement Order to that party.

Two-year expenditure schedule identifying funds to implement the plans that are not recoverable from potential dischargers

In the next two years, we estimate the expenditure will be $1,100,000. This includes the completion of the site investigation and feasibility study with RWQCB staff oversight.

Currently, the City and County of San Francisco is funding the site investigation. The plan is for the RWQCB to issue a Cleanup and Abatement Order to the responsible party or parties subsequent to completion of the site investigation, at which point, staff oversight costs and the feasibility study will be recoverable from that party.

Recommendation: Adopt the approaches, cost estimates and expenditure schedule as presented.

Site 2.7: San Francisco Bay Region, Islais Creek

Site Description:

The San Francisco Bay RWQCB identified several high priority toxic hot spots in their Regional Toxic Hot Spots Cleanup Plan. The RWQCB has identified several actions that are underway at Islais Creek. A potential discharger has been identified as being responsible for this site.

Description of site

Islais Creek is a one mile long channel of the Bay running east-west on the San Francisco waterfront near the foot of Potrero Hill and Caesar Chavez Street. Formerly, the estuary of Islais Creek reached back a couple of miles as far as Bayshore Boulevard, and was fed by a creek that ran down what is now Alamany Boulevard. Before the turn of the century, the area was filled to roughly its present size.

A bridge at Third Street forms a narrow 100-foot wide constriction that physically divides the channel into two segments. The eastern segment is approximately 400 to 500 feet wide; the western, 250 to 300 feet wide.

The City and County of San Francisco operates four wet weather overflow structures that discharge into the western segment. San Francisco also operates a sewage treatment plant effluent outfall that discharges into the western segment at Quint Street.

The banks of Islais Creek are covered with concrete rip-rap with narrow bands of vegetation in small isolated areas. Long stretches of creek bank in the eastern segment are under pier structures. Old pier pilings dot the southern shore of the western segment.

Light industrial and urban development surround Islais Creek. On the shores of the eastern segment are a sand and gravel facility, grain terminal, oil and grease rendering facility, warehouse, and container cargo terminal. Auto dismantlers and auto parts dealers, scrap metal recyclers, and warehouses make up the bulk of the current activities surrounding the western segment. Interstate 280 passes over the western end of Islais Creek.

Summary of actions initiated at the site

Since 1967, the RWQCB has issued numerous resolutions and orders prescribing requirements on the discharges from the CSO structures. One of the more significant ones is Cease and Desist Order No. 79-119 in 1979 requiring San Francisco to construct overflow consolidation structures to reduce wet weather overflow frequencies to allowable levels throughout the city. For Islais Creek, San Francisco completed the consolidation structures in 1996. These consolidation structures also provided settleable and floatable solids removal treatment for the overflows.

Order No. 79-119 also required the City to develop alternatives to address the discharge from the Quint Street outfall. The outcome of this order was improvement in the quality of the discharge to the outfall. Starting in 1997, the Quint Street outfall received only secondary treated wastewater. San Francisco accomplished this by a major re-piping project and increasing the secondary treatment capacity of their Southeast Treatment Plant.

More recently in June 1998, the RWQCB issued a draft Water Code Section 13267 letter requiring San Francisco to define the extent of the sediment contamination, and determine if the CSOs and Quint Street outfall are continuing to cause the contamination or may act to resuspend contaminated sediments already there. Section 13267 is a legal administrative tool with enforcement powers for the RWQCB to require collection of technical information. The RWQCB followed up with three more letters in August and September 1998 and march 1999 to further define and formalize the requirements of the investigation. San Francisco submitted a Sampling and Analysis Plan, and in October 1998 started the investigation.

Approach/Alternatives:

Corrective actions for Islais Creek sediments will require the following phases:

1. Completion of a Site Investigation that delineates the vertical and horizontal extent of contamination, and whether and to what extent the CSOs and Quint Street outfall are continuing to contribute pollutants.

2. Preparation of a Feasibility Study based on the findings of the Site Investigation. At a minimum the following cleanup options will be considered, if the CSOs and Quint Street outfall are not contributing pollutants:

   a. natural recovery,
   b. partial dredging with disposal and capping, and

c. dredging with disposal of sediments.

If the CSOs and Quint Street outfall are continuing to contribute pollutants, the cleanup options will include those listed above plus at a minimum the following:

d. reduce or eliminate the number of overflows by changing the operation or increasing the storage and treatment capacity of the current system, and/or
e. implement upstream measures that reduce the volume or intensity of runoff. An example of this would be a program to encourage increasing permeable cover.

3. Implement the remediation option(s) selected from the Feasibility Study.

4. Follow-up monitoring to make sure that the site has been cleaned up and remains clean.

An endangered species consultation with all appropriate agencies will be conducted before remediation plans are finalized.

Estimate of the total cost to implement the cleanup plan

We estimate that the cost of performing a full site investigation and feasibility study will be $1 million; the cost of remediation and follow-up monitoring will be $800,000 to $5,200,000 with dredging options; if option (d) is added and significant structural changes are needed the cost could increase to approximately $75 million. Regional Board staff costs will be $100,000 to $200,000 over the entire course of the project.

In estimating the remediation cost, we used an areal extent of 5 acres as a minimum and 35 acres as a maximum, and contamination to a depth of at least 3 feet below the sediment surface. Furthermore, we used dredging as the preferred option for cleanup, with sediment disposal in an upland facility, either a Class I landfill or a reuse site based on the degree of contamination. Following dredging, we also assume that the area would be backfilled with clean sediment.

Although there are costs to implementing this plan there are also benefits. Currently, beneficial uses are being impacted by high concentrations of chemicals at this site. The beneficial use that is impacted is ESTUARINE HABITAT(EST) and NONCONTACT

WATER RECREATION (REC 2). Implementation of this plan will minimize or eliminate these impacts on beneficial uses.

Estimate of recoverable costs from potential dischargers

The responsible party or parties are accountable for all costs for the site cleanup. Costs for RWQCB and other regulatory staff oversight are recoverable from the responsible party after the RWQCB issues a Cleanup and Abatement Order to that party.

Two-year expenditure schedule identifying funds to implement the plans that are not recoverable from potential dischargers

In the next two years, we estimate the expenditure will be $1,100,000. This includes the completion of the site investigation and feasibility study with RWQCB staff oversight.

Currently, the City and County of San Francisco is funding the site investigation. The plan is for the RWQCB to issue a Cleanup and Abatement Order to the responsible party or parties subsequent to completion of the site investigation, at which point staff oversight costs and the feasibility study will be recoverable from that party.

Recommendation: Adopt the approaches, cost estimates and expenditure plan as presented.

Site 3.1: Central Coast Region, Moss Landing Harbor and Tributaries

Site Description: The Central Coast RWQCB identified two high priority toxic hot spots in their Regional Toxic Hot Spots Cleanup Plan. The RWQCB has identified several actions that are underway at Moss Landing Harbor and its tributaries. A potential discharger has been identified as being responsible for some of the actions at this site.

Description of the site

Moss Landing Harbor receives drainage water from Elkhorn Slough watershed, Moro Cojo Slough watershed, Tembladero Slough watershed, the Old Salinas River, and the Salinas River. The watershed areas include only the lower portions of the Salinas watershed. Other watercourses such as the Blanco Drain and the Salinas Reclamation Canal also drain either directly or indirectly to Moss Landing Harbor.

Sediments from Moss Landing Harbor have been shown for a number of years to contain high levels of pesticides. Concentrations of a number of pesticides in fish and shellfish tissue have exceeded National Academy of Sciences (NAS) Guidelines, USEPA Screening Values, and Food and Drug Administration (FDA) Action Levels.

PCBs and tributyltin have also been identified as a pollutant of concern in the Harbor and its watershed.

The Harbor's watershed supports substantial agricultural and urban activities, which are also sources of pesticides and other chemicals. Some of which have been banned for many years.

Summary of actions initiated at the site

The RWQCB has long been involved in activities to address water quality issues in the Moss Landing area. The following are some of the Regional Board activities which either directly or indirectly address pollution at Moss Landing Harbor and its tributaries:

Issuance of Discharge Permits and CWA 401 Certifications

Existing RWQCB Waste Discharge Requirements for the Moss Landing Harbor District, U.S. Army of Corps of Engineers, National Refractories, and Pacific Gas and Electric Co. (now Duke Energy), contain prohibitions and limitations on the quality of effluent discharges to the ocean. These limitations are for the protection of beneficial uses. RWQCB staff also review Army

Corps permitted activity, pursuant to the Clean Water Act Section 401 Water Quality Certification Program.

Harbor Dredging Activities

The Moss Landing Harbor has suffered from severe sedimentation for a number of years; this has been exacerbated by high flows during the winter of 1997/98 which have made the Harbor nearly unusable for many vessels and landlocked some at their moorings. The Harbor District requested an increase of up to 150,000 cubic yards for 1998 and 1999 to address the current sedimentation problems.

Recent results of sediment sampling and analysis (Harding, Lawson, & Assoc., July 7, 1998 Draft) indicate that sediment quality in Moss Landing Harbor varies with depth and location, with some sediments showing significant toxicity and high chemical concentrations, and others suitable for unconfined aquatic disposal.

Suitable dredge material has been used for beach replenishment, or is disposed offshore at one of two areas. The disposal areas are located within the Monterey Bay National Marine Sanctuary and authorization to dispose of material at these sites is allowed under a grandfather clause. Dredging activities have occurred since the early 1950's, but there have been no focused studies of unconfined aquatic disposal of inner harbor material, and ultimate impacts are unknown.

Because of the long history of monitoring data indicating elevated levels of pesticides in inner harbor sediments, several regulatory agencies, including the U.S. Environmental Protection Agency and the Monterey Bay National Marine Sanctuary, expressed concerns in recent years regarding the suitability of the material for unconfined aquatic disposal. Dredging of inner harbor fine grain sediments has been limited during the past five years as a result of these concerns. Dredged materials which do not meet certain quality standards must be disposed of using sites located on land. The cost of upland disposal is considerably more expensive than unconfined aquatic disposal (Jim Stillwell, pers. comm., 1997).

The RWQCB has worked with other regulatory agencies in an effort to develop a sediment sampling and disposal suitability plan for the Monterey area. The basis of RWQCB approval is a determination of beneficial use protection. The RWQCB is currently involved in a dialog with the U.S. EPA, U.S. Army Corps of Engineers, California Dept. of Fish and Game, the California Coastal Commission, and Monterey Bay National Marine Sanctuary, regarding sampling and disposal of dredge spoils in the Moss Landing area. Moss Landing Harbor District has recently obtained several million dollars in Federal Emergency Management Act funding for dredging the Harbor, securing an upland disposal site, and possibly conducting an ecological risk assessment on contaminated sediments in the Harbor.

303(d) Listings of Water Quality Limited Water Bodies

Currently, the RWQCB has listed Moss Landing Harbor, Elkhorn Slough, Espinosa Slough, Moro Cojo Slough, Old Salinas River Estuary, Salinas River Lagoon, Salinas River Reclamation Canal, and Tembladero Slough on the 303(d) list of water quality limited water bodies. All of these water bodies are listed for pesticides and other problems. A Total Maximum Daily Load analysis for pesticides, which assesses sources and allocates loadings appropriately, must be developed for all of these waters. Once developed, management activities will be prioritized to best address various sources. The Regional Board will coordinate development of Total Maximum Daily Loads for pesticides with interested and responsible landowners, organizations and agencies. Coordination will occur through meetings, workshops, preparation and review of written documentation and implementation of existing memorandums of understanding or management agency agreements. For example, in the case of currently registered pesticides, the Regional Board will coordinate with DPR through the State Water Resources Control Board's Management Agency Agreement.

Watershed Management Initiative

In order to more effectively utilize limited resources, the Regional Board is implementing the Watershed Management Initiative (WMI), the purpose of which is to direct State and federal funds to the highest priority activities needed to protect water quality. The WMI is attempting to achieve water quality goals in all of California's watersheds by supporting development of local solutions to problems with full participation of all affected parties (this constitutes a "watershed management approach").

One objective of the RWQCB's WMI effort is to integrate and coordinate permitting, enforcement, implementation of the Coastal Zone Act Reauthorization Amendments (CZARA), basin planning, monitoring and assessment, total maximum daily load (TMDL) analysis, groundwater protection and nonpoint source (NPS) pollution control activities within watersheds.

As part of the WMI effort, the RWQCB has identified several target watersheds in the region, based on severity of water quality impacts. The Salinas River Watershed is currently the Region's top priority watershed.

Salinas River Watershed Strategy

In 1996, the Central Coast Regional Board established the Salinas River Watershed Team to develop a pilot watershed management approach to address water resource issues in the Salinas River watershed. The Team has outlined a two-year Salinas River Watershed Team Strategy (1996) to develop a Watershed Management Action Plan, which is scheduled to be completed by December 1998. The Team's goal is to promote integrated/coordinated water resource protection, enhancement, and restoration in the Salinas River Watershed. The general steps to accomplish this goal include the following:

1. Implement Existing Regulatory Responsibilities within the Watershed
2. Implement Watershed Activities
3. Characterize the Watershed
4. Identify and Evaluate Water Resource Issues/Areas
5. Develop a Watershed Management Action Plan
6. Implement the Plan
7. Evaluate Progress

Staff is currently implementing watershed activities by facilitating grant funding, supporting and participating in activities of the Water Quality Protection Program of the Monterey Bay National Marine Sanctuary, coordinating with the Central Coast Regional Monitoring Program, participating and supporting education and outreach efforts, and coordinating with other agencies on permit streamlining and resource protection activities. The RWQCB has committed staff time and resources towards watershed management in the Salinas River watershed. The RWQCB has also given the Salinas River Watershed priority for receipt of grant funding under Sections 205(j) and 319(h) of the Clean Water Act.

Nonpoint Source Program

The RWQCB has been implementing its nonpoint source program in the tributaries to Moss Landing for a number of years and is continuing to do so as part of its WMI effort. The RWQCB's nonpoint source program incorporates a tiered strategy for obtaining control of nonpoint source pollution. Consistent with the 1988 SWRCB Nonpoint Source Management Plan, Region 3 advocates three approaches for addressing nonpoint source management in the tributaries to Moss Landing Harbor (from the Central Coast Basin Plan, 1996).

1. Voluntary implementation of Best Management Practices

   Property owners or managers may volunteer to implement Best Management Practices.

2. Regulatory Encouragement of Best Management Practices

   Although the California Porter-Cologne Water Quality Control Act constrains RWQCBs from specifying the manner of compliance with water quality standards, there are two ways in which RWQCBs can use their regulatory authorities to encourage implementation of Best Management Practices.

   First, the RWQCB may encourage Best Management Practices by waiving adoption of waste discharge requirements on condition that dischargers utilize Best Management Practices. Alternatively, the RWQCB may encourage the use of Best Management Practices indirectly by entering into management agreements with other agencies which have the authority to enforce the use of Best Management Practices.

3. Adoption of Effluent Limitations

   The RWQCB can adopt and enforce requirements on the nature of any proposed or existing waste discharge, including discharges from nonpoint sources. Although the RWQCB is constrained from specifying the manner of compliance with waste discharge limitations, in appropriate cases, limitations may be set at a level which, in practice, requires the implementation of Best Management Practices.

   In general, the RWQCB's approach to addressing sediment and its associated pollutants follows this three tiered approach. The voluntary approach is predominantly utilized, with resources committed to planning, educational outreach, technical assistance, cost-sharing and BMP implementation.

Urban Runoff Management

The RWQCB has been reviewing phases of the application for an NPDES Municipal Storm Water Permit from the city of Salinas. The city of Salinas is developing and implementing management practices and will be conducting monitoring of urban discharges as part of that permit.

RWQCB staff participated in development of "The Model Urban Runoff Guide with the Cities of Monterey and Santa Cruz and the Monterey Bay National Marine Sanctuary". This project was funded under a 319(h) grant.

Implementation of strategies contained in the MBNMS Action Plan for Implementing Solutions to Urban Runoff (1996) are currently in progress. Seven strategies are identified in this plan:

Public Education and Outreach
Technical Training
Regional Urban Runoff Management
Structural and Nonstructural Controls
Sedimentation and Erosion
Storm Drain Inspection
CEQA Additions

Clean Water Act Section 319(h) and 205(j) Grants

A number of projects have been undertaken in the affected area using Clean Water Act (CWA) funding, provided by the United States Environmental Protection Agency and administered by the SWRCB and RWQCBs. Some of these projects are described in more detail below.

The Elkhorn Slough Agricultural Watershed Demonstration Program was developed by the State Coastal Conservancy and the Elkhorn Slough Foundation. This project included implementation of a series of BMP's on agricultural lands in Elkhorn Slough watershed, including filter strips, sediment basins, farm road revegetation and realignment, and riparian corridor restoration. The project also included developing a characterization of agricultural activities in the watershed in cooperation with U.C.

Santa Cruz, the Elkhorn Slough Foundation and the Nature Conservancy, developing a demonstration project and associated agricultural/environmental education outreach program, and coordinating with activities of various agencies.

A 205(j) grant was obtained by the Association of Monterey Bay Area Governments (AMBAG) to develop the "Northern Salinas Valley Watershed Restoration Plan". The Watershed Restoration Plan discusses pesticide pollution entering Moss Landing Harbor through its southern tributaries, including the Salinas River, Tembladero Slough, and Moro Cojo Slough, and recommends Best Management Practices to help alleviate this problem. The program emphasizes the use of "wet corridors" as a means of reducing sediment delivery to waterways. A number of Best Management Practices have been implemented associated with this plan. Several wet corridors have been installed by the Watershed Institute (California State University at Monterey Bay). Several other project sites for wet corridors have been identified to be in need of funding.

The Moro Cojo Slough Management and Enhancement Plan, prepared for the State Coastal Conservancy and Monterey County, was funded by a number of agencies, including the SWQRCB. This document examines several alternative plans for management of the lower slough and recommends Best Management Practices for implementation in the entire watershed. As part of plan implementation, two hundred acres in the lower slough have recently been acquired through Coastal Conservancy funds for restoration as wetland and floodplain.

The Elkhorn Slough Uplands Water Quality Management Plan, developed for AMBAG, examined the effectiveness of Best Management Practices at reducing pesticide runoff from strawberry fields on study sites in the Elkhorn Slough watershed, and makes recommendations for Land Use Policies and implementation of Best Management Practices.

The Model Urban Runoff Program, developed under a 319(h) contract, is a pilot project by the cities of Monterey and Santa Cruz which has produced a user's guide for small municipalities to help them develop effective storm water management programs.

There are currently five new 319(h) contracts awarded in the Salinas River Watershed. These projects will demonstrate the use of restored wetlands as filters for pollutants and as ground water recharge areas; reduce nitrate loading to ground water through demonstrating and promoting agricultural best management practices; promote citizen monitoring in the watersheds of the Monterey Bay National Marine Sanctuary; reduce erosion and sedimentation on the east side of the Salinas Valley; and develop an expedited permitting process to encourage implementation of agricultural best management practices for reduction of erosion and sedimentation.

Coordination with Existing Resource Protection Efforts

A number of other programs have been initiated in the past decade to address erosion and pesticide problems impacting Moss Landing Harbor and its watershed. The Regional Board has been involved in funding or providing technical support for many of these programs. Numerous land management plans have been developed for the various watersheds and tributaries within the Moss Landing watershed, and extensive effort has been dedicated to education, outreach, and technical assistance to agricultural landowners and operators.

The Water Quality Protection Program (WQPP) for the Monterey Bay National Marine Sanctuary is a cooperative effort of many agencies and entities working in the watersheds of the Sanctuary to protect the water quality of the Sanctuary. The RWQCB is a signatory of a Memorandum of Agreement between agencies which deals with water quality activities within the Sanctuary and its watersheds. The RWQCB participates in a number of programs related to Sanctuary efforts, including the WQPP. RWQCB staff are members of the WQPP Water Quality Council. Staff attend meetings and have worked with other Council members in developing and reviewing strategies to address problems facing the Sanctuary.

The WQPP has developed Action Plans to address water quality needs related to Urban Runoff and Boating and Marinas within the Sanctuary. These documents contain information pertinent to problems identified at Moss Landing Harbor. Full implementation of these plans will help address problems related to tributyltin, PCBs, PAHs, and other pollutants found in the Harbor and downstream of the City of Salinas.

The WQPP is currently involved in work with the agricultural community to develop an Agricultural Action Plan to better protect water quality. A number of meetings have been held with the agricultural community to acquire its input during the plan development process. The RWQCB has been an active participant in these meetings. The Action Plan focuses on a variety of ways to encourage the adoption of management measures to reduce sedimentation, pesticide and nitrate runoff through improvements in technical training, education, demonstration projects, economic incentives, regulatory coordination, etc.

The plan will be linked with the State Farm Bureau Federation's new Nonpoint Source Initiative which proposes that Farm Bureaus take a leadership role in establishing landowner committees and active projects to address nonpoint pollution. Six county Farm Bureaus on the Central Coast have developed an intercounty agreement to work together as an agricultural implementation arm of the WQPP, and to establish Farm Bureau-led pilot projects which will evaluate and implement management measures and track success over time. The local and state Farm Bureaus will work with the various WQPP members, particularly with the RWQCB as a key player, to ensure that their nonpoint efforts can help meet the water quality goals of a variety of agencies and sustain the agricultural economy.

The Natural Resources Conservation Service (NRCS) and Monterey County Resource Conservation District have been involved in technical assistance and bilingual educational outreach to the growers in the Elkhorn and Moro Cojo Slough watersheds, through the Elkhorn Slough Watershed Project (1994). This project focuses particularly on outreach to ethnic minority farmers and strawberry growers. Its goal is to produce a fifty percent reduction in erosion, sediment, and sediment-borne pesticides. It strives to reconcile some of the socio-economic factors hindering adoption of BMPs, including high land rental and production costs, leasing arrangements and unfamiliarity with technical services and opportunities. Funding has been provided to this program through the SWRCB Cleanup and Abatement Fund.

The U.S. Army Corps of Engineers has issued a regional, watershed permit to the NRCS and the Resource Conservation District for activities in and around streams associated with restoration efforts in the Elkhorn Slough area. This is a pilot permit streamlining effort to encourage landowners to implement management practices which protect water quality. Landowners working with the NRCS on approved management practices and meeting specific design conditions can be included in a regional watershed permit held by NRCS and the Resource Conservation District rather than applying for individual permits or agency approvals.

The Farm Services Agency and the Natural Resources Conservation Service of the U.S. Department of Agriculture have designated Elkhorn Slough and the Old Stage Road area on the East Side of the Salinas Valley as priority areas for cost sharing under the Environmental Quality Incentive Program (EQIP). Decisions on priority areas and other aspects of the EQIP program are made by local work groups, whose members include landowners, and staff from NRCS, resource conservation districts, RWQCBs, county planning departments and UC Cooperative Extension.

The State Coastal Conservancy and the County of Monterey funded the Elkhorn Slough Wetlands Management Plan (1989). This document describes problems in Elkhorn Slough resulting from erosion, pesticides, bacteria and sea water intrusion, describes enhancement plans for five major wetlands in the Slough, plans for public access, and proposed implementation for management problem areas. It includes a lengthy discussion of pesticide use in Elkhorn Slough and the Salinas River area.

Monterey County Water Resources Agency and the Salinas River Lagoon Task Force, with funding provided by a number of agencies, developed the Salinas River Lagoon Management and Enhancement Plan (MCWRA, 1997). This document describes natural resources of the area, as well as some land management issues of concern associated with this lagoon. The document encourages the participation of Task Force members in the WQPP planning process, and recommends that an Interagency/Property Owners Management Committee be formed to ensure implementation of the Management Plan. Funds have recently been obtained to begin implementation of portions of this plan related to bank revegetation.

Monterey County Water Resources Agency has also developed a Nitrate Management Program as part of the Salinas Valley Water Project (formerly the Basin Management Plan). This long-term program will address reduction of the transport of toxic pollutants, specifically nitrate, through implementation of "on-farm management" outreach and education programs, as recommended by the Salinas Valley Nitrate Technical Advisory Committee in October 1997. Additionally, the Water Conservation Section of the Agency has promoted and fostered water conservation and fertilizer management programs since the early 1990s. These efforts have been focused on reducing the transport of toxic pollutants, specifically nitrate to ground water. Simultaneously, they have resulted in reducing the transport of toxic pollutants to surface waters as well.

Approach/Alternatives:

Actions necessary to restore Moss Landing Harbor to an unpolluted condition include both removal of contaminated sediments through dredging and control of the sources of pollutants in the watersheds tributary to the harbor. A detailed description of each remedial action follows:

1. Dredging

It is not the intent of this cleanup plan to originate new requirements or actions associated with the dredging of the Harbor. The problems associated with dredging projects are well known and are the topic of continuing interagency discourse. The gravity of the problems facing the Moss Landing Harbor caused the United States Congress to seek funding specifically for this purpose. In addition, several million dollars in Federal Emergency Management Act money have been acquired by the Harbor District to address dredging issues.

Sediment originating in upland watershed areas will continue to be deposited in the harbor and disrupt navigation. This material will continue to present a dredging and disposal problem, as long as it contains pesticides and other pollutants. An upland site for drying and processing dredge spoils has been established in the North Harbor area, but upland disposal is significantly more expensive and labor intensive than offshore disposal. The sedimentation itself, and the financial burden of dredge spoil disposal, create adverse impacts to the Harbor District, marine research community, fishing industry and other harbor interests. The best long term solution is source control of sediment within the watershed.

The current dredging activities are expected to deal with much of the excess sediment in the Harbor area itself. However, dredging will provide only a partial solution to an ongoing problem of sediment and pollutants entering the harbor from the watershed.

This plan focuses cleanup efforts at the sources of sediment and associated pollutants.

Control of Harbor Pollutants

A number of activities are generated at harbors as a result of boat maintenance and other activities. Tributyltin, one of the chemicals of major concern, has long since been banned. However, other problem chemicals, including PAHs, copper, zinc, and other metals, can still create pollution problems in poorly flushed Harbor areas.

Implementation of the Boating and Marinas Action Plan Developed by the WQPP will contribute to reduction of pollutants resulting from harbor activities. Seven strategies are identified in this plan:

- Public Education and Outreach
- Technical Training
- Bilge Waste Disposal and Waste Oil Recovery
- Hazardous and Toxic Materials Management
- Topside and Haul-out Vessel Maintenance
- Underwater Hull Maintenance
- Harbor Pollution Reduction Progress Review

A position has recently been created to address the various water quality issues in the Harbors and Marinas of the Sanctuary.

1. Control of Urban Runoff

Urban runoff from the city of Salinas is a probable source of some of the contamination in the Moss Landing Harbor watershed. The city of Salinas is in the process of obtaining an NPDES Municipal Storm Water Permit through the RWQCB, and will implement management practices and conduct monitoring of urban discharges as part of that permit.

Other smaller cities will soon be required to develop municipal storm water programs as well. The Model Urban Runoff Guide developed by the Cities of Monterey and Santa Cruz and the Monterey Bay National Marine Sanctuary under a 319(h) grant will be promoted for use by small municipalities throughout the area.

Continued and increased implementation of strategies contained in the MBNMS Action Plan for Implementing Solutions to Urban Runoff (1996) will also reduce urban pollution discharges. Seven strategies are identified in this plan:

- Public Education and Outreach
- Technical Training
- Regional Urban Runoff Management
- Structural and Nonstructural Controls
- Sedimentation and Erosion
- Storm Drain Inspection
- CEQA Additions

The SWRCB's management agency agreement with the Department of Pesticide Regulation (DPR) provides another mechanism for developing strategies for reducing problems associated with runoff of pesticides into urban waters. The RWQCB will coordinate with DPR in developing and implementing such strategies.

3. Implementation of Management Practices to Reduce Nonpoint Source Pollution from Agriculture

There are currently many activities taking place within upland areas which can potentially reduce the movement of sediments containing pesticides from agricultural lands. In order to ensure increased implementation of management practices, the following actions are recommended:

4. Implement the Regional Board's Watershed Management Initiative.

To further the restoration process in the tributaries to Moss Landing Harbor the Regional Board will continue with implementation of the Salinas River Watershed Team Strategy and development of a watershed management action plan for the Salinas River Watershed. The scope of this effort should be expanded to include all tributaries to Moss Landing Harbor. This expansion will not be feasible without the addition of another staff person. Funding for this person is included in the estimates of cleanup costs.

5. Increase support for education and outreach.

Many activities and planning efforts are already underway by other agencies in the tributaries to Moss Landing Harbor, and have been described in this report. The RWQCB supports many of these activities through funding, technical support, or other means. It is important that implementation activities be continued and whenever possible, accelerated. The importance of education and outreach can not be overemphasized. Providing and facilitating funding for these efforts is a priority action of this cleanup plan.

6. Develop and promote a variety of tools to control agricultural nonpoint source pollution.

Agricultural nonpoint source pollution is diffuse by nature and is generated from a variety of crop types and land use configurations. Landowner attitudes towards government involvement in private property management vary considerably. It is important that a number of tools be available for implementing solutions and that a wide variety of approaches be applied by various agencies. These may include development of land management plans, cost sharing programs, educational programs, technical support programs, demonstration projects, land easement acquisition programs, purchase of critical areas for floodplain restoration and wetland buffer development, and so on. The RWQCB will work with state and local Farm Bureaus and the WQPP to develop effective strategies.

7. Coordinate implementation of existing land management plans.

A number of agencies and landowners have developed land management plans and are already actively involved in erosion control activities in the tributaries to Moss Landing. Many of these documents list Best Management Practices and make recommendations for site specific implementation projects. To ensure that the numerous management plans developed for this area are implemented in a coordinated and effective fashion, it is recommended that an agency and landowner task force or other coordinating body be designated to assume a lead role in prioritizing and implementing actions.

8. Build on existing plans and programs.

Work with the Natural Resources Conservation Service and other agricultural extension agencies to develop resource management plans which address both economic and environmental concerns.

9. Increase effective use of land use policies and local ordinances.

Local agencies can utilize land use policies and ordinances to provide incentives for retirement of marginal or highly erodible agricultural lands which are sources of sediment and pollutants, such as those on steep slopes. Local agencies should utilize erosion control policies and ordinances to discourage activities which create excessive soil erosion. Local agencies, however, are often underfunded. Investigation of means of increasing the ability of local agencies to effectively enforce ordinances would be of benefit.

10. Increase technical assistance and outreach to landowners.

Most private landowners are concerned with soil loss and pesticide use, for both environmental and economic reasons. Excessive or inappropriate use of pesticides can increase operating costs. Excessive soil erosion can increase land maintenance costs and result in irreversible impacts to land productivity. It has been estimated that strawberry farmers in the Elkhorn Slough watershed lose $1.7 million per year as a result of soil erosion (NRCS, 1994). Many landowners are familiar with Integrated Pest Management and basic erosion control practices and have worked with the Natural Resources Conservation Service and other technical agencies on land management issues. However, many farmers are uncomfortable or unfamiliar with the use of government assistance, and are unsure how to obtain such assistance (NRCS, 1994). This effort could be facilitated through development of short courses for row crops and vineyards, similar to the Ranch Water Quality Planning courses being offered Statewide by the University of California Cooperative Extension.

11. Support joint efforts of the California Farm Bureau Federation's Nonpoint Source Initiative and the Water Quality Protection Program.

The California Farm Bureau Federation has developed a statewide nonpoint source initiative to address water quality concerns. The initiative is based on a voluntary watershed planning process to be developed by landowners and coordinated through local farm bureaus. Farm bureaus in three watersheds tributary to Monterey Bay National Marine Sanctuary, including the Salinas River Watershed, will be working with the Water Quality Protection Program of the Sanctuary to develop pilot projects. Work with the WQPP and the Farm Bureau to ensure that the action plans developed for protection of water quality in the Sanctuary reflect agricultural needs and issues as well as regulatory requirements.

12. Encourage broad implementation of management practices to solve multiple problems.

Many practices exist which can reduce the delivery of pesticides to waterways. It is not the intent of this document to present a comprehensive list of practices that should be implemented. Many sources of guidance are available which address this issue. Also, these practices must be selected and tailored to the specific conditions at each site, combining the expertise of the grower/rancher and technical outreach by agencies as necessary. Some of the major approaches which can be utilized by the agricultural community are summarized below:

Maintain a vegetative buffer area between creek drainages and agricultural activities. Wider buffer areas should be utilized adjacent to larger creeks.

Revegetate drainage ways with grass or suitable wetland vegetation.

If levees are utilized, set them back from creek channels to provide a flood plain within the area of channelized flow.

Restore channelized areas wherever possible to a more natural flood plain condition.
Seek funding for riparian enhancement and easement development to offset financial losses from land conversion immediately adjacent to creek areas.

Utilize cover crops and grassed field roads during winter months to reduce soil erosion and pesticide runoff during rain events.

Utilize low till and no till farming practices wherever feasible.

Monitor land for evidence of soil loss; implement control measures as needed.

Use sediment basins and other detention or retention devices to help capture sediment before it leaves the property.

Reduce overall use of pesticides; utilize integrated pest management practices.

Time application of pesticides to minimize runoff.

Avoid overspraying and spraying when wind can transport chemicals.

Make use of cost sharing programs and available technical assistance to address erosion control problems and pesticide application issues.

Wherever possible, retire steeply sloped farmland to grazing or other, less erosive uses.

Utilize irrigation/runoff management such as underground outlets and irrigation tailwater return systems.

13. Coordinate with the Department of Pesticide Regulation.

The SWRCB's management agency agreement with DPR establishes a unified and cooperative program to protect water quality related to the use of pesticides. The SWRCB and DPR have produced the California Pesticide Management Plan which provides for outreach programs, compliance with water quality standards, ground and surface water protection programs, self-regulatory and regulatory compliance, and interagency communication. The RWQCB will coordinate with DPR and implementation efforts of the California Pesticide Management Plan.

An estimate of the total costs to implement the cleanup plan

Cost estimates for implementation of this Cleanup Plan are partitioned into four general categories as follows:

1. RWQCB Program costs

The Watershed Management Initiative Chapter (1997) for Region 3 states "Although the state has had a Nonpoint Source (NPS) Program for many years, funding has been extremely limited and inadequate to address NPS problems in the Region, and in the Salinas River watershed in particular, which has relatively few point source discharges." In the WMI, for FY 99/00, a staffing deficit of 1.6 Personnel Years (PYs) has been identified related to implementation of the Watershed Management Action Plan, Nonpoint Source activities, and this Cleanup Plan in the Salinas and Elkhorn watersheds. Because only a portion of the Salinas Watershed is considered in this cleanup plan, 1.0 PY is recommended for funding to implement this cleanup effort.

In addition to an allocation for this PY, an allocation has been made to cover other expenses expected to be incurred by the Regional Board in connection with its administration of the plan and in connection with water and habitat monitoring in support of the implementation of this plan. First year expenses include provisions for a monitoring program and equipment to aid in selection of implementation sites and for collecting baseline data to be used during subsequent years in the performance evaluation phase of monitoring the BMP installations.

2. Harbor implementation costs

Cost estimates for this aspect of the Cleanup Plan were developed using Action Plan III, Marinas and Boating, Water Quality Protection Program for Monterey Bay National Marine Sanctuary, May 1996. This plan dealt with the entire Sanctuary area and involved a broad range of agency and private sector stakeholder involvement in its development. Cost estimates included in the document were prorated to provide estimates for use in this Cleanup Plan in Moss Landing Harbor only (Table 7).

TABLE 7: HARBOR IMPLEMENTATION COSTS

Strategy	First Year		Second Year	
	Low Estimate	High Estimate	Low Estimate	High Estimate
Public Education and Outreach	5,000	6,667	10,000	15,000
Technical Training	4,000	5,000	6,667	11,667
Bilge Waste Disposal and Waste Oil Recovery	5,000	8,333	18,333	21,667
Hazardous and Toxic Materials Management	1,667	3,000	11,667	16,667
Topside and Haulout Maintenance	1,667	1,667	13,333	16,333
Underwater Hull Maintenance	1,667	3,000	4,000	6,333
Harbor Pollution Reduction Review	1,667	1,667	3,333	6,667
Overall Harbor Costs	20,667	29,334	67,333	94,333

3. Urban implementation costs

Cost estimates for this aspect of the Cleanup Plan were developed using Action Plan I, Implementing Solutions to Urban Runoff, Water Quality Protection Program for Monterey Bay National Marine Sanctuary, May 1996. This plan dealt primarily with the coastal urban areas of the Sanctuary and involved a broad range of agency and private sector stakeholder involvement in its development. Cost estimates included in the document were used as guidelines to provide estimates for use in this Cleanup Plan (Table 8).

TABLE 8: URBAN IMPLEMENTATION COSTS

Strategy	First Year		Second Year	
	Low Estimate	High Estimate	Low Estimate	High Estimate
Education and Outreach	22,500	22,500	10,000	10,000
Technical Training	10,500	10,500	6,500	6,500
Regional Urban Runoff Mgmt Program	134,000	134,000	75,500	85,500
Structural/Non-Structural Controls	30,000	40,000	30,500	67,500
Sedimentation / Erosion	7,500	12,500	15,000	32,500
Stormdrain Inspection	17,500	20,000	27,500	35,000
CEQA additions	3,500	4,500	3,500	3,500
Overall Urban Costs	225,500	244,000	168,500	240,500

4. Agricultural implementation costs

The overall area of the Moss Landing watershed used for this cost estimate is approximately 210,000 acres. The cost estimates were derived by evaluating several local land improvement plans and prorating costs contained in those plans to the area under consideration in this plan. Some elements of these plans are already being implemented, and recalculations based on these activities will reduce overall clean up cost estimates.

Primary source documents evaluated to provide a basis for the estimates contained in this document are:

A. Elkhorn Slough Uplands Water Quality Management Plan (Kleinfelder, 1993)

This plan estimates that implementation of Best Management Practices in the area will cost between \$1,000 and \$1,500 per acre of land treated.

B. Elkhorn Slough Watershed Project (SCS, 1994)

This plan includes the Elkhorn Slough and Moro Cojo Slough watersheds. It estimates implementation costs at about \$650 per acre. It proposes to reduce erosion and the resulting transport of sediment and sediment borne pesticides by 50%. The plan encompasses a 44,900 acre portion of the Moss Landing watershed, of which approximately 10,000 acres are agricultural land and 5,450 acres are proposed for treatment. The plan emphasizes agricultural land treatment measures, and gives special attention to strawberry growing operations in the area.

In addition to providing remediation for some of the problems in Moss Landing, this plan estimates that its implementation would reduce the cost of erosion damage on strawberry lands by an average of \$1,100,000 per year, public road cleanup costs by \$64,000 per year and traffic delay costs by \$9,000 per year.

C. Guidance Specifying Management Measures For Sources of Nonpoint Pollution in Coastal Waters (USEPA, Jan 1993)

While this guidance document is general in nature, it provides cost estimates for a wide variety of land treatment measures and offers a framework for comparison of the cost benefit ratios for various management measures.

For the purposes of the Cleanup Plan, the acreage of irrigated agricultural land being considered for treatment was roughly estimated at 100,000 acres, using Association of Monterey Bay Area Governments (AMBAG) Geographic Information System data layers which employed satellite imagery as a basis for land cover classification. Only a portion of this total acreage is targeted for implementation efforts.

Documented cost estimates for the types of treatment deemed suitable and feasible range from $650/acre (NRCS 1994) to $1,500/acre (Kleinfelder 1993). Though Kleinfelder cites a higher treatment cost per acre than NRCS, the variability appears to be based on the topography and actual cropping practices in their respective study areas. Further inquiry into cost estimates indicates that because of the flatter overall topography of the Tembladero and lower Salinas area the costs will actually be lower. NRCS indicates that estimates of $500/acre are reasonable (D. Mountjoy, pers. comm. 1997). The use of a focused, results-oriented implementation management approach, which gives high priority to projects at sites which produce maximum benefits, will have a significant impact on overall costs.

The cost estimates below (Table 9) are based on implementation of Best Management Practices on 10 to 15% of the estimated 100,000 acres of agricultural land addressed by this Cleanup Plan.

TABLE 9: OVERALL AGRICULTURAL IMPLEMENTATION COST ESTIMATE

Strategy	First Year		Second Year	
	Low Estimate	High Estimate	Low Estimate	High Estimate
Education and Outreach	75,000	100,000	40,000	50,000
Technical Training	50,000	75,000	40,000	40,000
Sedimentation / Erosion Control Projects	100,000	500,000	1,300,000	1,400,000
Land Use Practice BMP Assistance	100,000	300,000	100,000	100,000
Overall Agricultural Costs	325,000	975,000	1,480,000	1,590,000

An estimate of recoverable costs from potential dischargers

Harbor

Moss Landing Harbor District currently bears the financial burden of dredging sediment from the Harbor. Providing funding for regular maintenance dredging of the harbor will continue to be the responsibility of the harbor department. Federal funding for the large dredging project required by recent extreme sedimentation has been appropriated through the Federal Emergency Management Act (FEMA).

Urban

Urban stormwater control activities by municipalities in the area are currently underway and the cost of administering and implementing these activities is being borne by municipalities, the State, and federal government. The majority of funding for the urban stormwater component of this plan will be borne by the cities as part of their implementation of stormwater management plans.

Agricultural

Implementation of management measures to control erosion is most frequently carried out by a combination of public and private sector funds. A variety of cost sharing programs exist which will be employed as a part of the overall funding strategy. These cost sharing programs generally require a project proponent share of 25% to 50% of the overall project cost. Many of the needed management measures produce continuing economic benefits to landowners and land users in general. Accordingly, a portion of the land treatment cost is expected to be absorbed by individuals and organizations which receive direct benefit from the land treatment measures.

The cleanup plan implementation program will incorporate inducements for private and public sector investment, and will include a spectrum of grants, fees, tax incentives, and public-private partnerships. In the case of management measures which produce a predictable return on investment, State Revolving Funds may be considered as temporary financing to encourage private and public sector investment by amortizing implementation costs. Other mechanisms, such as conservation banking and mitigation banking, can combine many small sources of funding into an asset pool capable of supporting larger scale projects.

Currently, there is no plan to issue waste discharge requirements or otherwise regulate agricultural land uses in the tributaries to Moss Landing Harbor. Consequently, no directly recoverable costs are anticipated from agricultural land owners. However, if voluntary compliance continues to be inadequate to address pollution problem in the Harbor, regulatory action may be considered at some point, particularly for individual landowners whose actions are shown to cause significant impact. The RWQCB has existing authority to initiate such action, under the Porter Cologne Water Quality Control Act.

<u>Five-year expenditure schedule identifying funds to implement the plans that are not recoverable from potential dischargers.</u>

Expenditures in the first year of the program will be largely committed to identifying and prioritizing specific implementation measures and target sites. First year expenses would include the addition of one full time position for Region 3 staff, and staff time expenditures by several other agencies. The Region 3 staff position would be dedicated to "land treatment implementation management". The individual would initially be charged with the creation of a prioritized candidate project list for focused remediation of the Moss Landing sedimentation and pesticide problems. This list (Table 10) would include financing and performance monitoring options for each project. This effort will require and result in an increase in coordination and assistance with existing projects and programs.

Second year funding, as well as funding for following years will emphasize implementation activities and monitoring for success.

TABLE 10: FIVE-YEAR EXPENDITURE SCHEDULE

	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	5 YEAR TOTALS
Harbor	25,001	80,833	80,833	80,833	80,833	348,334
Urban	234,750	204,500	204,500	204,500	204,500	1,052,750
Agricultural	650,000	1,535,000	1,535,000	1,535,000	1,535,000	6,790,000
Program Management	185,000	185,000	185,000	185,000	185,000	925,000
Monitoring	198,000	110,000	110,000	110,000	150,000	678,000
Total Program	**1,292,751**	**2,115,333**	**2,115,333**	**2,115,333**	**2,155,333**	**9,794,084**

Recommendation:	Adopt the alternatives, cost estimates, and expenditure plan as presented.

Site 3.2: Central Coast Region, Canada de la Huerta

Site Description:

The Central Coast RWQCB identified two high priority toxic hot spots in their Regional Toxic Hot Spots Cleanup Plan. The RWQCB has identified several actions that are underway at the Canada del la Huerta site. A potential discharger has been identified as being responsible for this site.

Description of the site

The Shell Western/Hercules Gas Plant site (now owned by Aera Energy LLC (Aera)) is located adjacent to Canada de la Huerta, approximately 18 miles west of Goleta in Santa Barbara County. In 1986 soils at the site were discovered to contain PCBs and other chemicals, as a result of operation and maintenance of the plant, and storage of a heat transfer fluid onsite.

In 1988, a remedial investigation was initiated, as a result of a Consent Agreement between Shell Western and the Department of Toxic Substances Control. As a result of that investigation, soil containing PCBs in concentrations exceeding 50 parts per million (ppm) was excavated from the site and removed to a landfill for disposal. A Human Risk Assessment comprised a large part of the analysis associated with the Remedial Action Plan. The analysis only considered individuals in direct contact with the site. Cleanup at 50 ppm was deemed appropriate to protect Human Health given a "Reasonable Maximum Exposed " individual. This corresponds to the Toxic Substances Control Act Protection Level for PCBs, but is considerably less protective than other suggested protection levels as published in the National Sediment Quality Survey (U.S. EPA, 1997).

Data collected as part of the post-remediation monitoring program in 1997- 98 indicate that PCB levels at the site still violate EPA, Ocean Plan, and Basin Plan standards in both surface and ground water by orders of magnitude. Toxicity has been documented in both water and sediment. Sediment PCB levels from post-remediation sampling have ranged at some sites between 3,000 and 20,000 ppb (wet weight). These values are orders of magnitude higher than numerous protective levels referenced in the 1997 U.S. EPA document which are intended to provide protection for various beneficial uses.

Summary of Actions Initiated at the Site

During the Fall of 1996 and Winter of 1997, the site was excavated and capped, per a remedial action plan (RAP) approved by the Department of Toxic Substances Control (DTSC). The excavation was based on removing PCB contaminated soils to 50 ppm, to a depth of five feet and a site average concentration of 10-ppm. This Regional Board and other local and state agencies, prior to RAP approval, advised DTSC that water quality and the environment were not adequately assessed by the plan. Further, Regional Board staff indicated that the 50-ppm standard would not sufficiently protect water quality or the environment. DTSC disagreed with the other agencies and the Regional Board and approved the RAP on June 15, 1994. The time period between June of 1994 and the summer of 1997 was spent negotiating with DTSC and Aera over the inclusion and details of a post-remediation monitoring program.

It was agreed that the post-remediation monitoring plan would continue for a minimum of five years. Also included is a time-line of events, along with a rainfall record. A few post-remediation monitoring results are described as follows:

Mean PCB-Arochlors and Benzene concentrations have been found at 100 times and 1300 times drinking water and ground water standards, respectively. PCB-Arochlors concentrations in surface waters are 300 times higher than U.S. EPA's guidelines for protecting fresh water aquatic organisms. Total PCB-congeners, at 23 parts per million (mg/kg), in the Lower Canyon sediments, exceed the 10-ppm remediation cleanup criteria described above. Some invertebrate marine organisms are bioaccumulating PCBs at 11,000 times the U.S. EPA's guideline for protection of saltwater organisms and 30 times the U.S. EPA's recommended toxicity limit.

Laboratory bioaccumulation studies using worm tissue show toxic levels of total PCBs at 43 ppm. Laboratory toxicity tests show PCBs are at toxic levels for water and sediment dwelling organisms located in the lower riparian area.

Approach/Alternatives: The following actions are planned for this site. The success of implementing these actions depends on the cooperation of Aera, the DTSC, DFG, Santa Barbara County Planning and Protection Services, and this RWQCB.

1. Continue the post-remediation monitoring program for minimum of five years after remediation (one year has already past). Aera has taken the position time is needed to allow the site to stabilize, and that once stable, there will be a significant reduction in releases of constituents of concern to the environment. The above agencies have generally agreed with this position provided there is a substantial reduction in concentrations for constituents of concern within a very short period of one or two years.

2. Within this five-year monitoring period, particularly during the period of site stabilization, the implemented remedial action plan's effectiveness at protecting water quality and the environment will be evaluated.

3. If it is determined that water quality or the environment are not being protected, the monitoring program will be modified to assess the source of the contamination and the RAP will be amended to eliminate the source of contamination.

4. An ecological risk assessment may be appropriate to determine to what extent this site is impacting the environment.

5. Deed restriction on groundwater use should remain in place on the property until monitoring data demonstrate beneficial uses are being protected

Environmental Benefits

A number of environmental benefits will result from action taken to fully remediate the Shell Hercules site. Benefits of cleanup, in terms of existing and foreseeable Beneficial Uses designated in the Region 3 Basin Plan, include the following:

Commercial and Sport Fishing

Reduction of elevated levels of pollutants found in finfish and the benthic invertebrates which serve as food for a number of species.

Aquaculture

Reduction of elevated levels of pollutants found in shellfish.

Wildlife Habitat

Reduction of elevated levels of pollutants found in the food chain evidenced by bioaccumulation in various species.

Cold/Warm Freshwater Habitat

Reduction of elevated levels of pollutants found in the food chain evidenced by bioaccumulation in various species.

Rare, Threatened, and Endangered Species

Reduction of elevated levels of pollutants found in the food chain and evidenced by bioaccumulation in various species which may serve as prey for rare, threatened or endangered species.

Estimate of the total costs to implement the cleanup plan

At this time the amount of excavation and/or groundwater extraction needed to fully protect beneficial uses is unknown. Assuming additional excavation is required to remedy the contamination problem once the site has stabilized, estimates of cost can be estimated from past remediation efforts.

The Remedial Action Plan for the first cleanup effort estimated that 6,600 cubic yards of material would need to be excavated and disposed of properly. The plan determined that offsite disposal would be the most cost effective alternative. The total preliminary estimate for offsite disposal was $2,945,200. This estimate included clearing and grubbing, excavating, transportation, disposal, filling, grading and revegetating the site. Assuming that as much material must be removed and disposed of as was in the initial project, the total cost would probably be similar to the cost of the initial remediation effort. Obviously, this estimate will be highly dependent on the outcome of monitoring efforts directed at determining the areal extent and specific nature of the remaining problems.

Costs may be approximated as follows:

Monitoring ($30,000/yr for 10 years)	$300,000
Additional Site Assessment	$250,000
Amended Remedial Action Plan	$50,000
Implement Remediation Alternative	$2,000,000
Total	**$2,600,000**

Estimate of recoverable costs from potential dischargers

The Remediation Action Plan provides a non-binding preliminary allocation of financial responsibility. The document states that Shell Western E & P, Inc. (Aera) is allocated 100 percent financial responsibility for cleanup of this site.

Two-year expenditure schedule identifying funds to implement the plans that are not recoverable from potential dischargers.

This schedule assumes that continued monitoring shows insufficient improvement in water, sediment and biological measures.

Year 1 – Continued Monitoring and Assessment	$30,000
Regional Board staff time (160 hrs @ $70/hr)	$11,200
Year 2 – Continued Monitoring and Assessment	$30,000
Detailed assessment and RAP revision to address Cleanup needs	$250,000
RWQCB staff time (160 hrs @ $70/hr)	$11,200
Estimated costs for first two years	**$332,400**

All funds to be recovered from discharger.

Site 4.1: Los Angeles Region, Santa Monica Bay/Palos Verdes Shelf

Site Description: The Los Angeles RWQCB identified three high priority toxic hot spots in their Regional Toxic Hot Spots Cleanup Plan. The RWQCB has identified several actions that are underway in Santa Monica Bay and the Palos Verdes Shelf. Potential dischargers have been identified as being responsible for this site.

Description of the site

The contaminated sediments on the Palos Verdes Shelf appear to significantly impact the marine community and may pose a serious risk to individuals who regularly consume fish from the area. Currently, elevated levels of DDT and PCBs are found in the organisms that live in the area of the contaminated sediments, including bottom feeding fish such as white croaker, and water column feeders such as kelp bass. Marine mammals and birds may be affected through the consumption of contaminated fish [Ecological Risk Evaluation Report for the Palos Verdes Shelf, Draft report prepared by SAIC for United States Environmental Protection Agency, September 1998].

The ongoing release of these hazardous substances from the sediment into the environment and the resulting accumulation of DDT and PCB in food chain organisms may persist if no action is taken. Commercial fishing and recreational fishing have been affected by the contamination. The State of California has published recreational fishing advisories for most areas offshore of Los Angeles and Orange Counties and has closed commercial fishing for white croaker on the Palos Verdes Shelf.

Summary of actions initiated at the site

The Los Angeles RWQCB's Water Quality Assessment identifies the Palos Verdes Shelf as an impaired waterbody. The aquatic life beneficial use is impaired due to sediment toxicity, tissue bioaccumulation of pollutants (DDT, PCBs, silver, chromium, lead), sediment contamination (DDT, PCBs, cadmium, copper, lead, mercury, nickel, zinc, PAHs, chlordane), and a health advisory warning against consumption of fish (white croaker). The RWQCB believes that the impairment is due to the effects of historical discharges of these pollutants, since the concentrations presently discharged are very low.

The Santa Monica Bay Restoration Project (SMBRP) was formed in 1988 under the National Estuary Program in response to the critical problems facing Santa Monica Bay. The Los Angeles RWQCB has been an active participant in this program. The SMBRP was charged with the responsibility for assessing the Bay's problems, developing solutions and putting them into action. The scientific characterization of the Bay is described in the SMBRP's "State of the Bay, 1993" report and other technical investigations. This report, along with the Project's recommendations for action, comprises the Bay Restoration Plan which was approved in 1995. With over 200 recommended actions (74 identified as priorities), the plan addresses the need for pollution prevention, public health protection, habitat restoration and comprehensive resource management. The Los Angeles RWQCB is the lead agency responsible for implementation of several recommended actions.

The Los Angeles RWQCB has adopted a watershed management approach, which is expected to regulate pollutant loads from point sources through permits that better focus on issues relevant to each watershed. The RWQCB also expects that pollutant loads from nonpoint sources can be better controlled through the participation of the public in the management of their watersheds. During the 1996-97 Fiscal Year, the watershed management approach was used to renew selected NPDES permits within the Santa Monica Bay Watershed. The NPDES permit for the Los Angeles County Sanitation District's Joint Water Pollution Control Plant, which discharges a mixture of advanced primary and secondary effluent through an ocean outfall onto the Palos Verdes Shelf, was renewed with appropriate limits, performance goals and mass emission caps to limit the discharge of pollutants of concern.

Approach/Alternatives:

In July 1996, the U.S. Environmental Protection Agency decided to undertake a Superfund response (under the Comprehensive Environmental Response, Compensation and Liability Act) called a removal action to address the contaminated sediment problem on the Palos Verdes Shelf. EPA initiated the preparation of an Engineering Evaluation/Cost Analysis (EE/CA) of possible response actions. The EE/CA will evaluate the need for Superfund action and will use the three broad criteria of effectiveness, implementability and cost to evaluate the alternatives for addressing hazardous substances being released into the environment.

As an initial step in the EE/CA process, EPA has prepared the "Screening Evaluation of Response Actions for Contaminated

Sediments on the Palos Verdes Shelf". The Screening Evaluation describes the range of potential cleanup and disposal technologies for contaminated sediments and makes an initial determination about which technologies will be incorporated into the alternatives evaluated in detail in the EE/CA. General response actions which were evaluated included:

- removal (i.e., dredging) and treatment or disposal;
- institutional controls; and
- in situ (or in-place) capping.

1. Sediment removal (dredging)

While sediment removal (i.e., dredging) is technically feasible, it could possibly result in the dispersal of contaminated sediment, thereby increasing short-term risks. Once dredged, the sediment would require disposal, possibly preceded by treatment, which could be both expensive and very difficult to implement. Upland disposal facilities are very limited, and disposal options along the coastline or in the open ocean would likely violate Federal and State environmental laws. For these reasons, EPA has decided not to consider dredging and treatment or disposal options further in the EE/CA.

2. Institutional Controls

Institutional control measures, such as warning notices or fishing restrictions, intended to protect human health already have been established for certain coastal areas including the Palos Verdes Shelf by the State of California, although their effectiveness is uncertain. Additional institutional controls could include measures to (1) expand the scope of existing State controls by increasing the area affected; (2) increase the awareness of and effectiveness of existing controls through additional public outreach efforts; and (3) enhance State enforcement of the commercial fishing closure.

3. In-place capping

In situ, or in-place, capping can be used to prevent or reduce direct human or ecological exposure to contaminants and to prevent migration of contaminants into the water. The cap could reduce or eliminate adverse impacts through (1) physical isolation of the contaminated sediment from the benthic environment, reducing the exposure of organisms to contaminants and limiting the potential for bioaccumulation and movement of contaminants into the food chain; (2) physical stabilization of the contaminated layer to retard resuspension and transport of contaminated sediment; and (3) reducing the flux of dissolved contaminants from the sediments into the water column due to waves and currents. Large caps for areas like the Palos Verdes Shelf typically would consist of clean dredged material (i.e., sand or silt) that is placed over the contaminated area using dredge or platform barges. Caps can be constructed to various sizes or thicknesses and may be augmented after initial construction to increase effectiveness. For a large site like the Palos Verdes Shelf, a phased approach to capping would likely be desirable in order to maximize cost-effectiveness. Any cap design would need to consider the engineering characteristics of the cap material and the effluent-affected sediment in order to address potential erosion by currents and waves, mixing of the cap material and underlying sediment by bottom-dwelling organisms or other disturbances.

In situ capping has the potential to isolate the contaminated marine sediments, thereby providing long-term protection for the majority of the mass of contaminants on the Palos Verdes Shelf. Approximately 25% of the mass of contaminants is on the Palos Verdes slope, which is likely to be too steep for capping. Over the short term, capping would have some adverse impact on the existing benthic communities in the capped area, although it is expected that they would rapidly recolonize. If the cap were composed of suitable dredged material generated by local navigation projects (e.g., maintenance dredging), there would be no additional excavation beyond that already required for those projects, and reuse of the material for capping would reduce short-term impacts at traditional disposal sites. Carefully controlled placement of the cap material would minimize the resuspension of contaminated sediment.

In situ caps have been used successfully at numerous sites, although not as deep as the deeper parts of the Palos Verdes Shelf. In general, existing caps have stabilized after initial reworking and consolidation of the contaminated sediment. Capping could be accomplished reasonably quickly, depending on the availability of capping material.

A draft report (September 1998) prepared by the United States Army Corps of Engineers for EPA evaluates "Options for In-Situ Capping of Palos Verdes Shelf Contaminated Sediment". The report considers two options: (1) capping an area of approximately 4.9 square kilometers centered over the area with the highest DDT contamination; (2) capping a secondary area of contamination comprising approximately 2.7 square kilometers located northwest of the first area. Bioturbation, consolidation and cap effectiveness evaluations indicated that a thickness of 15 centimeters would be appropriate for a thin capping approach, designed to isolate contaminated material from shallow burrowing benthic organisms, while a 45 centimeter cap would be adequate for a thick cap design, effectively isolating the contaminated material from benthic organisms. Capping both areas with a thick cap (45 cm) would result in a reduction of potential exposures to contaminants over the total shelf area on the order of 70%, while a thin cap (15 cm) over both areas reduces the potential exposures on the order of 60%. Capping only the most contaminated area (4.9 square kilometers) with a thin cap would reduce potential exposures on the order of 40%.

Cost Estimate to Implement Cleanup Plan

Cost estimates have been developed for three capping options:

Option 1 - capping of both areas (4.9 + 2.7 square kilometers) with a thick (45 cm) isolation cap = approximate cost would be $44 million to $67 million.

Option 2 - capping of both areas (4.9 + 2.7 square kilometers) with a thin (15 cm) cap = approximate cost would be $18 million to $30 million.

Option 3 - capping of only the most contaminated area (4.9 square kilometers) with a thin (15 cm) cap approximate cost would be $13 million to $19 million.

Option 1 would require on the order of 7 million cubic meters of capping material for implementation, while options 2 and 3 would require proportionally less material.

Estimate of Recoverable Costs from Dischargers

The United States National Oceanic and Atmospheric Administration (NOAA), via its Natural Resource Damage Assessment, and the United States Environmental Protection Agency (EPA), via Superfund, are attempting to recover financial damages from parties responsible for DDT-related damages to the environment on the Palos Verdes Shelf. EPA estimates that approximately $20-25 million may be recovered from municipalities through settlement agreements. NOAA is seeking to recover approximately $100 million from Montrose Chemical Corporation, Westinghouse Electric Corporation and other industrial dischargers.

Two-year Expenditure Schedule

EPA should complete its evaluation of alternatives (including the "no-action" alternative) and issue the EE/CA report during 1999. At the end of the EE/CA process, EPA will solicit public comment on the EE/CA report, including the recommended removal alternative. If EPA decides to move ahead, EPA would issue an Action Memorandum formally selecting the response action.

Option 1 would require approximately 5 years to construct with a single hopper dredge. However, to take advantage of the availability of clean dredged material from the Queensway Bay dredging project for use in the cap, it may be necessary to use three hopper dredges, reducing the time for completion of the project to less than 2 years. Options 2 and 3 would require proportionally less material and less time for completion.

If $20-25 million becomes available from settlement agreements or other means, Options 2 and 3 potentially could be implemented within two years. Although Option 1 could be completed with 2 years with the use of multiple hopper dredges, $20-25 million would only allow completion of approximately one-third to one-half of the capping project, unless additional funds are available.

Benefits of Remediation

Capping of the DDT and PCB contamination on the Palos Verdes Shelf would isolate this material from the benthic environment and reduce bioaccumulation and movement of contaminants into the food chain. This would improve the ecological health of the marine environment and should lead to elimination of the health advisory warning against human consumption of fish caught in this area.

Recommendation: Adopt the alternatives, cost estimates and expenditure plan as presented.

Site 4.2: Los Angeles Region, Mugu Lagoon/Calleguas Creek Tidal Prism

Site Description: The Los Angeles RWQCB identified three high priority toxic hot spots in their Regional Toxic Hot Spots Cleanup Plan. The RWQCB has identified several actions that are underway at Mugu Lagoon and the Calleguas Creek tidal prism.

Description of site

Monitoring of Mugu Lagoon and the lower Calleguas Creek watershed has identified the following problems: (1) impaired reproduction in the light-footed clapper rail, a resident endangered species inhabiting the lagoon, due to elevated levels of DDT and PCBs; (2) fish and shellfish tissue levels exceeded National Academy of Sciences guidelines for several pesticides; (3) possible exceedances of U.S. Environmental Protection Agency water quality criteria for the protection of saltwater biota for nickel, copper and zinc at some locations; (4) possible impacts to sediment and water quality, as well as aquatic community health, from operations at the Naval Air Base over many years. Several pesticides whose use has been discontinued still are found at high concentrations in the sediment and biota; (5) excessive sediment loading.

The Point Mugu Naval Air Base is located in the immediate vicinity of Mugu Lagoon. The surrounding Oxnard Plain supports a large variety of agricultural crops. These fields drain into ditches which either enter the lagoon directly or through Calleguas Creek and its tributaries. The lagoon borders on an Area of Special Biological Significance and supports a great diversity of wildlife, including several endangered birds and one endangered plant species. Except for the military base, the Oxnard Plain portion of the watershed is relatively undeveloped.

Calleguas Creek and its major tributaries (Revolon Slough, Conejo Creek, Arroyo Conejo, Arroyo Santa Rosa and Arroyo Simi) drain an area of 343 square miles in southern Ventura County and a small portion of western Los Angeles County. This watershed is about 30 miles long and 14 miles wide.

The Calleguas Creek watershed exhibits some of the most active and severe erosion rates in the country. Although erosion rates are naturally high in this tectonically active area, land use also is a factor in erosion and sedimentation problems. Channelization of

Calleguas Creek was initiated by local farmers in Somis and downstream areas beginning about 1884, and around Revolon Slough in 1924. Following complete channelization, eroded sediment generated in the higher reaches of the Calleguas Creek watershed has begun to reach Mugu Lagoon even during minor flood events. At current rates of erosion, it is estimated that the lagoon habitat could be filled with sediment within 50 years.

Urban developments generally are restricted to the city limits of Simi Valley, Moorpark, Thousand Oaks and Camarillo. Although some residential development has occurred along the slopes of the watershed, most upland areas still are open space. Agricultural activities (primarily cultivation of orchard and row crops) are spread out along valleys and on the Oxnard Plain. The U.S. Navy maintains a Naval Air Base on much of the area around Mugu Lagoon.

The main surface water system drains from the mountains and toward the southwest, where it flows through the flat, expansive Oxnard Plain before emptying into the Pacific Ocean through Mugu Lagoon. Mugu Lagoon, situated at the mouth of the Calleguas Creek system, is one of the few remaining salt marshes in southern California along the Pacific Flyway. Threatened and endangered species that are supported by valuable habitats in Mugu Lagoon include the peregrine falcon, least tern, light-footed clapper rail and brown pelican. In addition to providing one of the last remaining habitats on the mainland for harbor seals to pup, Mugu Lagoon is a nursery ground for many marine fish and mammals.

The Eastern Arm of Mugu Lagoon is somewhat removed from the rest of the lagoon and tends to receive water from and drain directly into the lagoon mouth. The arm empties and fills rather quickly, leaving a considerable amount of sand near its western end, but moving towards finer sediments further east. The water tends to be marine in character the majority of the time.

The Main Lagoon and Western Arm are the areas most heavily used by birds (including endangered species). The Western Arm, with its slight gradient and slow water flow, has the most widespread freshwater influence during dry weather, receiving water from several drains. The Main Lagoon is affected primarily by Calleguas Creek, which may carry a considerable amount of fresh water during storms, although this flow generally is funneled into a channel which leads to the lagoon mouth.

<u>Summary of actions initiated at the site</u>

The Los Angeles RWQCB's Water Quality Assessment identifies the following problems in Mugu Lagoon: aquatic life beneficial use is impaired based on water column exceedances of criteria for copper, mercury, nickel, and zinc, bird reproductivity affected (DDT), tissue accumulation (arsenic, cadmium, silver; chlordane, DDT, endosulfan, dacthal, toxaphene, PCBs); sediment concentrations (DDT, toxaphene), sediment toxicity and excessive sediment. Fish consumption beneficial use is impaired based on tissue accumulation of DDT, PCBs and toxaphene. For Calleguas Creek (Estuary to Arroyo Los Posas), the Water Quality Assessment lists the following problems: aquatic life beneficial use is impaired based on water column toxicity, sediment contamination (DDT, toxaphene), tissue bioaccumulation (chlordane, toxaphene, PCBs, DDT, dacthal, endosulfan) and sediment toxicity. Fish consumption beneficial use is impaired based on tissue bioaccumulation (DDT, toxaphene, chlordane).

The first large-scale stakeholder effort in the watershed was Mugu Lagoon Task Force, formed in September 1990. The purpose of the Task Force is to improve communication between agencies with various interests and specific projects in Ventura County that may impact water quality in Mugu Lagoon. All of the members share a common goal - to preserve and enhance Mugu Lagoon. The Task Force currently meets infrequently, since many of its members belong to the Calleguas Creek Watershed Management Committee. Active members of the Mugu Lagoon Task Force include the U.S. Army Corps of Engineers, University of California Cooperative Extension Service Farm Advisor, Ventura County Public Works Agency, Ventura County Planning Department, California DFG, California Coastal Conservancy, U.S. Navy Point Mugu Naval Air Station, Ventura County Resource Conservation District, U.S. Natural Resources Conservation Service and Los Angeles RWQCB.

The Los Angeles RWQCB's Watershed Management Initiative began in late 1994 with the Calleguas Creek (and Ventura River) watersheds. Through watershed management, the Regional Board expects to regulate pollutant loads from point sources through permits that better focus on issues relevant to each watershed. The RWQCB also expects that pollutant loads from nonpoint sources can be better controlled through the participation of the public in the management of their watersheds.

The Los Angeles RWQCB renewed NPDES permits for discharges within the Calleguas Creek Watershed in June 1996. However, the RWQCB was unable to fully assess cumulative impacts to beneficial uses from all pollutant sources, particularly from nonpoint sources, during the first eighteen months of application of the Watershed Management Initiative. The Regional Board was able to develop a regional monitoring program for the inland waters of the watershed which is currently being implemented and should provide additional information needed to assess cumulative impacts.

Thanks to the formation of the Calleguas Creek Watershed Management Committee in 1996, stakeholders will have the opportunity to structure and implement measures that will address pollutants from nonpoint sources through the development of a Watershed Management Plan. The Committee intends to hire a facilitator to help prepare a plan to develop a strategy for the preservation, enhancement and management of the watershed's resources, including identification and control of sources of pollution. The Committee has outlined a three-phased plan to accomplish this goal over a 2.5 year period, beginning in January 1998. The RWQCB plans to reassess cumulative impacts to the beneficial uses of waters in the watershed by fiscal year 2002-2003. Using this information, the RWQCB is scheduled to revise NPDES permits by June 2003.

The RWQCB is working with the Naval Air Weapons Station at Point Mugu to develop a cleanup plan for contamination at this Department of Defense site. This effort still is at the stage of characterizing historical sources of pollution and the extent of existing contamination levels. In the near future, decisions will be made concerning possible remediation and restoration activities in and around Mugu Lagoon.

Approach/Alternatives:

Effects-based data has established that Mugu Lagoon sediment is more toxic than sediment from other lagoons in the region. Current agricultural and erosion control practices are likely moving soils heavily polluted with residuals of banned pesticides to drainages and subsequently into Mugu Lagoon.

Under the direction of the California Coastal Conservancy, Ventura County Resource Conservation District and other members of the Mugu Lagoon Task Force, the U.S. Natural Resources Conservation Service completed a report entitled: "Calleguas Creek Watershed Erosion and Sediment Control Plan for Mugu Lagoon (May 1995)". The primary focus of this study was to address erosion and sedimentation impacts and solutions for the watershed. The U.S. Environmental Protection Agency, State Water Resources Control Board and the Los Angeles Regional Water Quality Control Board recently have granted additional 319(h) funds to implement specific erosion control measures for Grimes Canyon, a critical area targeted for remediation in the plan.

Existing contaminated sediments within Mugu Lagoon and the Calleguas Creek Tidal Prism are unlikely to remediate naturally within a reasonable time frame. Removal of the contaminated sediments (i.e., dredging) or treatment appear to be the most appropriate remediation alternatives, although in situ capping might be the best solution for historical deposits, particularly within the lagoon.

Cost Estimate to Implement Cleanup Plan

Given the sensitive nature of Mugu Lagoon as a habitat for endangered species, the most likely remediation alternatives would be no action or in situ treatment. The no action alternative would not have a financial cost, but the contaminated sediment could remain in the environment and continue to cause problems for several more decades. In situ treatment would be very expensive and may pose technical problems for remediation in an estuarine environment. No reliable cost estimate exists at this time for this treatment method, but it would probably exceed $100 per cubic yard.

Dredging could be used to remove the contaminated sediments from the Calleguas Creek Tidal Prism. However, identifying a suitable and legal disposal site for contaminated sediments may be difficult. Application of this technique would cost an estimated $1 million to $5 million, based on a cost estimate of $20-100 per cubic yard (disposal costs are likely to be high, so the cost estimate probably would approach or even exceed the upper limit of the cost estimate range).

Estimate of Recoverable Costs From Dischargers

Contamination of the Mugu Lagoon sediments probably associated with historical use of the now-banned pesticide DDT. Although the United States Navy could be liable for any remediation activities required as a result of historical discharges of pollutants due to operations at the Naval Air Weapons Station at Point Mugu, there is no evidence that the Navy is responsible for the elevated concentrations of DDT in the sediments. It is unlikely that costs can be recovered from any other dischargers in this watershed.

Two-Year Expenditure Schedule

The RWQCB plans to work with the Calleguas Creek Watershed Management Committee, which already has begun development of a watershed management plan, to select the appropriate remediation alternative for Mugu Lagoon and the Calleguas Creek Tidal Prism. In addition, watershed management measures may be required to control sources of contaminants and prevent recontamination of these areas.

During Year One, the focus would be on selection of the appropriate remediation alternative for Mugu Lagoon and Calleguas Creek Tidal Prism. Additional sediment sampling may be required, particularly for Calleguas Creek Tidal Prism, to fully characterize the areal extent of the sediment contamination and prepare a plan for capping, dredging or treatment of the contaminated sediments. This sampling program probably will require approximately $100,000 - $250,000 for implementation. A source for this funding has not been determined.

During Year Two, the focus would be on implementation of the remediation alternative(s) selected for Mugu Lagoon and Calleguas Creek Tidal Prism, as well as watershed management measures to control sources of contamination and prevent recontamination of the existing hot spots. Remediation of the Calleguas Creek Tidal Prism probably could be completed within Year Two, if funding is available. However, remediation of Mugu Lagoon could require additional time, depending upon the alternative selected. A monitoring program will be required to measure the success of the remediation plans that are implemented; although a monitoring program has not yet been designed, the estimated cost would be $50,000 - $100,000 per year, and may be required for at least three to five years following completion of the remediation activities.

Benefits of Remediation

Successful remediation of the contamination in Mugu Lagoon and the Calleguas Creek Tidal Prism would eliminate the source of impairment of the beneficial uses of these waters.

Recommendation: Adopt the alternative approaches, cost estimates and expenditure plan as presented.

Site 4.3: Los Angeles Region, Los Angeles/Long Beach Harbors, Los Angeles Outer Harbor, Cabrillo Pier

Site Description: The Los Angeles RWQCB identified three high priority toxic hot spots in their Regional Toxic Hot Spots Cleanup Plan. The RWQCB has identified several actions that are underway in Los Angeles Outer Harbor at Cabrillo Pier.

Description of the Site

The Los Angeles and Long Beach Harbors are located in the southeastern portion of the Los Angeles Basin. Along the northern portion of San Pedro Bay, there is a natural embayment formed by a westerly extension of the coastline which contains both harbors, with the Palos Verdes Hills as the dominant onshore feature. Offshore, a generally low topographic ridge is associated with the eastern flank of the Palos Verdes uplift and adjacent Palos Verdes fault zone, and extends northwest across the San Pedro shelf nearly to the breakwater of the Los Angeles Harbor.

The port and harbor areas have been modified over the course of more than one hundred years to include construction of breakwaters, landfills, slips and wharves, along with channelization of drainages, dredging of navigation channels and reclamation of marshland. The inner harbor includes the Main Channel, the East and West Basins, and the East Channel Basin. The outer harbor is the basin area located between Terminal Island and the San Pedro and Middle Breakwaters. Los Angeles and Long Beach Harbor are considered to be a single oceanographic unit, and share a common breakwater across the mouth of San Pedro Bay. The outer harbor areas reflect the conditions of the coastal marine waters of the Southern California Bight, while the inner harbor areas typically have lower salinities.

In the presence of the strong currents and rocky habitat of the outer harbor, aquatic life communities are similar to those of the nearby coast, while the inner harbor supports biota generally found in bays and estuaries. The inner harbor has a mostly soft bottom character.

The major surface drainages in the area include the Los Angeles River, which flows in a channel and drains parts of the San Fernando Valley, as well as downtown and south Los Angeles, into eastern San Pedro Bay at Long Beach. The Dominguez Channel drains the intensely urbanized area west of the

Los Angeles River into the Consolidated Slip of the Los Angeles Inner Harbor, carrying with it mostly urban runoff and non-process industrial waste discharges. A major source of both freshwater and waste in the outer harbor is secondary effluent from the Terminal Island Treatment Plant. Waste discharges to the inner harbor area of Los Angeles Harbor consist of both contact and non-contact industrial cooling wastewater and stormwater runoff. Fuel spills and oil spills from marine vessel traffic or docking facilities also contribute pollutants to the inner harbor.

Summary of Actions Initiated at the Site

The Los Angeles RWQCB's Water Quality Assessment lists the following problems in the Cabrillo area of Los Angeles Outer Harbor: aquatic life beneficial use is impaired due to tissue accumulation (DDT), sediment toxicity, sediment contamination (PAHs, DDT, zinc, copper, chromium).

The Los Angeles RWQCB has adopted a watershed management approach, which is expected to regulate pollutant loads from point sources through permits that better focus on issues relevant to each watershed. The RWQCB also expects that pollutant loads from nonpoint sources can be better controlled through the participation of the public in the management of their watersheds. During the 2001-02 Fiscal Year, the watershed management approach will be used to renew NPDES permits within the Los Angeles/Long Beach Harbors Watershed. The Los Angeles RWQCB's Site Cleanup Unit has developed cleanup and remediation plans for many contaminated sites, including refineries and old oil fields. The RWQCB has issued waste discharge requirements for some of the boatyards and stormwater runoff sources within the port.

The Los Angeles RWQCB and the California Coastal Commission will begin work during fiscal year 1997-98 to prepare a long-term management plan for the dredging and disposal of contaminated sediments in the coastal waters adjacent to Los Angeles County. The goals of this plan will be to develop unified multi-agency policies for the management of contaminated dredged material, promote multi-user disposal facilities and reuse, to the extent practicable, and support efforts to control contaminants at their source using a watershed management approach.

Approach/Alternatives: Given the protected nature of the Cabrillo Pier area within the Los Angeles Outer Harbor, in situ capping might be a feasible method for containment of contaminated sediments. Dredging would be a proven method to remove the contaminated sediments, but identification of a suitable and legal disposal site is often a problem. Treatment of contaminated sediments may be feasible, but is likely to be expensive and difficult to accomplish with marine sediments.

Cost Estimate to Implement the Cleanup Plan

In situ capping would probably be the least expensive remediation option. However, a stable cap must be designed to prevent reexposure of the contaminated sediments. Application of this technique to contain contaminated sediments from the Cabrillo Pier area would cost an estimated $0.5 million to $1 million, based on a cost estimate of up to $20 per cubic yard (this is a rough estimate, since the unit cost could be higher).

Dredging could be used to remove the contaminated sediments from the Cabrillo Pier area. However, identifying a suitable and legal disposal site for a large volume of contaminated sediments can be difficult. Application of this technique would cost an estimated $0.5 million to $5 million, based on a cost estimate of $20-100 per cubic yard (if a disposal site, such as a confined aquatic disposal or land disposal site, is available within or close to the Los Angeles/Long Beach Harbors complex, the cost estimate probably would approach the lower limit of the cost estimate range).

Treatment of the contaminated sediments is likely to be expensive. Application of this technique would cost an estimated $2.5 million to $50 million, based on a cost estimate of $100-$1,000 per cubic yard (due to limited experience in treating marine sediments, costs are likely to be in the upper part of the cost estimate range).

Estimate of Recoverable Costs from Dischargers

In July 1996, the U.S. Environmental Protection Agency decided to undertake a Superfund response (under the Comprehensive Environmental Response, Compensation and Liability Act) to address the contaminated sediment problem on the Palos Verdes Shelf. However, the Los Angeles Harbor area was not included within the scope of the Superfund action. Since it will be difficult or impossible to prove that the contamination of the harbor is due to stormwater runoff from the Montrose Chemical Corporation's historical manufacturing site in Torrance, which appears to be a likely source for this contamination, we do not anticipate recovering any remediation costs from dischargers.

Two-year Expenditure Schedule

The RWQCB plans to work with the Los Angeles Basin Contaminated Sediments Task Force to select a remediation alternative and implement the cleanup plan for the Cabrillo Pier hot spot. Additional sediment sampling will be required to better define the areal extent of the sediment contamination, prior to selection of an appropriate remediation alternative. This sampling program could be conducted during Year One, if funding becomes available (estimated cost approximately $250,000 - $500,000). However, the RWQCB would recommend implementing the cleanup of the Consolidated Slip/Dominguez Channel hot spot prior to initiating any remediation activities at the Cabrillo Pier site, since the Consolidated Slip/Dominguez Channel area may represent a source of contamination to the Cabrillo Pier area. A monitoring program would be required upon completion of any remediation activities; it is estimated that monitoring would cost $50,000 to $100,000 per year, and may be required for three to five years.

Benefits of Remediation

Remediation of the contamination would eliminate the source of impairment of beneficial uses of the receiving waters.

Recommendation: Adopt the alternatives, cost estimates and expenditure plan as presented.

Site 4.4: Los Angeles Region, Los Angeles Inner Harbor/Dominguez Channel, Consolidated Slip

Site Description: The Los Angeles RWQCB identified three high priority toxic hot spots in their Regional Toxic Hot Spots Cleanup Plan. The RWQCB has identified several actions that are underway in the Los Angeles Inner Harbor at Dominguez Channel and Consolidated Slip.

<u>Summary of Actions Initiated at the Site</u>

The Los Angeles RWQCB's Water Quality Assessment lists the following problems in Dominguez Channel: aquatic life beneficial use is impaired due to sediment contamination (chromium, zinc, DDT, PAHs) and benthic community impairment. The Water Quality Assessment identifies the following problems in Consolidated Slip: aquatic life beneficial use is impaired due to tissue accumulation (DDT, chlordane, PCBs, tributyltin, zinc), sediment toxicity, benthic community effects, sediment contamination (PAHs, zinc, chromium, lead, DDT, chlordane, PCBs); and a fish consumption advisory.

The Los Angeles RWQCB's Site Cleanup Unit has developed cleanup and remediation plans for many contaminated sites, including refineries and old oil fields. The RWQCB has issued waste discharge requirements for some of the boatyards and stormwater runoff sources within the port.

The Los Angeles RWQCB has adopted a watershed management approach, which is expected to regulate pollutant loads from point sources through permits that better focus on issues relevant to each watershed. The RWQCB also expects that pollutant loads from nonpoint sources can be better controlled through the participation of the public in the management of their watersheds. During the 2001-02 Fiscal Year, the watershed management approach will be used to renew NPDES permits within the Los Angeles/Long Beach Harbors Watershed and the Dominguez Channel Watershed.

The Los Angeles RWQCB and the California Coastal Commission will begin work during fiscal year 1997-98 to prepare a long-term management plan for the dredging and disposal of contaminated sediments in the coastal waters adjacent to Los Angeles County. The goals of this plan will be to develop unified multi-agency policies for the management of contaminated dredged material, promote multi-user disposal facilities and reuse, to the extent practicable, and support efforts to control contaminants at their source using a watershed management approach.

Approach/Alternatives: Dredging would be a proven method to remove the contaminated sediments, but identification of a suitable and legal disposal site often can be a problem. Treatment of contaminated sediments may be feasible, but is likely to be expensive and difficult to accomplish with marine sediments. In situ capping is not likely to be chosen as an alternative, due to the high flows that can occur in this area and the potential for reexposure and transport of contaminated material.

Cost Estimate to Implement Cleanup Plan

Dredging could be used to remove the contaminated sediments from the Dominguez Channel/Consolidated Slip area. However, identifying a suitable and legal disposal site for a large volume of contaminated sediments can be difficult. Application of this technique would cost an estimated $1 million to $5 million, based on a cost estimate of $20-100 per cubic yard (if a disposal site, such as a confined aquatic disposal or land disposal site, is available within or close to the Los Angeles/Long Beach Harbors complex, the cost estimate probably would approach the lower limit of the cost estimate range).

Treatment of the contaminated sediments is likely to be expensive. Application of this technique would cost an estimated $5 million to $50 million, based on a cost estimate of $100-$1,000 per cubic yard (due to limited experience in treating marine sediments, costs are likely to be in the upper part of the cost estimate range).

Estimate of Recoverable Costs from Dischargers

No responsible parties have been identified from which costs could be recovered.

Two-year Expenditure Schedule

The RWQCB plans to work with the Los Angeles Basin Contaminated Sediments Task Force to select a remediation alternative and implement the cleanup plan for the Consolidated Slip/Dominguez Channel hot spot. Additional sediment sampling will be required to precisely define the areal extent of the sediment contamination, prior to selection of an appropriate remediation alternative. This sampling program could be conducted during Year One, if funding becomes available (estimated cost approximately $250,000 - $500,000). If dredging is selected as the desired remediation method, the RWQCB will work with the Task Force to identify a suitable disposal alternative (e.g., constructed fill site, confined aquatic disposal site). A monitoring program would be required upon completion of any remediation activities; it is estimated that monitoring would cost $50,000 to $100,000 per year, and may be required for three to five years.

Benefits of Remediation

Remediation of the contamination would eliminate the source of impairment of beneficial uses of the receiving waters.

Recommendation: Adopt the approaches, cost estimates and expenditure plan as presented.

Site 5.1: Central Valley Region, Mercury Cleanup Plan

Site Description: The Central Valley RWQCB identified several high priority toxic hot spots in their Regional Toxic Hot Spots Cleanup Plan. The RWQCB has identified several actions that are underway to cleanup and remediate toxic hot spots associated with mercury.

Description of the Site

Mercury has been identified as the pollutant responsible for creating a candidate toxic hot spot in the Sacramento-San Joaquin Delta Estuary. In January 1998 the Central Valley Regional Water Quality Control Board adopted a revised 303(d) list, ranked mercury impairments in the lower Sacramento River, Cache Creek, Sulfur Creek , Lake Berryessa, Clear Lake and the Sacramento-San Joaquin Delta Estuary as high priority because of elevated concentrations in fish tissue and committed to the development of a load reduction program by the year 2005[12]. The widespread distribution of mercury contamination emphasizes the regional nature of the problem and the need for regional solutions.

There is a human health advisory in effect in the Delta and in San Francisco Bay because of elevated mercury levels in striped bass and other long lived fish. The entire area of the Delta is therefore considered a hot spot. The Delta is a maze of river channels and diked islands covering roughly 78 square miles of open water and about 1,000 linear miles of channel.

Cache Creek is a 1100 square mile watershed in the Coast Range with about 150 linear miles of mercury impacted waterways. The watershed also contains Clear Lake, the largest natural lake in California at 43,000 acres. A human health advisory has also been posted in Clear Lake because of elevated mercury concentrations in fish tissue. The source of the mercury is Sulphur Bank Mine, a U.S. EPA Superfund site.

Summary of Actions Initiated at the Site

Three actions have been taken in the Central Valley to begin addressing the human health problems posed by mercury. Each is summarized below.

[12] The lower American River, lower Feather River, Harley Gulch, Sacramento Slough, March Creek and Reservoir, San Carlos Creek, James Creek, and Panoche Creeks were also placed on the 303(d) list as impaired because of excess mercury but were given a lower priority for cleanup.

Loading studies

Bulk mercury loading studies conducted by the Central Valley RWQCB (Foe and Croyle, 1998) and by Larry Walker and Associates (1997) on the Sacramento River have determined that new loads of metal enter the estuary each year during high flows. Coast Range inputs appear more important than Sierra Nevada ones as a significant fraction of the inputs from the latter are intercepted and trapped by foothill reservoirs. Cache Creek has been identified as an important Coast Range mercury source. Other sources on the Sacramento River upstream of the confluence of the Feather River may also be important but remain unidentified.

Bioavailability

Studies by Slotton *et al.* have determined that fish tissue concentrations can be predicted from changes in mercury concentration in invertebrate trophic levels. This relationship has been used to standardize mercury food chain bioaccumulation in the Central Valley and identify local areas where fish may or may not be present but elevated concentrations of bioavailable mercury are accumulating in the food chain. The studies have identified areas with apparent high methylation potential in the Sierra Nevadas and Coast Range. All are associated with past intensive gold, silver and mercury mining. The process has also suggested that some sites with large bulk mercury loads, such as the Cache Creek drainage, might not be as vulnerable to methyl mercury production as their loads would suggest. Similar food chain studies need to be completed for all mercury rich areas in the Central Valley.

CALFED

The CALFED Water Quality Common Program has identified mercury as a contaminant of concern. The program is developing actions to attempt to reduce mercury tissue concentrations in edible fish from the Central Valley and Delta to concentrations below health advisory levels. A draft of the Water Quality Common Program is presently being circulated among the public for comment.

The CALFED Category III Ecosystem Restoration Program has proposed to purchase large tracts of farmland in the Estuary, break levees, and convert the fields to shallow water intertidal habitat. Newly flooded wetlands are known to have elevated rates of methyl mercury production and concern has been expressed that

CALFED restoration activities might increase methyl mercury concentrations in estuarine fish. The CALFED Category III program announced in December 1997 that they would fund a grant entitled "The effects of wetland restoration on the production of methyl mercury in the San Francisco Bay Delta System" by Drs. Suchanek and Slotton. Purpose of the three year project is to quantify changes in methyl mercury production caused by restoration practices and evaluate the bioavailability and impact of the mercury on the Bay Delta Ecosystem. The ultimate intent of the Authors is to provide recommendations to managers for potentially modifying restoration approaches to minimize methyl mercury production.

Approach/Alternatives:

In January 1998 the Central Valley RWQCB adopted a revised 303(d) list, ranked mercury in fish tissue as a high priority impairment in several Central Valley water bodies and committed to adopting a TMDL to control mercury bioaccumulation by the year 2005. The purpose of the Bay Protection mercury clean up plan is to lay out a strategy for collecting the information needed to develop a phased TMDL with the initial emphasis in Cache Creek.

According to the U.S. EPA (1998), "The goal of a TMDL is the attainment of water quality standards. A TMDL is a written quantitative assessment of water quality problems and the contributing pollutant sources. It specifies the amount of reduction needed to meet water quality standards, allocates load reductions among sources... and provides the basis for taking actions to restore a water body."

It will be challenging to successfully implement a TMDL for mercury in the Central Valley as there are fundamental unresolved scientific questions about mercury bioaccumulation in aquatic food chains. Principal among these is a lack of knowledge about the primary chemical forms of mercury most efficiently methylated and the locations and processes which most stimulate the conversion. Therefore, RWQCB staff propose a phased mercury TMDL. Staff propose to commence pilot mercury control work in Cache Creek, a major source of mercury to the Estuary. As the necessary scientific information is obtained and success demonstrated in the control of bioavailable mercury in this watershed, then similar control efforts will be undertaken in other mercury enriched water courses and in the estuary itself. The working hypothesis for the estuary is that as all bioavailable sources of mercury to the estuary are identified and their discharge reduced to the maximum extent possible, material already present in the system will gradually become buried and less bioavailable. The result will be a slow reduction in mercury fish tissue levels.

The U.S. EPA (1998) suggests that the successful development of a TMDL requires information in six general areas: identification of a target, location of sources, quantification of the amount of reduction needed, allocation of loads among sources, an implementation plan, and monitoring and evaluation to track results and demonstrate compliance. RWQCB staff also believe that a seventh element, formation of a regional mercury task force, is needed to help guide the control effort. Each element, including the associated scientific uncertainties and resources needed to resolve these, is briefly described below.

1. Task force.

A regional mercury control strategy task force should be formed. The Task Force should be composed of scientists, watershed stakeholder groups, and resource managers from both the Central Valley and San Francisco Bay area. The nucleus of the Task Force could be the Cache Creek Mercury Group. Purpose of the Task Force would be to advise RWQCB staff on the definition of an appropriate target, on the identification of sources and the allocation of loads, on developing the regional mercury control strategy, and on acting as a clearing house for mercury information. RWQCB staff will take the Task Force's recommendations in a timely fashion, the staff will develop the TMDL considering all information and advice available. Finally, the Task Force should make recommendations to the RWQCB, CALFED, and other entities on funding priorities.

2. Target.

Purpose of the Cache Creek mercury TMDL is to reduce fish tissue mercury concentrations to levels that are safe for ingestion by humans and wildlife. Several possible fish tissue mercury targets should be evaluated and one selected for incorporation into the TMDL. Possible options are the identification of a fish tissue concentration that would fully protect both wildlife and human health. An alternate target is the identification of a background Cache Creek fish tissue concentration in areas of the watershed uninfluenced by mining or other anthropogenic activities which enhance mercury bioavailability.

Wildlife The U.S. Fish and Wildlife Service has identified *Mergus merganser*, the common merganser, as the wildlife species most likely at risk from elevated fish tissue mercury concentrations in Cache Creek (personal communication, Schwarzbach). The bird is known to breed in the Cache Creek basin and elevated mercury levels in its diet may cause reproductive impairment. Principal merganser prey items are small (3-7 inch) fish. The U.S. Fish and Wildlife Service estimate that the provisional "no and low effect dietary concentrations" for the common merganser range between 0.1 and 0.3 ppm mercury fish wet weight (personal communication, Schwarzbach). Limited data exist in the basin for mercury concentrations in small fish. Values collected in the lower basin range between 0.1 and 0.3 ppm (Davis, 1998) and in Bear Creek in late summer between 0.3 and 1.75 ppm whole body wet weight (personal communication, Schwarzbach). These values suggest that mergansers may presently experience reproductive impairment at some locations in the basin. The safe concentration estimate of 0.1 ppm wet weight is based upon a three generation mallard feeding study (Heinz, 1979). The safe value was calculated by dividing the lowest effect concentration by a factor of three. The U.S. EPA (1997) in their Report to Congress used a similar safety factor to estimate no effect concentrations. The Cache Creek wildlife target could be improved by completion of a mercury dietary study for a fish eating bird, such as a merganser, to verify the proposed no and low effect levels. The study should also evaluate seasonal changes in mercury concentrations in feathers. The risk posed by mercury to wildlife could be further strengthened by conducting an egg-feather survey in Cache Creek and elsewhere around the Estuary to ascertain how mercury concentrations in eggs and feathers of fish eating birds compare to those documented to be toxic in the merganser feeding study.

Human Health The U.S. EPA (1995) presently recommends a mercury screening value of 0.6 ppm wet weight in fish fillet to protect human health. International studies of the human health effects of mercury exposure via fish consumption are underway in the Seychelles and Faroes Islands. The reference level protective of human health may change as a result of these studies which are expected to be completed and analyzed within the next several years. A better estimate of a safe mercury concentration to protect human health should be available upon completion of this work.

Limited mercury fish tissue data is available for Cache Creek. Most of the data has been collected in the lower basin between the City of Woodland and the Settling Basin. As noted previously, average mercury concentrations in predacious fish of a size consumed by people range between 0.2 and 0.9 ppm wet weight. Staff of the California Office of Environmental Health Hazard Assessment (OEHHA) have evaluated this data and concluded that, while more information is needed, some of the concentrations appear elevated for human consumption (personal communication, Brodberg).

A follow-up fish tissue study is needed. The purpose of the study is two fold. The first objective is to determine mercury concentrations in fish caught throughout the basin to better characterize the threat posed to human health and wildlife by the consumption of fish from Cache Creek. The second objective is to establish statistically reliable baseline data to evaluate the effect of mercury remediation activity in the Basin. The study should emphasize the seasonal collection of a variety of fish species at locations most likely used by people and wildlife. The study should be coordinated with OEHHA, local offices of County Public Health, Fish and Game and U.S. Fish and Wildlife Service. Resources are requested in to collect the fish tissue data. Funds are also requested for OEHHA to help organize the study and evaluate the data.

Baseline No baseline fish tissue data is available for Cache Creek. Efforts should be undertaken to establish such data at locations in the watershed unaffected by mining activity. Possible locations for evaluation include Rayhouse, Fiske, Cole, Kelsey, Adobe, Scott and Middle Creeks. One or more of these locations should be included in the fish tissue studies described above. The data would be evaluated to ascertain whether the baseline concentrations are lower than the concentrations necessary to protect human health and wildlife. If so, the value might be considered an "anti-degradation" type of target.

3. Sources

Two mercury source studies were conducted in the Cache Creek Basin. The first was a loading study to determine the amount of total recoverable mercury exported from the watershed and the principal seasonal sources within the basin (Foe and Croyle, 1998). The second was an invertebrate bioavailability study to determine the major locations in the basin where mercury was bioaccumulating in the aquatic food chain (Slotton *et al.*, 1997b). Both are briefly reviewed below to help identify the major mercury sources needing remediation.

Loading Studies conducted between 1996-98 determined that Cache Creek was a major source of estuarine mercury (Foe and Croyle, 1998). Most of the mercury appeared to be transported on sediment particles. A correlation was noted between total mercury concentration at Road 102 and flow immediately upstream at the Town of Yolo. The relationship was employed to estimate bulk mercury loads. The basin was estimated to have exported 980 kg of mercury during the wet 1995 water year. Half of the metal appears to have been trapped by the Cache Creek Settling Basin while the remainder was exported to the Estuary. In contrast, little to no mercury was predicted to be transported out of the Basin during dry years emphasizing the importance of winter runoff in the off site transport of mercury.

Seasonal studies demonstrate three general loading patterns: summer irrigation season, winter non-storm runoff periods, and winter storm runoff events. The irrigation season occurs during the six month period between April and October. Mercury transport rates in the upper basin were on the order of 10-50 g/day with most of the metal coming from Clear Lake. Probable source of the Clear Lake mercury is from the Sulfur Bank Mine, an EPA Superfund site. The winter non-storm period is the next most common event and occurs between November and March. The only observations to date have been made during wet winters. Mercury export rates were on the order of 100-1,000 g/day. Much of the mercury appears to have originated from Benmore and Grizzly Creeks which are tributaries to the North Fork of Cache Creek. Finally, storm runoff events were least common and occurred about 4-10 times per wet year. All subbasins of Cache Creek exported significant amounts of mercury but the majority of the metal appeared to come from the Cache Creek canyon between the confluence of the North and South Forks but above Bear Creek. The precise source(s) of the metal in the inaccessible canyon was not identified. Sulfur Creek and Harley Gulch, sites with extensive abandoned mining activity, also exported large amounts of mercury. Storm export rates were on the order of 5,000-100,000 g/day. Resuspension of mercury contaminated sediment appears to be a major source of mercury during all three time periods. Little dissolved and no methyl mercury data was collected. These two forms of mercury may provide a better correlation with *in situ* bioavailability than the bulk mercury mineral loads measured in this study.

Additional loading information is needed. Emphasis should be on collecting seasonal information on dissolved and methyl mercury loads at key locations throughout the basin including several background sites and all major mercury mining sources.

Bioavailability studies In the spring of 1996 a one time benthic invertebrate survey was conducted in the upper Cache Creek basin to determine local mercury bioavailability (Slotton *et al.*, 1997). Representative benthic invertebrates were collected with a kick screen, sorted to taxa, grouped according to trophic level, and analyzed for total mercury body burden. All elevated invertebrate tissue burden samples were associated with drainage from known mercury mines or geothermal hot springs. These include Sulfur and Davis Creeks, Harley Gulch, and Clear Lake. No elevated mercury signal was observed in the North Fork of Cache Creek downstream of Benmore and Grizzly Creeks suggesting that these two non-mine impacted mercury enriched drainages might not be major sources of locally bioavailable mercury. The conclusions of the bioavailability study also differ from the loading one in that Clear Lake is identified as a major source of bioavailable mercury in the upper watershed. The loading study suggested that Clear Lake was only a major source of mercury during summer and on an annual basis did not account for much of the mercury transported in the basin. The bioavailability data collected downstream of Clear Lake emphasize the need to better understand the forms and processes which mediate methyl mercury production and cycling in the Cache Creek aquatic food chain.

Additional information is needed on the correlation of mercury concentrations in water, sediment and invertebrate body burden levels. Invertebrates are emphasized as they are more ubiquitous than fish and, being closer to the bottom of the food chain, should respond more rapidly to changes in bioavailable mercury than any other life form. Also, in the Coast Range invertebrates often exhibit mercury concentrations very similar to small fish (personal communication, Slotton). More data is needed to establish the relationship between invertebrate body burden levels and mercury concentration in larger fish. Intensive seasonal monitoring of water and sediment coupled with changes in invertebrate body burden levels should be conducted at key locations in the watershed. The sediment sampling should determine flux rates of dissolved inorganic and methyl mercury from the sediment. The water, sediment and invertebrate studies should be closely coordinated with the fish tissue sampling effort. The purpose is twofold. First, establish baseline seasonal invertebrate bioavailability data for the watershed so that changes in mercury cycling may be more readily determined once remediation is undertaken. Second, by intensively sampling water/sediment and invertebrates, better identify the times, locations and mercury forms most important in the formation and movement of methyl mercury up the aquatic food chain. This information will be essential to quantify the amount of load reduction needed at different sources.

Site Remediation studies   As noted above, Sulfur Creek, Harley Gulch, and Clear Lake have been identified as major sources of total and bioavailable mercury. All three watersheds have abandoned mercury mines. In addition, Sulfur Creek has active geothermal activity which may also contribute mercury. Site remediation feasibility studies should be undertaken in Sulfur Creek and Harley Gulch to identify the major sources of the bioavailable mercury and the most practical, cost effective control methods which will insure that the TMDL goals for the site are met. Control efforts for evaluation may include runoff and waste material isolation studies, natural revegetation, waste rock removal and infiltration evaluations.

Sulphur Bank Mine is the likely source of the mercury in Clear Lake. The mine is an active U.S. EPA Superfund site. Downstream load reduction requirements should be coordinated with the Superfund cleanup activities to ensure that the beneficial uses of both Clear Lake and the downstream watershed are protected. No funding is suggested for Sulphur Bank Mine as the site has been selected as a U.S. EPA Superfund site and the cost of remediation will be paid for by the Federal Government.

4. Quantification of the Amount of Load Reduction Needed

The key weakness in the development of this TMDL is our present lack of understanding about the relationship between inorganic mercury concentrations in water/sediment and methyl mercury concentrations in invertebrate and fish tissue. However, it is anticipated that detailed information about mercury concentrations in the water column from upstream transport and from *in situ* sediment fluxing coupled with changes in invertebrate and fish tissue concentration will help establish such a relationship. This information will be used to determine how much reduction in the various forms of mercury are needed downstream of each source. No implementation plan should be incorporated into the Regional Board's Basin Plan until these relationships are established.

5. Implementation

The RWQCB committed to adoption of a mercury TMDL implementation plan by the year 2005. While discussion of the contents of the implementation plan are premature, several factors are worth noting. First, as noted throughout the discussion, the development of the plan will require significant directed research. All research results should be reviewed by the Mercury Task Force and recommendations made to Regional Board staff prior to commencing implementation. The recommendations should include an evaluation of the scientific defensibility of the research conclusions and the likelihood of success should the implementation plan be incorporated into the Basin Plan and remediation control activity undertaken. Second, the plan will include a time schedule and recommendations on how to fund implementation. This may include a discussion of developing "Pollution Trading" opportunities whereby Central Valley and Bay Area Dischargers are allowed to fund more cost effective nonpoint source cleanup projects in Cache Creek and elsewhere *in lieu* of less effective abatement actions at their own facilities. Third, while the mine remediation feasibility studies have not yet been undertaken, it is likely that one of the conclusions will be that some of the principal sources of bioavailable mercury are from sites where the owners have insufficient resources to carry out the cleanup. So, in the interim, the State of California should pursue federal "Good Samaritan" legislation or identify some other legally defensible mechanism to minimize State liability and insure that public funds can be used for mercury control efforts wherever they are most cost effective. Finally, it is estimated that all the studies outlined above can be completed within 2.5 years of their being initiated. The mercury Task Force should be allowed an additional six months to evaluate the study results and make recommendations to RWQCB staff on load allocations and an implementation plan. It should take an additional half a year for Regional Board staff to evaluate the data, all recommendations and develop a TMDL for insertion into the Basin Plan.

6. Monitoring and Evaluation

Significant monitoring will be required once the TMDL is implemented and site remediation is undertaken. It is predicted that methyl mercury concentrations in invertebrates close to the sources should decrease most rapidly (within a year or so of the completion of remediation). Concentrations in large fish and higher trophic level invertebrates more distant from the source will change more slowly. If significant reduction in invertebrate body burden levels are not measured in a timely fashion close to the sources then further remediation or other adaptive management measures should be considered. The TMDL will be considered successful and will be terminated only when mean small and large fish tissue concentrations in the Basin reach the adopted target level.

7. Other Studies Needed

As previously mentioned, there are other major sources of mercury to the Sacramento-San Joaquin Delta Estuary besides Cache Creek. These include runoff from the historic placer gold fields in the Sierra Nevadas and runoff from other mercury producing areas in the Coast Range. Off site movement of this material has contributed to elevated mercury levels in sediment and biota in the Estuary and to the posting of health advisories warning the public to limit consumption of large striped bass and shark. The strategic plan described above is a pilot TMDL with the initial emphasis being on determining mercury bioavailability and mine remediation feasibility studies in Cache Creek. The anticipation is that the information gained by intensively studying one watershed will result in the identification of cost effective solutions which can be employed elsewhere. However, in the interim, some directed studies will be needed outside of Cache Creek. Each area is briefly described below.

A. Source identification Mercury mass load studies (total recoverable, dissolved and methyl mercury) should continue in the Central Valley with an emphasis on watersheds where no data are available. These should include the San Joaquin, Mokelumne, and Cosumnes Rivers. Detailed follow up studies should be undertaken in watersheds where the initial studies demonstrate that major sources of mercury come from. Follow up studies should include an assessment of inter-annual variability and the precise locations of all the major mercury sources within each watershed. The studies should also include assessments of the load contributions from major NPDES and storm water discharges. The mass load work should be accompanied by biological surveys to identify locations with enhanced food chain mercury bioavailability. Funding for the loading studies are requested in Table 11.

B. Public Health Mercury fish tissue studies should continue in the Delta. Studies should be designed and carried out in coordination with the Office of Environmental Health Hazard Assessment, Department of Health Services, and Fish and Game. The primary purpose is to establish the range of mercury in fish tissue in the Estuary to assess the public risk posed by their consumption. A secondary objective is to establish baseline conditions to evaluate the future success of upstream remediation activities.

C. Bioavailability Studies Directed research should be undertaken to better understand mercury cycling in the Central Valley and Estuary. Research emphasis should be on evaluating the relative bioavailability of the different sources of mercuric material moving into the Estuary in comparison with concentrations already present and available in sediment porewater. At a minimum these should include an evaluation of inputs from the Cache Creek drainage in the Coast Range, Sierra Nevada Mountains and municipal, industrial, and storm water discharges. The studies should also include an evaluation of the importance of the remobilization of mercury from sediment by natural fluxing and release during dredging, disposal of dredge material on island levees, and creation of shallow water habitat. The ultimate objective of this directed research is to provide resource managers with recommendations on how to minimize mercury bioaccumulation in the Central Valley, Delta and San Francisco Bay.

Estimate of Costs

An estimate of the costs to develop the information necessary to implement the TMDL are provided in Table 11 below. It is impossible until this information is obtained to estimate the actual cost of implementing the mercury TMDL.

TABLE 11: ESTIMATE OF COST TO COLLECT INFORMATION TO DEVELOP A MERCURY CONTROL STRATEGY.

Task		Cost
TARGET		
Fish eating bird (Merganser) study		$200,000
Egg study		$60,000
Coordination with OEHHA		$75,000
	Total	$335,000
MERCURY MONITORING IN CACHE CREEK (per year)		
Methyl mercury sediment flux studies		$200,000
Water, invertebrate and fish tissue work		$200,000
Mercury mass loading studies		$160,000
	Multi-year total	$1,120,000
MINE REMEDIATION FEASIBILITY STUDIES		$150,000
ESTUARINE MERCURY MONITORING STUDIES (per year)		
Source identification		$100,000
Fish tissue studies (wildlife and human health)		$150,000
Bioavailability		$500,000
	Multi-year Total	$1,500,000
	Grand Total	$3,105,000

Estimate of recoverable costs from potential dischargers

No cost recovery possible.

Two-year expenditure schedule

Several potential sources of funding may be available. First, CWA Sections 104(b)(3), 106(g), and 319(h) grants have been used in the past by the RWQCBs to address such issues. Second, the Sacramento River Toxic Pollutant Control Program may have fiscal year 1998 and 1999 appropriation money available for mercury work. Finally, CALFED has indicated an interest in funding mercury work and asked the RWQCB in cooperation with DFG to develop a mercury proposal. CALFED has not yet decided whether to fund the work.

Recommendation: Adopt the alternatives and cost estimates as presented.

Site 5.2: San Joaquin River Dissolved Oxygen Cleanup Plan

Site Description: The Central Valley RWQCB identified several high priority toxic hot spots in their Regional Toxic Hot Spots Cleanup Plan. The RWQCB has identified several actions that are underway to cleanup and remediate toxic hot spots associated with oxygen depression in the San Joaquin River. Should the RWQCB approaches for remediating the toxic hot spot be adopted?

Description of the Site

Low dissolved oxygen concentrations in the San Joaquin River in the vicinity of the City of Stockton has been identified as constituting a candidate BPTCP hot spot. In January 1998 the Central Valley Regional Water Quality Control Board (Regional Board) adopted a revised 303(d) list which identified low dissolved oxygen levels in the lower San Joaquin River as a high priority problem and committed to developing a waste load allocation (TMDL) by the year 2011.

The San Joaquin River in the vicinity of the Stockton RWCF annually experiences violations of the 5.0 and 6.0 mg/l dissolved oxygen standard[13]. Violations are variable in time but usually occur over a ten mile River reach between June and November. Dissolved oxygen concentrations in the mainstem River are often less than 2.5 mg/l.

The areal extent of the water quality exceedance is variable but may in some years be as much as 10 miles of mainstem River. The temporal extent is also variable but can be for as long as 4 months. Dissolved oxygen concentrations are often less than 2.5 mg/l in the mainstem River.

Summary of Actions Initiated at the Site

Low dissolved oxygen levels near the City of Stockton in late summer and fall are a well known problem. In 1978 the Board adopted more stringent BOD and TSS effluent limits for the Stockton RWCF with the intent of reducing or eliminating the low dissolved oxygen conditions in the San Joaquin River. The plant has constructed the necessary additional treatment facilities and has complied with the more stringent effluent limitations. Despite the Cities best efforts, the low dissolved oxygen conditions persist.

[13] The 5.0 mg/l standard applies between 1 December and 30 August while the 6.0 mg/l standard is for the period of 1 September through 30 November.

A model developed for the Stockton RWCF suggested that further decreases in effluent BOD and ammonia would improve in-stream dissolved oxygen concentrations during critical periods but would not completely correct the problem. In 1994 the RWQCB further tightened BOD and ammonia permit limits to protect water quality. The permit was appealed to the SWRCB because River hydrology had changed since the permit was adopted. State Board remanded the permit back to the RWQCB to reevaluate the modeling based upon new Delta flow conditions. In the interim, the Stockton RWCF installed a gauge at their discharge point to measure River flow and refined their computer model. The model concluded that the primary factors controlling dissolved oxygen concentration in the critical late summer and fall period were River flow and temperature, upstream algal blooms, SOD, and discharge from the Stockton RWCF. The model also made a preliminary evaluation of placing aerators in the River during critical periods. The results appeared promising. Finally, simulations coupling the dissolved oxygen and the San Joaquin River daily input-output model should be run. It may be possible by coupling the two models to predict exceedances of the Basin Plan dissolved oxygen standard about two weeks in advance. This could be valuable in that it raises the possibility of being able to conduct "real time management" to aid in correcting the problem.

Approach/Alternatives:

In January 1998 the Central Valley RWQCB adopted a revised 303(d) list which identified low dissolved oxygen levels in Delta Waterways near Stockton as a high priority impairment. The goal of the TMDL is to ensure that the San Joaquin River achieves full compliance with the Basin Plan Water Quality Objective for dissolved oxygen. To meet this objective, the Central Valley RWQCB intends to develop a strategy for collecting the information necessary to develop a TMDL.

According to the U.S. EPA (1998), "the goal of the TMDL is the attainment of water quality standards. A TMDL is a written quantitative assessment of water quality problems and the contributing pollutant sources. It specifies the amount of reduction needed to meet water quality standards, allocates load reductions among sources... and provides the basis for taking actions to restore a waterbody".

The U.S. EPA (1998) suggests that the successful development of a TMDL requires information in six general areas: identification of a target, location of sources, quantification of the amount of reduction needed, allocation of loads among sources, an implementation plan and monitoring and evaluation to track results and compliance. RWQCB staff also believe that a seventh element, the formation of a Steering Committee, is needed to help guide the control effort. Each of the elements are described briefly below.

1. Steering Committee.

The Steering Committee shall be composed of representatives from the Stockton RWCF, upstream and adjacent NPDES dischargers, the dairy industry, irrigated agriculture, the environmental community, and state and federal resource agencies. A facilitator/coordinator will be needed to conduct the Steering Committee meetings. The primary role of the Steering Committee will be to establish a Technical Advisory Committee, determine other stakeholders who should be participants on the Steering Committee, review recommendations of the Technical Advisory Committee on what special studies should be performed, how the load reductions should be allocated, and the time schedule and strategy for implementing the TMDL. The Steering Committee will also be responsible for developing a financial plan to secure the funding for collecting the information needed to implement the TMDL.

The responsibilities of the Technical Advisory Committee will be to identify information needs, determine and prioritize special funding needs, recommend load allocations, direct and assist in the review of the Stockton RWCF model, collate and analyze existing data, conduct special studies, critique special study and data analysis results, establish a common data bank, develop cost estimates, draft implementation and monitoring plans, review monitoring data and advise on effectiveness of the implementation plan. RWQCB staff will make final recommendations to the Board about load allocations and the TMDL implementation. If it appears likely that the Steering and Technical Advisory Committees will be unable to make recommendations in a timely fashion, then staff will develop the load allocation and TMDL implementation plan in the absence of this information.

2. Target.

The target of the TMDL is attainment of the Basin Plan dissolved oxygen water quality objective in the lower San Joaquin River. The dissolved oxygen objective for the time period of 1 September through 30 November is 6.0 mg/l and at all other times is 5.0 mg/l.

3. Sources and Causes.

The Stockton RWCF dissolved oxygen model identified the following factors as the cause of the low dissolved oxygen levels: upstream and adjacent algal blooms, SOD, river flow, discharge from the Stockton RWCF and temperature. It is felt that there is a need for independent validation of the Stockton RWCF dissolved oxygen model. U.S. EPA has committed resources through Tetra Tech to do so. Model evaluation should occur after input has been obtained from both the Steering and Technical Advisory Committees. If validation shows that the model is reliable and that its initial findings are accurate, then the actions listed below are recommended.

4. Summarize and Compile Data.

Collate all pertinent background data on the principle factors which contribute to the dissolved oxygen problem. These include information on all upstream and adjacent point and non-point source BOD and nutrient loads as well as all information on historical dissolved oxygen patterns in the San Joaquin River and changes in fisheries resources that may have been caused by the problem. All information gaps should be identified. Funds necessary for this task are shown in Table 12.

5. Determine BOD and Nutrient Sources.

Collect all additional nutrient and BOD data needed to fill information gaps identified above. This will probably include additional studies on loadings from both local and upstream point and non-point source discharges. In addition, feasibility studies should be undertaken to evaluate the cost and efficacy of load reductions at the most important sources. Funding for this task is identified in Table 12.

6. Determine Sources and Causes of SOD.

The Steering and Technical Advisory Committees will conduct investigations to determine the sources and causes of SOD. Also, feasibility studies will be undertaken to identify the most effective solutions for controlling SOD. Funds necessary for this task are shown in Table 11.

7. Evaluate Engineered Solutions.

The TMDL strategy should include evaluations of creative engineered solutions. At a minimum, the Steering and Technical Advisory Committees should evaluate the feasibility of river aeration and changes in San Joaquin River hydrology. Evaluations of river hydrology may include several options. One is real time management of flows at the head of Old River during critical periods. A second option might be pumping water south through the Delta Mendota Canal for release down Newman Wasteway to augment base flows in the lower San Joaquin River during critical periods. Either option might be significantly enhanced by linking the continuous monitoring data (flow, salinity, temperature, dissolved oxygen and pH) presently collected in the San Joaquin River with measurements of nutrients, and chlorophyll to determine sources and timing of high organic loads so that the head of Old River barrier can be operated in an adaptive management framework (Jones and Stokes Associates, 1998). A cost estimate for evaluating these options is shown in Table 12.

8. Amount of Load Reduction Needed.

The load reduction needed is the difference between the load that would fulfill the Basin Plan Water Quality Objective for dissolved oxygen and the load that causes the dissolved oxygen concentrations presently measured in the main channel of the River.

9. Allocation of Loads Among Sources.

The Steering and Technical Advisory Committees will make recommendations on load allocations to Regional Board staff after considering the following: importance of source, cost of correction per unit of dissolved oxygen increase obtained and probability of success of the action. The Steering and Technical Advisory

Committees may also consider creative solutions such as funding aeration or hydrologic changes or the development of nonpoint source management practices. These are suggested as methods for assuring a contribution from other responsible parties who can make no load reductions. Finally, the load allocation process will include a safety factor to account for population growth in the Basin during the next 30 years.

10. Implementation Plan.

While a full discussion of the implementation plan is premature, several facts are worth noting. First, the Steering and Technical Advisory Committees will make recommendations on load reduction allocations and the schedule and funding for implementing the TMDL. Regional Board staff will review these recommendations and propose a dissolved oxygen TMDL to the Board. It is anticipated that Regional Board staff will need about 6 months to review the recommendations and prepare the paperwork for the Basin Plan amendment. Second, the Basin Plan amendment will include load reduction allocations and a time schedule for meeting them. The reductions may necessitate revisions of NPDES permits and development and enforcement of management practices in the agriculture community.

It is anticipated that the TMDL will take three years to develop once funding has been secured. In the interim, the Regional Board will be revising NPDES permits for discharge to both the lower San Joaquin River and South Delta. Staff propose recommending to the Board when revising these NPDES permits, that no additional ammonia load reductions for correction of the dissolved oxygen problem will be sought while satisfactory progress is being made on the development of the TMDL and the discharge is not responsible for a significant portion of the dissolved oxygen problem. It will be assumed that satisfactory TMDL progress is being made if the majority of studies to determine load allocations are underway by December 1999 and it appears likely that the Steering Committee will recommend a TMDL implementation plan, including load allocations, to Regional Board staff by the year 2002.

11. Monitoring and Reevaluation.

The implementation plan will include monitoring. The purpose of monitoring is to verify compliance with the Basin Plan Dissolved

Oxygen Objective. If monitoring demonstrates that the Water Quality Objective is not being met, then additional load reductions will be required. These new load reductions will be implemented after consultation with the Steering and Technical Advisory Committees.

Estimate of Costs

Table 12 provides cost estimates for developing a dissolved oxygen TMDL in the lower San Joaquin River and an estimate of the time required to complete each task.

TABLE 12: COST ESTIMATES FOR DEVELOPING A DISSOLVED OXYGEN TMDL IN THE LOWER SAN JOAQUIN RIVER

Task	Cost	Years from date funds available
Steering Committee		as long as required
Facilitator/Coordinator	$ 12,000[1]	
Problem Statement		
Summarize and compile data	$ 50,000	0.5
Source Analysis		
Validate D.O. Model	$ 30,000	0.5
Determine BOD and nutrient sources	$ 200,000	2.0
Evaluate feasibility of control options	$ 50,000	
Determine sediment contribution	$ 200,000	2.0
Evaluate feasibility of control options	$ 50,000	
Evaluate engineered solutions	$ 80,000	2.0
Implementation Plan		
TMDL for Regional Board consideration	--	2.5
Monitoring/Reevaluation		annually after TMDL adopted
Monitoring to evaluate load reductions	$ 20,000[1]	

[1] per year

An Estimate of Recoverable Costs from Potential Dischargers

No immediate funds are available from the discharge community to develop the TMDL. However, once the load reductions are allocated, then the responsible parties will be required to assume the costs of implementation.

Two Year Expenditure Schedule

CWA Sections 104(b)(3), 106(g), and 319(h) grants are potential sources of funding and have been used in the past by RWQCBs to address such issues. CALFED may also be a source of funding.

Recommendation: Adopt the alternative actions and cost estimates as presented.

Site 5.3: Diazinon Orchard Dormant Spray Cleanup Plan

Site Description: The Central Valley RWQCB identified several high priority toxic hot spots in their Regional Toxic Hot Spots Cleanup Plan. The RWQCB has identified several actions that are underway in the vicinity of toxic hot spots associated with pesticides in the Delta. The RWQCB has requested that the cleanup planning portion of the document be deferred to the TMDL process under way at the RWQCB. Should the SWRCB approve a variance for addressing pesticides in the Delta?

<u>Summary of Actions Initiated at the Site</u>

The Department of Pesticide Regulation (DPR) and the State Water Resources Control Board (SWRCB) both have statutory responsibilities for protecting water quality from adverse effects of pesticides. In 1997, DPR and the SWRCB signed a management agency agreement (MAA), clarifying these responsibilities. In a companion document, the Pesticide Management Plan for Water Quality (Pesticide Management Plan), a process was outlined for protecting beneficial uses of surface water from the potential adverse effects of pesticides. The process relies on a four-stage approach: Stage 1 relies on education and outreach efforts to communicative pollution prevention strategies. Stage 2 efforts involve self-regulating or cooperative efforts to identify and implement the most appropriate site-specific reduced-risk practices. In stage 3, mandatory compliance is achieved through restricted use pesticide permit requirements, implementation of regulations, or other DPR regulatory authority. In stage 4, compliance is achieved through the SWRCB and RWQCB water quality control plans or other appropriate regulatory measures consistent with applicable authorities. Stages 1 through 4 are listed in a sequence that should generally apply. However, these stages need not be implemented in sequential order, but rather as necessary to assure protection of beneficial uses.

Currently, DPR is coordinating a stage 2 effort to address effects of dormant sprays on surface water. DPR's stated goal is to eliminate toxicity associated with dormant spray insecticides (i.e., chlorpyrifos, diazinon, and methidathion) in the Sacramento and San Joaquin River Basins and Delta. As long as progress continues toward compliance with appropriate water quality objectives, stage 3 activities will be unnecessary.

The U.S. EPA requires Regional Boards under the Clean Water Act to maintain 303(d) lists of impaired water bodies. In January 1998 the Central Valley Regional Board approved a revised 303(d) list of impaired water bodies and provided a schedule for the development of Total Maximum Daily Loads. The Sacramento and San Joaquin Rivers and Delta-Estuary were listed, in part, because of diazinon impairments from orchards to water quality. The Regional Board ranked the impairment in all three locations as a high priority and committed to the development of a TMDL by the year 2005. Components of a TMDL include problem description, numeric targets, monitoring and source analysis, implementation plan, load allocations, performance measures and feedback, margin of safety and seasonal variation and public participation. If compliance monitoring demonstrates that the problem has not been corrected by 2005, then a TMDL waste load allocation, including an implementation schedule, must be adopted as a Basin Plan amendment by the Regional Board.

Several activities are underway in the Basin to develop agricultural BMPs to control orchard dormant spray runoff. These are summarized below by the Agency conducting the study.

Department of Pesticide Regulation In addition to the activities already discussed, DPR is investigating orchard floor management as a means to reduce discharges of dormant sprays into surface waterways (Ross *et al.*, 1997). At an experimental plot at UCD, DPR staff measured discharges of chlorpyrifos, diazinon, and methidathion from a peach orchard with three orchard floor treatments. Investigations are continuing in a commercial orchard. At California State University at Fresno, DPR is investigating the effects of microbial augmentation and postapplication tillage on runoff of dormant sprays. Results will be highlighted in DPR's own outreach activities and will be made available to other groups interested in the identification and promotion of reduced-risk management practices.

DPR is also monitoring water quality at four sites--two each within the Sacramento and San Joaquin river watersheds. During the dormant spray use season, approximately January through mid-March, water samples will be collected five times each week from each site. Chemical analyses are performed on each sample; one chronic and two acute toxicity tests, using *Ceriodaphnia dubia*, are performed each week.

Novartis The Registrant of diazinon distributed over ten thousand brochures last winter through U.C. Extension, County Agricultural Commissioner's Offices, and Pesticide distributors. The brochure described the water quality problems associated with dormant spray insecticides and recommended a voluntary set of BMPs to help protect surface waters. Novartis intends to repeat the education and outreach program this winter.

DowElanco and Novartis The Registrants of chlorpyrifos and diazinon have undertaken a multiyear study in Orestimba Creek in the San Joaquin Basin with the primary objective of identifying specific agricultural use patterns and practices which contribute the bulk of the off-site chemical movement into surface water. The study involves an evaluation of pesticide movement in both winter storms and in summer irrigation return flows. Objectives in subsequent years are to use the data to develop and field test BMPs to reduce off site chemical movement. The first year of work is complete and a report may be released soon.

Biologically Integrated Prune Systems (BIPS) The BIPS program is a community-based project that supports implementation of reduced-risk pest management strategies in prune orchards. The reduction or elimination of organophosphate dormant sprays is a goal. The project has a strong outreach component that includes demonstration sites and "hand-on" training for growers and pest control advisors (PCAs). BIPS is a recipient of one of DPR's pest management grants.

Biologically Integrated Orchard Systems (BIOS) The BIOS program pioneered community-based efforts to implement economically viable, nonconventional, pest management practices. It emphasizes management of almond orchards in Merced and Stanislaus counties in ways that minimize or eliminate the use of dormant spray insecticides. BIOS was a recipient of a DPR pest management grant and a federal Clean Water Act (CWA) section 319(h) nonpoint source implementation grant.

Biorational Cling Peach Orchard Systems (BCPOS) This project has the same goals as the BIPS program, except that it focuses on primary pests in cling peach orchards. The University of California Cooperative Extension is acting as project leader, with Sacramento and San Joaquin valley coordinators. BCPOS is another recipient of a DPR pest management grant.

Colusa County Resource Conservation District The Colusa County Resource Conservation District (RCD) is leading a runoff management project within the watershed of Hahn Creek. Project participants are trying to identify management practices that reduce runoff from almond orchards within the watershed, thereby reducing pesticide loads in the creek. Outreach and demonstration sites are part of this project. This project was the recipient of a CWA section 319(h) grant.

Glenn County Department of Agriculture The Glenn County Department of Agriculture is organizing local growers and PCAs to address the use of dormant spray insecticides in the county. The local RCD is also involved; they are applying for grants to facilitate the implementation of reduced-risk pest management practices.

Natural Resources Conservation Service-Colusa Office The Colusa County office of the Natural Resources Conservation Service (NRCS) was recently awarded over $100,000 from the Environmental Quality Incentives Program (EQIP), one of the conservation programs administered by the U.S. Department of Agriculture. EQIP offers contracts that provide incentive payments and cost sharing for conservation practices needed at each site. Most of these funds should be available to help implement reduced-risk pest management practices in almond orchards in the area.

Natural Resources Conservation Service--Stanislaus Office The Stanislaus County office of NRCS was recently awarded $700,000 from EQIP. Half of the funds are allocated to address livestock production practices, but most of the remaining funds should be available to address dormant sprays and the implementation of reduced-risk pest management practices. Local work groups, comprised of Reds, NRCS, the Farm Services Agency, county agricultural commissioners, Farm Bureau, and others will determine how EQIP funds will be distributed. Applicants for EQIP funds will be evaluated on their ability to provide the most environmental benefits.

Nature Conservancy The Nature Conservancy is enrolling more prune growers in the BIPS project as it proceeds with its Felon Island restoration project in the Sacramento Valley. This project is supported by a CWA section 319(h) grant.

U.C. Statewide Integrated Pest Management Project In late 1997 the U.C. Statewide Integrated Pest Management Project was awarded a two year grant by the SWRCB to: (1) identify alternate orchard management practices to prevent or reduce off site movement of dormant sprays, (2) provide outreach and education on these new practices to the agricultural community, and (3) design and initiate a monitoring program to assess the success of the new practices. A Steering Committee composed of representatives from Commodity groups, State Agencies including RWQCB staff, and U.C. Academics was formed to serve as a peer review body for the study.

Approach/Alternatives: In January 1998 the Central Valley RWQCB adopted a revised 303(d) list, ranked diazinon impairments in the Sacramento and San Joaquin Rivers and in the Delta Estuary as high priority and committed to the development of a load reduction program by the year 2005. In October 1998 staff briefed the RWQCB on pesticide detection patterns in the Central Valley and requested guidance on whether these should be considered "frequent" as required by the Bay Protection Program in order to be considered as a candidate high priority hot spot. In addition, guidance was sought on whether to prepare cleanup plans under BPTCP or seek a variance and prepare a control program under Section 303(d) of the Clean Water Act. The RWQCB unanimously decided that the pattern of pesticide detections observed in the Sacramento and San Joaquin Rivers and in the Bay-Delta from dormant spray applications was frequent and merited consideration as a high priority candidate Bay Protection Hot Spot. The RWQCB also directed staff to seek a variance and begin pesticide regulation under section 303(d) of the Clean Water Act.

An estimate of the total costs to develop the plan.

Not Applicable.

An estimate of recoverable costs from potential discharges.

Not Applicable

Two-year expenditure schedule identifying funds to implement the plan that are not recoverable from potential dischargers.

Not Applicable.

Recommendation: Approve the recommended variance from the cleanup plan provisions. Require that the RWQCB comply with CEQA and APA when the TMDL for pesticides is approved by the RWQCB.

Site 5.4: Urban Stormwater Pesticide Cleanup Plan

Site Description:

The Central Valley RWQCB identified several high priority toxic hot spots in their Regional Toxic Hot Spots Cleanup Plan. The RWQCB has identified several actions that are underway in the vicinity of toxic hot spots associated with pesticides in urban stormwater. The RWQCB has requested that the cleanup planning portion of the document be deferred to the TMDL process under way at the RWQCB. Should the SWRCB approve a variance for addressing pesticides in urban stormwater?

Summary of Actions Initiated at the Site

The discovery of diazinon in urban storm runoff in both the Central Valley and San Francisco Bay Region at toxic concentrations to *Ceriodaphnia* led to the formation of the Urban Pesticide Committee (UPC). The objective of the UPC is to provide a forum for information exchange, coordination and collaboration on the development and implementation of an urban pesticide control strategy. An additional advantage of the Committee is that it facilitates a more efficient use of limited resources. The initial characterization of the pesticide problem through extensive bioassay, chemical and TIE work occurred in the Central Valley with confirmation in the Bay Area while the follow-up studies identifying sources and loads has primarily occurred in the Bay Area.

The UPC has prepared three reports describing various aspects of the urban pesticide problem in the Bay Area and a fourth volume describing a strategy for reducing diazinon levels in urban runoff. The first report provides a compilation and review of water quality and aquatic toxicity data in urban creeks and storm water discharges in the San Francisco Bay Area focusing on diazinon (Katznelson and Mumley, 1997). The review also includes a discussion of the potential adverse impact of diazinon on aquatic ecosystems receiving urban runoff. The second report characterizes the temporal and spatial patterns of occurrence of diazinon in the Castro Valley Creek watershed (Scanlin and Feng, 1997). Runoff at an integrator point for the entire watershed was sampled during multiple storms to record both seasonal and within-event variations in diazinon concentration. The purpose of the third report was to compile information on the outdoor use of diazinon in urban areas in Alameda County including estimates of quantity applied, target pests, and seasonal and long term trends

(Scanlin and Cooper, 1997). This information will be used in the development of a strategy to reduce the levels of diazinon in Bay Area creeks. Finally, the UPC has produced a strategy for reducing diazinon levels in Bay area creeks (Scanlin and Gosselin, 1997). Since pesticides are regulated on the state and national level, much of the strategy focuses on coordinating with enforcement agencies. The strategy presents a framework of roles and responsibilities that can be taken by various agencies to achieve the overall goal. The strategy focuses on diazinon as it is the most common insecticide detected at toxic levels. In the Central Valley both diazinon and chlorpyrifos are regularly observed and must be simultaneously addressed in any cleanup plan.

As was explained in the diazinon orchard dormant spray clean up plan, DPR and the SWRCB both have statutory responsibilities for protecting water quality from adverse effects of pesticides. In 1997 DPR and the SWRCB signed a MAA, clarifying these responsibilities. In a companion document, the Pesticide Management Plan for Water Quality (Pesticide Management Plan), a process was outlined for protecting beneficial uses of surface water from the potential adverse effects of pesticides. The process relies on a four-stage approach: Stage 1 relies on education and outreach efforts to communicative pollution prevention strategies. Stage 2 efforts involve self-regulating or cooperative efforts to identify and implement the most appropriate site-specific reduced-risk practices. In stage 3, mandatory compliance is achieved through restricted use pesticide permit requirements, implementation of regulations, or other DPR regulatory authority. In stage 4, compliance is achieved through the SWRCB and RWQCB water quality control plans or other appropriate regulatory measures consistent with applicable authorities. Stages 1 through 4 are listed in a sequence that should generally apply. However, these stages need not be implemented in sequential order, but rather as necessary to assure protection of beneficial uses. At present pesticides in urban storm water are managed through stage 1 of the MAA.

The U.S. EPA requires RWQCBs under the Clean Water Act to maintain 303(d) lists of impaired water bodies. In January 1998 the Central Valley RWQCB approved a revised 303(d) list of impaired water bodies and provided a schedule for the development of Total Maximum Daily Loads. Morrison Creek, Mosher Slough, and Five Mile Slough were listed because of diazinon and chlorpyrifos impairments to water quality. The RWQCB ranked the impairment in all three locations as a medium priority and committed to the development of a TMDL by the year 2011. Components of a TMDL include problem description, numeric targets, monitoring and source analysis, implementation plan, load allocations, performance measures and feedback, margin of safety and seasonal variation and public participation. If compliance monitoring demonstrates that the problem has not been corrected by 2011, then the TMDL waste load allocation, including an implementation schedule, must be adopted as a Basin Plan amendment by the RWQCB.

Approach/Alternatives: In January 1998 the Central Valley RWQCB adopted a revised 303(d) list, ranked diazinon and chlorpyrifos impairments in urban runoff dominated back sloughs around the Delta as a medium priority and committed to the development of a load reduction program by the year 2011. In October 1998 staff briefed the RWQCB on pesticide detection patterns in the Central Valley and requested guidance on whether these should be considered "frequent" as required by the BPTCP in order to be considered as a candidate high priority hot spot. In addition, guidance was sought on whether to prepare cleanup plans under Bay Protection or seek a variance and prepare a control program under section 303(d) of the Clean Water Act. The RWQCB unanimously decided that the pattern of pesticide detections observed in urban runoff were frequent and merited consideration as high priority candidate Bay Protection Hot Spot. The RWQCB also directed staff to seek a variance and begin pesticide regulation under section 303(d) of the Clean Water Act.

<u>An estimate of the total costs to develop the plan.</u>

Not Applicable.

<u>An estimate of recoverable costs from potential dischargers.</u>

Not Applicable

<u>Two-year expenditure schedule identifying funds to implement the plan that are not recoverable from potential dischargers.</u>

Not Applicable.

Recommendation: Approve the recommended variance from the cleanup plan provisions. Require that the RWQCB comply with CEQA and APA when the TMDL for pesticides in urban stormwater is approved by the RWQCB.

Site 5.5: Irrigation Return Flow Pesticide Cleanup Plan

Site Description: The Central Valley RWQCB identified several high priority toxic hot spots in their Regional Toxic Hot Spots Cleanup Plan. The RWQCB has identified several actions that are underway in the vicinity of toxic hot spots associated with pesticides in irrigation return flows. The RWQCB has requested that the cleanup planning portion of the document be deferred to the TMDL process under way at the RWQCB. Should the SWRCB approve a variance for addressing pesticides in irrigated return flows?

<u>Summary of Actions Initiated at the Site</u>

As described previously, DPR and SWRCB both have statutory responsibilities for protecting water quality from adverse effects of pesticides. In 1997, DPR and the SWRCB signed a MAA, clarifying these responsibilities. In a companion document, the Pesticide Management Plan for Water Quality (Pesticide Management Plan), a process was outlined for protecting beneficial uses of surface water from the potential adverse effects of pesticides. The process relies on a four-stage approach: Stage 1 relies on education and outreach efforts to communicative pollution prevention strategies. Stage 2 efforts involve self-regulating or cooperative efforts to identify and implement the most appropriate site-specific reduced-risk practices. In stage 3, mandatory compliance is achieved through restricted use pesticide permit requirements, implementation of regulations, or other DPR regulatory authority. In stage 4, compliance is achieved through the SWRCB and RWQCB water quality control plans or other appropriate regulatory measures consistent with applicable authorities. Stages 1 through 4 are listed in a sequence that should generally apply. However, these stages need not be implemented in sequential order, but rather as necessary to assure protection of beneficial uses.

The U.S. EPA requires RWQCBs under the Clean Water Act to maintain 303(d) lists of impaired water bodies. In January 1998 the Central Valley RWQCB approved a revised 303(d) list of impaired water bodies and provided a schedule for the development of Total Maximum Daily Loads. The San Joaquin River and Delta-Estuary were listed, in part, because of chlorpyrifos impairments to water quality. The RWQCB ranked the impairment in both locations as a high priority and committed to the development of a TMDL by the year 2005. Components of a TMDL include problem description, numeric targets, monitoring and source analysis, implementation plan, load allocations, performance measures and feedback, margin of safety and seasonal variation and public participation. The TMDL waste load allocation, including an implementation schedule, must be adopted as a Basin Plan amendment by the Regional Board should compliance monitoring demonstrate that the problem has not been corrected.

Two activities are underway in the Central Valley to develop BMPs to reduce pesticide movement into surface water in irrigated agriculture. Each are summarized below.

U.C. Statewide Integrated Pest Management Project. In December 1997 the U.C. Statewide Integrated Pest Management Project was awarded a three year one million dollar grant by the CALFED Bay Delta Program. Objectives of the grant are to (1) Identify alternate urban and rural BMPs to prevent and reduce off site movement of diazinon and chlorpyrifos into surface water. Study is to consider both summer and winter uses of the two insecticides. (2) Provide outreach and education on these new practices to the urban and agricultural community, and (3) design and initiate a monitoring program to assess the success of the new practices. Stanislaus County will be the focus of the study effort.

DowElanco The Registrant of chlorpyrifos has undertaken a multi year study in the San Joaquin Basin at Orestimba Creek to identify the specific agricultural use patterns and practices which contribute the majority of the off-site movement of their product into surface water. The study involves an evaluation of pesticide movement in both winter storms and in summer irrigation return flows. Objectives in subsequent years are to use the data to develop and field test BMPs to reduce off site chemical movement. The initial study is now complete. A report is expected soon.

Much similarity exits between agricultural practices in the San Joaquin Basin and the Delta. The results of the DowElanco work may be important in helping to identify the agricultural practices responsible for causing instream toxicity in the Estuary and also for developing successful BMPs to solve the problem. All promising solutions need to be field tested in Delta farmland.

Approach/Alternatives: In January 1998 the Central Valley RWQCB adopted a revised 303(d) list, ranked chlorpyrifos impairments in the San Joaquin River and in the Delta as high priority and committed to the development of a load reduction program by the year 2005. In October 1998 staff briefed the RWQCB on pesticide detection patterns in the Central Valley and requested guidance on whether these should be considered "frequent" as required by the BPTCP in order to be considered as a candidate high priority hot spot. In addition, guidance was sought on whether to prepare cleanup plans under Bay Protection or seek a variance and prepare a control program under section 303(d) of the Clean Water Act. The RWQCB unanimously decided that the pattern of pesticide detections observed in various Delta backsloughs were frequent and merited consideration as a high priority candidate Bay Protection Hot Spot. The Board also directed staff to seek a variance and begin pesticide regulation under section 303(d) of the Clean Water Act. Therefore, no further assessment of the actions required under the Cleanup Plan are listed here.

An estimate of the total costs to develop the plan.

Not Applicable.

An estimate of recoverable costs from potential dischargers.

Not Applicable.

Two year expenditure schedule identifying funds to implement the plan that are not recoverable from potential dischargers.

Not Applicable.

Recommendation: Approve the recommended variance from the cleanup plan provisions. Require that the RWQCB comply with CEQA and APA when the TMDL for pesticides in irrigation return flows is approved by the RWQCB.

Site 8.1: Santa Ana Region, Lower Newport Bay, Rhine Channel

Site Description: The Santa Ana RWQCB identified one high priority toxic hot spot in their Regional Toxic Hot Spots Cleanup Plan. The RWQCB has identified several actions that are underway to cleanup and remediate the toxic hot spot in Lower Newport Bay at Rhine Channel.

Description of the Site

An assessment of the areal extent of the Rhine Channel Toxic Hot Spot is between 1.5 and 2.5 acres. Six boat yards currently operate along the channel. Historic practices at the boat yards are the most likely source of pollutants, although a thorough characterization of the depth of pollution has never been undertaken.

Summary of Actions Initiated at the Site

The RWQCB currently regulates the discharge of process wastewater and stormwater from all boat yard facilities in Lower Newport Bay and Huntington Harbour through General Waste Discharge Requirements (Order No. 94-26, as amended by Order No. 95-60 and 96-52). The boat yards were initially issued individual NPDES permits beginning in 1975. The main feature of Order No. 94-26, as amended, is the elimination of the discharge of process wastewater in accordance with the requirement of the Water Quality Control Policy for the Enclosed Bays and Estuaries of California. Process wastewater is defined by the Order to include the first one tenth of an inch of rain that is proceeded by seven days of dry weather. This permit requirement was to be implemented by April, 1996. Presently, five of the six boat yards in Rhine Channel have complied with this requirement.

The Newport Bay watershed is one of two watersheds within the Santa Ana Region that are the focus of intensive watershed management activities. The expected outcome of this planning and management effort includes a further refinement of water quality problems, both in the Bay and watershed, the development and implementation of a watershed management plan that addresses these problems, and mechanisms for measuring the success of the plan and improvements in water quality.

Additionally, Lower Newport Bay is currently listed as water quality limited for metals and pesticides pursuant to Section 303(d) of the Clean Water Act. A TMDL for metals and pesticides will be developed by the RWQCB to address this impairment. The control of pollutant sources occurring in Rhine Channel will be a component of the TMDLs.

Approach/Alternatives:

There are four options for cleanup of the Rhine Channel toxic hot spot. These include ex-situ treatment, chemical separation, immobilization, and dredging.

1. Ex-situ Treatment.

The ex-situ treatment of pollution at Rhine Channel could include either chemical separation or immobilization. Chemical separation would separate the weakly bound metals from the sediment, and the clean sediment would then be disposed. The problem with this treatment is the limited application of the method, the need for further treatment systems integration for a complete separation, and the need for a treatment site. This last factor is significant due to the urban setting of the site. Significant transportation costs would be incurred by hauling the sediment to a non-local treatment area.

2. Immobilization by chemical fixation.

Immobilization of trace metals by chemical fixation is another possible treatment. This treatment has been used extensively for solid wastes. A limitation with this treatment is the high moisture content of the sediment in Rhine Channel and the need for a treatment site.

3. Capping or containment.

The capping or containment of the site is not an option due to the shallow depth of Rhine Channel. Capping would effectively eliminate any navigation in the channel and adversely affect the economic activities of businesses that use the channel (i.e., the boatyards).

4. Dredging.

The only other viable treatment is dredging and off-site disposal. Dredging of the site would allow for a confined remediation area with a low potential for the off-site migration of toxic substances through the use of siltation curtains. It would also allow for the continued use of the channel without a significant disruption of access or business activity.

An estimate of the total cost and benefits of implementing the cleanup plan.

The dredging of Rhine Channel would involve the removal of approximately 23,000 cubic yards of sediment (2 acres x 7 feet deep--Table 13). This is a rough estimate because there has not been a thorough characterization of the areal extent of pollution. These amounts should be considered conservative and preliminary. Additional costs could be incurred if alternative disposal transportation is required. Cost estimates are listed in Table 13.

TABLE 13: COST ESTIMATE TO DREDGE RHINE CHANNEL

Sediment Removal		
Hydraulic dredge	(23,000 cy @ $10 cy)	$230,000
Silt screen (material, labor)	(600 ft @ $3 ft)	$1,800
Sediment Transport		
Truck	(23,000 cy @ $200 cy)	$4,600,000
Sediment Disposal		
Class I disposal facility (Hazardous waste)	(23,000 cy @ $250 cy)	$5,750,000
Total		$10,581,800

Estimate of recoverable costs from potential dischargers

The recoverable costs from dischargers would be insufficient to perform cleanup activities. The boatyard operations are small businesses, with a few having financial difficulty implementing control measures currently required by the RWQCB. If the RWQCB were to issue Cleanup and Abatement Orders to the boatyards in an attempt to recover costs for the proposed cleanup activities, it is envisioned that several of the boatyards would claim bankruptcy rather than participate. It is estimated that recoverable cleanup costs from dischargers would be from 1 to 10 percent.

Two-year expenditure schedule identifying funds to implement the plans that are not recoverable from potential dischargers.

Year 1.

The activities conducted during the first year would be further site pollution characterization. These activities would include extensive sampling to determine the areal extent, depth, and severity of pollution in Rhine Channel. The cost would be approximately $900,000.

Year 2.

The activities conducted during the second year would be the development of an engineering report and operating plan for the cleanup site, obtaining the appropriate permits (e.g., 401/404), and producing appropriate environmental documentation (e.g., NEPA/CEQA). These services would be provided by a consulting firm. This would cost approximately $500,000.

Recommendation: Adopt the alternatives, cost estimates and expenditure plan as presented.

Site 9.1: San Diego Region, Seventh Street Channel, National City

Site Description: The San Diego RWQCB identified one high priority toxic hot spot in their Regional Toxic Hot Spots Cleanup Plan. The RWQCB has identified several actions that are underway at the Seventh Street Channel in San Diego Bay. Should the RWQCB approaches for remediating the toxic hot spot be adopted?

Description of the Site

The remediation alternatives are applicable to Approximately three acres, encompassing the area of Stations 90009, 93227, 93228. However, the area affected could be substantially larger or smaller. Dredging activities could have occurred in this area since San Diego Bay was sampled during the period 1992 to 1994. If so, this area or parts of this area may no longer be considered for remediation.

Summary of Actions Initiated at the Site

The following is a summary of actions that have been initiated by the San Diego RWQCB to reduce the accumulation of pollutants at the THS. The following programs address water quality near the Seventh Street Channel. It is unknown whether any of the organizations or facilities named below have discharged chemical wastes at levels which could have caused the accumulation of pollutants at existing toxic hot spots.

NPDES Permits for the Naval Station

The Naval Station Graving Dock, which lies midway between Chollas Creek and the Seventh Street Channel and a half mile north of the Seventh Street Channel, currently is covered by its own National Pollutant Discharge Elimination System (NPDES) permit. Discharges from Navy industrial facilities are currently covered under the State Water Resources Control Board General Industrial Storm Water Permit. The Regional Board may issue NPDES permits for discharges from other Navy activities adjacent to San Diego Bay.

NPDES Municipal Storm Water Permit

In 1990, the RWQCB issued NPDES stormwater permits to municipalities responsible for civilian areas, including those tributary to San Diego Bay. Activities underway in the Paleta Creek watershed by the City of National City include public education, public service announcements on television, and street sweeping. The stormwater permit is now being revised.

Pacific Steel site

During the 1980s, the Regional Board took enforcement action against Pacific Steel, an automobile recycler. The company, which was located inland of the Seventh Street Channel, maintained a large "fluff" pile of non-ferrous waste. Runoff from the fluff pile was prohibited by the RWQCB from draining to San Diego Bay. The fluff pile was subsequently removed and the site cleaned up.

Military cleanups

The Regional Board has participated in Department of Defense Environmental Response Program (DERP) and Navy Installation Restoration (IR) activities to close former military hazardous waste sites on land adjacent to the Bay. Several disposal sites are located around the Seventh Street Channel.

Approach/Alternatives:

Section 13360 of the Porter-Cologne Water Quality Control Act prohibits RWQCBs, the SWRCB, and the courts from designating the means of compliance with the California Water Code. For this reason, the options presented below are not meant to influence the ultimate solution, but are presented to comply with BPTCP legislative requirements and to provide a starting point for discussion. The RWQCB could require potential responsible parties to submit California Water Code Section 13267 technical reports documenting the amounts and types of wastes discharged.

1. RWQCB procedures.

A first step could be to convene a meeting between potential responsible parties to discuss the data and to receive comments and information about the site. After review by staff of available information, the RWQCB Executive Officer could ask potential dischargers to submit technical reports. Subsequently, the RWQCB could require potential responsible parties to sample the site and surrounding area to document in detail the areal extent of the site and to identify specific pollutants at the site. Only after extensive review of all available information would the RWQCB require remediation actions.

2. Persistence of wastes at this site.

The chemical wastes found in the Seventh Street Channel and at the mouth of Paleta Creek, the pesticides Chlordane and DDT, and the class of polynuclear aromatic hydrocarbon (PAH) "ring" compounds derived from fossil fuels, are known to persist in nature. These organic chemicals may be resistant to treatment or natural remediation processes such as oxidation, microbial degradation, and photolysis. For this reason, natural recovery or in situ treatment may not be feasible. In-place capping is presumed to be infeasible because of frequent vessel traffic in this area of the Bay. Two options which may be feasible are dredging followed by placement in an upland confined disposal facility, and dredging followed by contained aquatic disposal. There is precedent for both options in San Diego Bay. Dredging of contaminated bottom material has occurred at boat yards in north San Diego Bay and at the 24th Marine Terminal in the south Bay. A submerged aquatic disposal site has been completed in the north Bay off several storm drains known to have contributed PCBs to the Bay.

3. Dredging and upland disposal.

Stations 90009, 93227, and 93228 are located in a heavily-used dredged channel frequented by barges, boats, and tugs. Navigation charts show depths of between 18 to 21 feet at mean lower low water, although the depths may be shallower or deeper due to sedimentation or recent dredging. There may be suitable sites on land nearby to build settling ponds to receive hydraulic dredge spoils. Sediment removal activities could include clamshell dredging or hydraulic dredging, and transportation to a suitable disposal site by barge, rail, or truck, or to settling ponds next to the Channel.

4. Dredging and contained aquatic disposal.

Another method could involve dredging a disposal site at another location in San Diego Bay, depositing the contaminated dredge spoil from the candidate toxic hot spot site, and capping the site with suitable material. The following conditions would have to be met if this option were to be implemented:

- Clean Water Act Section 404 dredging permits would be obtained from the U.S. Army Corps of Engineers for the contaminated site and for the aquatic disposal site
- State waste discharge requirements would be obtained from the Regional Board for the disposal site
- The cap would provide adequate coverage to prevent the spread of contaminated material
- Burrowing organisms would be prevented from mixing polluted sediments (i.e., bioturbation must not occur)

- The contaminated material covered would be able to support the cap
- The bottom slope would be able to support the cap during seismic events
- The cap would be well marked and protected against erosion or destruction from anchors, propellers, and strikes by vessels
- The site would be located away from major navigation lanes
- The exact location of the site would be noted on maps, charts, and deeds

Estimate of the Total Cost to Implement the Cleanup Plan

This preliminary cost list is based on the schedule found in the 1997 guidance document (see Table 14). High and low costs are provided. It is assumed that if ocean disposal at the 100 fathom site is chosen, the U.S. Army Corps of Engineers would require extensive testing of the material removed from the Seventh Street Channel to be transported to the LA-5 site 6 miles from Pt. Loma. Costs were not able to be estimated for California Environmental Quality Act (CEQA) compliance, Section 404 dredging permit and state waste discharge requirements acquisition, or sampling to determine the areal extent of the candidate toxic hot spot.

Costs for dredging and upland disposal.

High costs: Assume that 14,520 square yards (three acres) need remediation and that sediment to a depth of one yard would be removed. The 14,520 cubic yards of dredge spoil would then be placed on a barge, offloaded onto trucks, and transported to a suitable upland landfill. Low costs: Assume that the wastes are transported to a Class III site. Cost estimates are presented in Table 14.

TABLE 14: COMPARISON OF HIGH AND LOW COSTS FOR DREDGING AND UPLAND DISPOSAL

High Cost per Cubic Yard		Low Cost per Cubic Yard	
Clamshell dredging	$10	Clamshell dredging	$10
Unloading from barge	TBD	Unloading from barge	TBD
Transport by truck	200	Transport by truck	200
Disposal at Class I site	300	Disposal at Class III site	30
Sub total per cubic yard	$510	Sub total per cubic yard	$240
14,520 cubic yards X $510 = $7,405,200 (not including permits)		14,520 cubic yards X $240 = $3,384,800 (not including permits)	

Costs for dredging and contained aquatic disposal.

Cost estimates are presented in Table 15. High costs: Assume that 14,520 square yards (three acres) need remediation and that sediment to a depth of one yard would be removed. An aquatic disposal site would be dredged and suitable material obtained for use as a cap. Another suitable cap to prevent burrowing animals from penetrating into the underlying contaminated sediment would be provided as well. The 14,520 cubic yards of dredge spoil would be placed on a barge and transported to the aquatic disposal site. The caps would then be constructed. Low costs: Assume that confinement at the disposal site is not necessary.

TABLE 15: COMPARISON OF HIGH AND LOW COSTS FOR DREDGING AND CONTAINED AQUATIC DISPOSAL

High Cost per Cubic Yard		Low Cost per Cubic Yard	
Excavation of disposal site	TBD	Clamshell dredging and disposal (assuming confined disposal is not needed)	$10
Clamshell dredging	$10		
Barge transport of waste (assume high truck costs)	TBD		
Disposal at aquatic site	$9		
Cap at disposal site	TBD		
Monitoring at disposal site	TBD		
Sub total per cubic yard	$19	Sub total per cubic yard	$10
14,520 cubic yards X $19 = $275,880 total (not including creating and maintaining disposal site or acquiring permits)		14,520 cubic yards X $10 = $145,520 total (assuming a confined site is not needed)	

Estimate of Recoverable Costs From Potential Dischargers

No attempt has been made to ask potential responsible parties to participate in any remediation activities, so projected participation by responsible parties is based on conjecture. If fifty percent of the costs were recovered and the cleanup were to cost $7.4 million, the following schedule may be possible. Assume that $3.7 million is not recoverable.

Two-Year Expenditure Schedule Identifying Funds to Implement the Plans That Are Not Recoverable From Potential Dischargers

Assume that a total of more than $3.7 million would be needed, and that more than two years would be needed to remediate the Seventh Street Channel site.

Activity		Deficit
Year 1:		
- Meeting with responsible parties - Request for technical information - Discharger response - Staff review of response - Cleanup and abatement order - Sampling plan to characterize areal extent - Request for bids for chemistry sampling and analysis - Lab contract		
	estimate	$800,000
Year 2:		
- Site characterization - Engineering report - Section 404 dredging permit application - State waste discharge requirements application - NEPA and CEQA environmental documentation		
	estimate	$900,000

Recommendation: Adopt the alternatives, cost estimates and expenditure plan as presented.

ENVIRONMENTAL BENEFITS OF THE PROPOSED CONSOLIDATED TOXIC HOT SPOTS CLEANUP PLAN

In the next section of the FED short-term adverse effects resulting from the remediation activities and possible mitigation strategies are discussed. This section summarizes the types of long-term benefits anticipated to result after remediation occurs. The Water Quality Control Policy for Guidance on the Development of Regional Toxic Hot Spots Cleanup Plans (SWRCB, 1998a) required that the RWQCBs consider the benefits that would be derived by remediating known Toxic Hot Spots. The Policy acknowledged that the benefits derived from remediation would be qualitative in nature and that any assessment of benefits should be based on the SWRCB established beneficial uses of water.

Quantitative information on the benefits derived from remediation are generally not available to make a specific assessment of the economic and biological benefits of remediation. Only a qualitative description of the potential benefits resulting from improvements in ecosystem health as a result of implementing remediation measures is possible because of: (1) the complexity and diversity of California aquatic systems, and the diversity of ecological receptors for toxic pollutants; (2) pollutants and exposure conditions; (3) the complexity of ecosystem structure and function, and uncertainty in the interaction between factors involved in ecosystem recovery and responses; and (4) uncertainty regarding the extent to which remediation will result in toxic loadings reductions or concentrations significant enough to generate appreciable changes in ambient concentration and ecosystem health. The RWQCBs used the beneficial use information presented in the Guidance Policy to assess the beneficial effects of remediation in each known THS (Table 16). The benefits of remediating the high priority toxic hot spots are presented in each Regional Cleanup Plan (Appendix B).

Ecological Benefits

Toxicity may occur with either acute or chronic exposure to pollutants. Current concentrations of pollutants in the identified THSs pose a risk not only to humans through consumption of fish and shellfish but also to resident and migratory biota. Exposure to chronic low levels of pollutants can adversely affect resources by causing physiological and behavioral impairments in organisms or reduction of food-web resources and alteration of habitats. Reduction of pollutant concentration through remediation would reduce the risk of disturbances to the ecological integrity and important habitats of the biological resources.

TABLE 16. BENEFICIAL EFFECTS OF REMEDIATION

Beneficial effect	Values quantifying these beneficial effects	Beneficial use affected
Lower toxicity in planktonic and benthic organisms	Greater survival of organisms in toxicity tests.	MAR, EST
Undegraded benthic community	Species diversity and abundance characteristic of undegraded conditions.	MAR, EST
Lower concentrations of pollutants in water	Water column chemical concentration that will not contribute to possible human health impacts.	MIGR, SPWN, EST, MAR, REC 1, REC 2
Lower concentrations of pollutants in fish and shellfish tissue	Lower tissue concentrations of chemicals that could contribute to possible human health and ecological impacts.	MAR, EST, REC 1, COMM
Area can be used for sport and commercial fishing.	Anglers catch more fish. Impact on catches and net revenues of fishing operations increase.	REC 1, COMM
Area can be used for shellfish harvesting or aquaculture	Jobs and production generated by these activities increase. Net revenues from these activities are enhanced.	SHELL, AQUA
Improved conditions for seabirds and other predators	Increase in populations. Value to public of more abundant wildlife.	WILD, MIGR, RARE
More abundant fish populations	Increase in populations. Value to public of more abundant wildlife.	MAR, EST
Commercial catches increase	Impact on catches and net revenues of fishing operations.	COMM
Recreational catches increase, more opportunities for angling	Increased catches and recreational visitor-days.	REC 1
Improved ecosystem conditions	Species diversity and abundance characteristic of undegraded conditions.	EST, MAR
Improved aesthetics	Value to public of improved aesthetics. In some cases, estimates of the value to the public of improved conditions may be available from surveys.	REC 2
More abundant wildlife, more opportunities for wildlife viewing	Impact on wildlife populations. Impact on recreational visitor-days.	MAR, WILD, RARE, REC 2

Adverse effects of toxic pollutants include increased susceptibility to disease, reduced growth and development, altered physiology and behavior, impaired reproductive health and behavior, and if concentrations are high enough, death. Any one of these adverse effects can ultimately affect the survival, reproductive success, and overall health of a population, which may affect ecosystem health. These adverse effects can impact ecosystem function and integrity through direct and indirect effects on the biota by altering system processes such as impaired decomposition of organic matter and disruption of predator-prey interactions.

The aquatic ecosystems of California's bays and estuaries include food webs of phytoplankton, invertebrates, fish, birds, mammals, and other organisms that interact with each other through a complex flow of matter and energy. When remediation takes place ambient water and sediment quality improves through reductions in the concentrations of pollutants in the aquatic system and improvement in biological response. Because all components of this ecosystem are linked, improved survival, growth, productivity, and reproductive capacity translate to improved ecosystem stability, resilience, and overall health. Overall, this improvement in ecosystem health results in an enhancement of beneficial uses of the waters of the enclosed bays and estuaries of California.

Human Health Benefits

Bays and estuaries are natural sinks for the toxic pollutants. Concentrations of pollutants in the identified THSs pose a risk to humans through consumption of fish and shellfish. Tissues from fish and shellfish found in sites have been found to contain pollutant loads that exceed FDA and NAS action levels or have an advisory for the consumption of fish and shellfish. These are sites that are influenced by past and present accumulation of pollutants from point and nonpoint source discharges.

Fish consumption advisories are an acknowledgment that the beneficial uses associated with commercial and sport fishing are impacted greatly or lost. Concerns about the health effects of eating contaminated fish reduces the value of the fishery. It also increases the cost of commercial fishing because the fishermen may need to travel longer distances to make their catch. As a result, the sport angler makes fewer fishing trips because of health concerns. Likewise, the overall cost per fish in commercial catches goes up because of increased costs associated with the commercial fishing operation.

In addition, knowledge of toxic pollution and contamination of aquatic organisms at a specific site, regardless of consumption concerns, may not only reduce angler uses of coastal resources but also may decrease participation in non-consumptive uses of water such as water contact and non-contact recreation. A decrease in the level of toxic pollution and contamination through either implementation of remediation measures or active source control may increase ecosystem stability, resilience and overall health. This should translate into fish and shellfish with lower contaminants, possibly higher catch rates and increased angling efforts. An improved perception of water quality will also have a positive impact on the other non-consumptive water-associated recreational uses of water.

POTENTIAL ADVERSE ENVIRONMENTAL EFFECTS OF THE PROPOSED CONSOLIDATED TOXIC HOT SPOTS CLEANUP PLAN

The previous section of this FED summarizes the environmental benefits of remediation of the High Priority Toxic Hot Spots. However, CEQA requires public agencies to consider the potential adverse environmental effects of an action. In this case, the proposed action is SWRCB adoption of the proposed Consolidated Toxic Hot Spots Cleanup Plan as policy for water quality control. Consideration of potential adverse effects of remediation should be considered in the context of the fact that overall environmental conditions at these sites will be improved by remediation; and that potential adverse effects of remediation can be lessened by proper site-specific planning, site-specific compliance with laws protecting the environment, and application of mitigation measures outlined in the Consolidated Plan.

Potentially Adverse Significant Impacts

Analyzing the potential adverse impacts of adoption of an environmental policy or plan is considerably different in nature than the analysis of actions described in a more typical, public facility or private development environmental impact report. The environmental effects of a policy or plan do not occur directly as a result of the action (i.e., adoption of the document), but as an indirect consequence of the practices used to comply with the policy. The analysis of actions due to the SWRCB adoption of the proposed Consolidated Toxic Hot Spots Cleanup Plan should compare a baseline description of remediation practices under the existing regulatory framework (no Consolidated Toxic Hot Spots Cleanup Plan) with practices that would result from adoption of the Cleanup Plan.

Because of the extensive existing authority vested in the RWQCBs and the SWRCB by the Porter-Cologne Water Quality Control Act, all of the remediation alternatives identified in the Consolidated Toxic Hot Spots Cleanup Plan can take place regardless of whether the Plans are adopted by the RWQCBs and the SWRCB. At each of the High Priority Toxic Hot Spots beneficial uses have been shown to be adversely affected. The RWQCBs and the SWRCB currently have the authority to issue and revise waste discharge requirements, and issue and implement enforcement actions to require remediation of these sites. Adoption of the Consolidated Toxic Hot Spots Cleanup Plan does not change RWQCB authority or responsibility to remediate the identified High Priority Toxic Hot Spots, nor does adoption of the Plans change the physical way in which the sites might be remediated. The Consolidated Toxic Hot Spots Cleanup Plan is a response to a legislative requirement to identify sites, rank sites and plan for their cleanup. Because of this legislative mandate, remediation may be more likely to proceed.

The Consolidated Toxic Hot Spots Cleanup Plan provides both a number of alternatives for cleanup and a generic description of the remediation alternatives. Responsible parties may select among the identified remediation alternatives, or they may reject them all and propose another method to remediate the Toxic Hot Spot. (See Water Code Section 13360, which provides that the SWRCB and RWQCBs shall not specify the manner in which compliance may be had with a requirement, order, or decree. Persons shall be permitted to comply with the order in any lawful manner.)

A description of the existing environmental setting is provided in a previous section of this FED. However, a quantitative evaluation of environmental effects can only be done when site-specific remediation is selected and specific cleanup orders are developed. The exact timeframe for implementation of remediation alternatives is not known for many of the High Priority Toxic Hot Spots.

For the above reasons, the potential environmental effects of identified remediation alternatives on the environmental setting at the time of remediation will be addressed in this FED in a generic, policy-level manner.

It is possible that the quality of the environment could be degraded or biological resources adversely impacted, at least temporarily, if cleanup and mitigation efforts are not carefully planned and executed. This FED is not intended to provide CEQA compliance of the individual remediation projects. Appropriate CEQA compliance is required when site-specific remediation plans are developed. The FED also provides policy-level mitigation measures that must be considered by the RWQCBs to lessen or avoid potential adverse environmental impacts of remediation.

Finally, it should be noted that the remediation alternatives identified in the Consolidated Toxic Hot Spots Cleanup Plan are regulated to protect against adverse impacts to the environment. Compliance with applicable laws, and local and State regulations will reduce the potential for significant adverse impacts to the environment. These regulatory programs are discussed in this section of the FED.

This section of the FED focuses on discussions of potential impacts to water resources, wetlands, air quality, fish and wildlife, and the handling and potential for release of pollutants. Other issues were evaluated and determined not to be significant based on the environmental checklist and supporting analysis included in a subsequent section of this FED.

The following table (Table 17) lists the High Priority Toxic Hot Spots, and the remediation alternatives currently identified by the RWQCBs.

TABLE 17. IDENTIFIED REMEDIATION ALTERNATIVES

Site	Dredging/Excavation and Disposal	Capping	No Action Natural Recovery	Source Control[14]	Education-Institutional Controls[15]	Study[16]
Humboldt Bay Eureka Waterfront H Street	X					
San Francisco Bay (entire)				X	X	X
S.F. Bay - Peyton Slough	X	X				X
S.F. Bay - Castro Cove	X	X	X	X		X
S.F. Bay - Stege Marsh	X	X	X	X		X
S.F. Bay - Point Potrero	X	X	X		X	
S.F. Bay - Mission Creek	X	X	X	X		X
S.F. Bay - Islais Creek	X	X	X	X		X

14 Includes watershed management, TMDLs, best management practices, the SWRCB and RWQCB storm water programs, treatment, pretreatment.

15 Includes education to reduce use of products that are sources of pollutants; signs; warnings.

16 Includes monitoring, investigation, feasibility studies, subsequent development of TMDLs independent of the cleanup plan (cf. Central Valley RWQCB pesticide cleanup plans).

Site	Dredging/Excavation and Disposal	Capping	No Action Natural Recovery	Source Control[14]	Education-*Institutional* Controls[15]	Study[16]
Moss Landing and tributaries	X			X	X	X
Cañada de la Huerta	X	X				X
Santa Monica Bay/Palos Verdes Shelf		X			X	
Mugu Lagoon	X		X			
Los Angeles Inner Harbor/ Dominguez Channel Consolidated Slip	X					
Los Angeles Outer Harbor/ Cabrillo Pier	X	X				
San Joaquin River/ Sacramento River Delta, Mercury				X		X
San Joaquin River/ Sacramento River Delta, Dissolved Oxygen				X		X

Site	Dredging/Excavation and Disposal	Capping	No Action Natural Recovery	Source Control[14]	Education-Institutional Controls[15]	Study[16]
San Joaquin River/ Sacramento River Delta, Diazinon Dormant Spray				X		X
San Joaquin River/ Sacramento River Delta, Urban Stormwater Pesticide				X		X
San Joaquin River/ Sacramento River Delta, Irrigation Return Flow Pesticide				X		X
Lower Newport Bay, Rhine Channel	X					
San Diego Bay, Seventh Street Channel	X					

The Consolidated Toxic Hot Spots Cleanup Plan identifies 21 high priority toxic hot spots Statewide (Table 18). These sites are located in ocean waters (e.g., Santa Monica Bay), enclosed bays (e.g., sites in Humboldt Bay, Moss Landing Harbor, Los Angeles Harbor, Lower Newport Bay, San Diego Bay), estuaries (e.g., San Francisco Bay and the Sacramento/San Joaquin River Delta), and coastal lagoons (e.g., Mugu Lagoon). The size of the toxic hot spots ranges from approximately 1.5 acres to 1631 square miles (San Francisco Bay).

TABLE 18: AREAL EXTENT AND HABITAT AT TOXIC HOT SPOTS

Toxic Hot Spot	Areal Extent	Habitat
Cañada de la Huerta, Shell Hercules Site	3600 feet x 1200 feet	Creek mouth
Delta Estuary, Cache Creek	1100 square mile watershed, 1500 linear miles of creek	Creek in the Delta
Delta Estuary, Entire Delta	78 square miles of water area, 1,000 linear miles of waterways	Estuary
Delta Estuary, Morrison Creek, Mosher, 5-Mile, Mormon Slough & Calaveras River	5 linear miles of back sloughs	Estuary
Delta Estuary, Ulatis Creek, Paradise Cut, French Camp & Duck Slough	up to 15 linear miles of waterways	Estuary
Humboldt Bay, Eureka Waterfront H Street	3.5 acres, 10,000 cubic yards	Enclosed bay
Los Angeles/ Inner Harbor, Dominguez Channel/ Consolidated Slip	Approximately 50,000 cubic yards	Enclosed bay
Los Angeles Outer Harbor, Cabrillo Pier	25,000-50,000 cubic yards	Enclosed bay
Lower Newport Bay, Rhine Channel	1.5 to 2.5 acres	Enclosed bay

Toxic Hot Spot	Areal Extent	Habitat
Moss Landing Harbor and Tributaries	Harbor and Tributaries: 3,210 acres, lineal river miles 20 miles, and associated watershed subarea 187,596 acres	Enclosed Bay Estuaries and river
Mugu Lagoon east arm, Main Lagoon, western arm Callegas Creek Tidal Prism	150 acres, 725,000 cubic yards	Coastal lagoon
San Diego Bay, Seventh St. Channel Naval Station	Approximately 3 acres	Enclosed Bay
San Francisco Bay, Castro Cove	Between 10 and 100 acres	Enclosed Bay
San Francisco Bay, Entire Bay	1631 square miles	Estuary
San Francisco Bay, Islais Creek	Approximately 11 acres	Estuary
San Francisco Bay, Mission Creek	Approximately 9 acres	Estuary
San Francisco Bay, Peyton Slough	Approximately 1.25 acres	Estuary Slough
San Francisco Bay, Point Potrero/ Richmond Harbor	Approximately 1 acre	Enclosed Bay
San Francisco Bay, Stege Marsh	Approximately 10 acres to 23 acres	Estuary
San Joaquin River, City of Stockton	Approximately 10 miles	River
Santa Monica Bay, Palos Verdes Shelf	Approx. 15 square miles	Ocean

Dredging, Disposal, and Capping

Many of the remediation alternatives outlined in the Consolidated Toxic Hot Spots Cleanup Plan involve dredging, disposal, and/or capping of polluted sediments (see Table 17). While removal of the polluted sediments will have a beneficial impact on aquatic life and human health (e.g., improvement in aquatic life resources, recreational opportunities, etc.), there may be environmental impacts associated with remediation.

Dredging involves the use of machinery with scooping or suction devices to remove sediment. Typical dredging methods include mechanical or hydraulic dredging. Mechanical dredging removes sediments through direct application of mechanical force and excavates the material at almost *in situ* densities. Sediments removed by a mechanical dredge are placed into a barge or boat for transport to the disposal site. Sediments can be resuspended by the impact of the bucket, by the removal of the bucket, and by leakage of the bucket. Mechanical dredging typically produces sediments low in water content.

Hydraulic dredging uses centrifugal pumps to remove sediments in the form of a slurry. Although less sediment may be resuspended at the removal site, sediment slurries contain a high percentage of water at the end of the pipe. The slurry is transported by pipeline to a disposal area.

Removal and consolidation can involve a diked or containment structure which retains the dredged material and assures that pollutants do not migrate. Large portable settling tanks can also be used to consolidate sediment. After consolidation, disposal to an off-site location may include either upland (landfill) or containment. Considerations once the material has been dredged shall be (1) staging or holding structures or settling ponds, (2) de-watering issues including treatment and discharge of wastewater, (3) transportation of dredged material, (i.e., pipeline, barge, rail, truck), or (4) regulatory constraints.

Capping involves subaqueous coverage of polluted sediments to contain the toxic waste at the site.

Potential Impacts to Air Quality

Emissions from equipment used for dredging, disposal, and capping have the potential for temporary adverse effects to air quality. The primary pollutants of concern in these emissions are NOx or nitrogen oxides (Pers. comm., Grant Chin, Air Resources Board). NOx are precursors to ozone formation, and many of the remediation projects are located in areas which have been designated as nonattainment areas for ozone[17]. Nonattainment areas for State ambient air quality standards are all the coastal counties from San Diego County north to Marin County as well as Sonoma, Napa, Yolo, Sacramento, San Joaquin, Contra Costa, and Solano counties. In addition, nonattainment areas for National ambient air quality standards are all the coastal counties from San Diego County north to Santa Barbara County as well as San Mateo, San Francisco, Marin, Sonoma, Napa, Yolo, Sacramento, San Joaquin, Contra Costa, and Solano counties. Emissions from dredging operations are from mechanical or hydraulic dredges and supporting vessels.

Other emissions of concern could be carbon monoxide and PM_{10} (particulate matter < 10 microns). Los Angeles County is a nonattainment area for State carbon monoxide standards, and both the Los Angeles and Orange counties are carbon monoxide nonattainment areas under national standards. Los Angeles and Orange counties are also nonattainment areas for PM_{10} under national standards; all coastal counties are nonattainment areas for PM_{10} under State standards.[18]

In order to evaluate the air quality impact of emissions due to dredging, disposal, and capping equipment, the project proponent must identify the specific type of equipment that will be used in the remediation action. Next, emissions from the equipment must be quantified and evaluated in the context of air quality standards for the area in which the remediation is occurring, climate and meteorology, and time of year remediation will occur. A project scheduled in the winter may be less likely to cause exceedances of ozone standards than an action taken in the summer when ambient ozone levels are higher.

When evaluating the potential adverse effects to air quality, the project proponent must contact the appropriate regional air district for assistance in determining whether the amount of emissions generated at the remediation site will cause a violation of air

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[17] Proposed Amendments to Designation Criteria and Amendments to the Area Designations for State Ambient Air Quality Standards and Proposed Maps of the Area Designations for the State and National Ambient Air Quality Standards, California Air Resources Board, August 1998; and errata with changes adopted by California Air Resources Board on September 24, 1998.

[18] Proposed Amendments to Designation Criteria and Amendments to the Area Designations for State Ambient Air Quality Standards and Proposed Maps of the Area Designations for the State and National Ambient Air Quality Standards, California Air Resources Board, August 1998; and errata with changes adopted by California Air Resources Board on September 24, 1998.

standards. Project proponents would be responsible for meeting the requirements of the local air quality district for their specific project. If there is potential for an air quality violation, the project proponent should attempt to prevent or control emissions. This can be done by operating equipment under permit, purchase of air credits or offsets, use of electric dredging equipment, planning the project for the time of year or day when emissions would be least likely to cause an exceedance of air quality standards, optimizing the mode of transportation, favoring disposal sites closer to dredge sites, and minimizing the number of trips necessary to transport dredged material to the disposal site or rehandling facility.

Subaqueous material has the potential to create objectionable odors (e.g., hydrogen sulfide), and this is a potential adverse impact to air quality at the site where dredged materials are disposed or reused. In addition, objectionable odors may occur during dredging of subaqueous material. Whether the odor is considered to be significant is a function of the location of the site and whether a substantial number of people are affected. The impact is expected to be less than significant due to the short duration and locations of these activities. Reuse and disposal facilities must be located and designed to avoid generating nuisance odors that will adversely affect surrounding neighborhoods.

Water Resources and Wetlands

Generally, the stated goal of the State and Federal agencies is no net loss of wetlands (this includes acreage and value). This is done by requiring mitigation in the following order:

- Avoiding impacts by issuing permits only for the least environmentally damaging practical alternative or reconfiguring the project;
- minimizing impacts by modifying the project or restoring areas temporarily affected during a phase of the project; and, finally, if necessary
- compensating for unavoidable adverse impacts by restoring or creating wetlands:
  (1) restoring existing degraded wetlands
  (2) creating new wetlands in upland sites.

The proper application of the regulatory requirements (presented below generally) for project review and mitigation should reduce the potential for impacts to wetlands and water quality due to disposal of dredged materials.

Project-specific planning can also reduce the potential for adverse environmental effects due to dispersal of polluted sediments. Following is a discussion of the regulatory framework and issues that should be considered when planning for disposal of polluted sediments.

California Porter-Cologne Water Quality Control Act

The Porter-Cologne Water Quality Control Act (Porter-Cologne) establishes a comprehensive program for the protection of water quality and beneficial uses of water. It applies to surface waters including wetlands. Porter-Cologne requires adoption of Water Quality Control Plans that identify beneficial uses of waters, water quality objectives that will protect the uses, specified discharge prohibitions, and a plan of implementation for achieving water quality objectives. Typical beneficial uses include water supply, water contact and non-contact recreation, warm freshwater habitat, wildlife habitat, ground water recharge, preservation of rare and endangered species, and establish a program of implementation. Anyone discharging or proposing to discharge materials that could affect water quality (other than to a community sewer system) must file a report of waste discharge. The RWQCBs regulate discharges under Porter-Cologne primarily through issuance of WDRs. WDRs are intended to protect the beneficial uses of water bodies, and list what can and can not be discharged to waters of the State.

CWA Section 404/401

Under CWA Section 404, the Corps issues permits to regulate discharges of dredged or fill material to waters of the United States. The CWA Section 404(b)(1) Guidelines are the environmental criteria used in evaluating discharges of dredged or fill material under CWA Section 404. Under the guidelines, the analysis of practicable alternatives is the primary screening mechanism to determine the necessity of permitting a discharge of dredged or fill material into regulated waters. The guidelines prohibit all discharges of dredged or fill material into regulated waters unless the discharge constitutes the least environmentally damaging practicable alternative that will achieve the basic project purpose.

Disposal or discharge of dredged materials into waters of the United States (including wetlands) are highly regulated in order to protect against adverse environmental effects as well as to protect against net loss of wetlands. Section 404(a) of the Clean Water Act makes it unlawful to discharge dredged materials into waters of the United States without a permit from the Army Corps of Engineers. The Corps must conduct a public interest review that weighs benefits versus detriments of the project and considers all relevant factors including: conservation, aesthetics, wetlands, flood hazards, flood plain values, navigation, recreation, water quality, safety, mineral needs, economics, general environmental concerns, cultural values, fish and wildlife values, land use, shoreline erosion and accretion, water supply and conservation, energy needs, food and fiber production, property ownership, and the needs and welfare of the public. The permit process must comply with National Environmental Policy Act (NEPA).

The Corps may also issue General Permits for discharges of dredged materials that have minimum adverse environmental effects (including cumulative effects). General Permits usually contain project-specific mitigation requirements. Nationwide Permits are issued by the Corps for specified types of projects that are limited in size and impacts.

Section 404(b)(1) directs the U.S. EPA to develop guidelines for issuance of fill permits. The stated policy in these guidelines is that discharges of dredged or fill material into waters of the United States should not be conducted unless it can be proven that it will not have an unacceptable adverse direct or cumulative impact. U.S. EPA may prohibit placement of fill if there will be an unacceptable adverse effect on: municipal water supplies, shellfish beds, fisheries, wildlife, or recreation areas. The guidelines provide that dredged or fill material shall not be permitted in a water of the United States if there is a practicable alternative that would have less impacts. For "Special Aquatic Sites" (wetlands, wildlife sanctuaries, mudflats, vegetated shallows, and riffle and pool complexes in streams), the guidelines presume that practicable alternatives are available and the permit applicant must provide otherwise. The CWA Section 404(b)(1) Guidelines are the substantive environmental criteria used in evaluating discharges of dredged or fill material under CWA Section 404. Under the guidelines, the analysis of practicable alternatives is the primary screening mechanism to determine the necessity of permitting a discharge of dredged or fill material into regulated waters. The guidelines prohibit all discharges of dredged or fill material into regulated waters unless the discharge constitutes the least environmentally damaging practicable alternative that will achieve the basic project purpose.

CWA Section 401 allows states to deny or grant water quality certification for any activity which may result in a discharge to waters of the United States and which requires a Federal permit or license. Certification requires a finding by the State that the activities permitted will comply with all water quality standards individually or cumulatively over the term of the permit. Under Federal regulations (40 Code of Federal Regulations Section 131), water quality standards include the designated beneficial uses of the receiving water, the water quality criteria for those waters, and an antidegradation policy. Certification must be consistent with the requirements of the Federal CWA, the CEQA, the California Endangered Species Act (CESA), and the SWRCB's mandate to protect beneficial uses of waters of the State.

The SWRCB considers issuance of Water Quality Certifications for the discharge of dredged and fill materials. CWA Section 401 allows the State to grant or deny water quality certification for any activity which may result in a discharge to navigable waters and which requires a federal permit. Title 23 California Code of Regulations Section 3830 provides the regulatory framework under which SWRCB issues Water Quality Certifications under CWA Section 401. The Corps may not issue a Section 404 permit if the State denies water quality certification.

In order to certify a project, the SWRCB must certify that the proposed discharge will comply with all of the applicable requirements of CWA Sections 301, 302, 303, 306, and 307 (42 U.S.C. §§ 1311, 1312, 1313, 1316, and 1317). Essentially, the SWRCB must find that there is reasonable assurance that the certified activity will not violate water quality standards. Water quality standards include water quality objectives and the designated beneficial uses of the receiving water. CEQA compliance is required during the Section 401 water quality certification process. CWA Section 401 requires the water quality certification process to comply with CWA Section 404(b)(1) Guidelines.

In addition to the 404(b)(1) guidelines, both the San Francisco and Los Angeles districts of the U.S. Army Corps of Engineers have habitat mitigation and monitoring guidelines, and California DFG, Fish and Wildlife, and NMFS have wetlands mitigation guidelines.

Fish and Game Code Section 5650 could also be invoked if there is the discharge of deleterious substances into the environment.

Stream Bed Alteration Agreement Program

Fish and Game Code Section 1600 et seq. establishes a process to ensure that projects conducted in and around lakes, rivers or streams do not adversely impact fish and wildlife resources, or when adverse impacts cannot be avoided, ensures that adequate mitigation and or compensation is provided. Sections 1601 and 1603 of the Fish and Game Code are the primary sections with regard to developing Stream Bed Alteration Agreements. Projects that divert, obstruct or change the natural flow or bed, channel or bank of any river, stream, or lake where there is an existing fish or wildlife resource are subject to Section 1600. Fish and Game Code 1601 regulates the agreement process for projects proposed by state or local government agencies or public utilities while section 1603 regulates the process for projects proposed by all private project sponsors and federal projects without a state agency sponsor.

Landfill Disposal

In some cases, the cleanup of sites may generate significant amounts of materials that could be disposed in an appropriately designated solid waste disposal site. This could create increased demand for landfill capacity. In order to assess the potential effect to landfills, the areal extent and volume of sediment should be characterized. Once this is done, project impact to landfill capacity can be evaluated. If estimates exceed capacities, plan for alternative use of polluted sediments to remove impact (e.g., land-based confined disposal facilities, capping confined aquatic disposal, wetland restoration, levee reuse). Environmental effects and mitigation of site-specific impacts of these other alternatives would have to be evaluated.

Rehandling Facilities and Confined Disposal Facilities

Rehandling facilities are a link between dredging projects and the ultimate disposal of dredged material in upland projects. Dredged materials are typically off-loaded from barges, dewatered, dried, then transported to a final destination. Material (such as polluted sediments) that requires confinement may be transported to a dedicated confined disposal facility (CDF) constructed for the permanent storage of the dredged material, to other existing sites (e.g., landfills) that provide the necessary confinement. It is unknown if there is adequate rehandling or CDF capacity to handle the volume and quality of dredged material identified for removal in the Consolidated Plan.

Consequently, it is necessary when site-specific projects are considered that an evaluation be completed on the availability of rehandling facilities and CDFs (LTMS, 1996). If inadequate capacity is available, the RWQCB should consider, in the planning effort, the development of new facilities. In the evaluation of new facilities the RWQCB should consider, but not be limited to: (1) site selection, (2) facility construction practices, (3) facility operation, (4) facility administration and maintenance, and (5) regulatory, mitigation, and monitoring requirements (Table 19).

TABLE 19: DREDGE MATERIAL DISPOSAL ISSUES RELATED TO REHANDLING FACILITIES AND CONFINED DISPOSAL FACILITIES TO BE ADDRESSED DURING PROJECT-SPECIFIC REVIEW

Factor to be Considered	Issues to be Addressed During Project-Specific Review.
Site Selection	Water access to site
	Evaluation of site conditions: • elevation • tidal range • Alignment and elevation of existing levees • area available for dredged material use (fill depth) • Typical foundation conditions • Characteristics of dredged material to be used (e.g., material density, grain size, dredge method, etc.
	Assessment of land uses
Site Construction	Assessment of adequately engineered and constructed perimeter and interior levees
	Assessment of the feasibility of proposed dredged material off-loading facilities and methods of transporting the dredged material
Site Development	Proximity to channel with sufficient water depth to allow access for dredged material off-loading.
	Sufficient mooring for barges
	Evaluation of suitable off-loading site(s) in terms of proximity to the site of final use and its ability to handle the proposed types of off-loading equipment.
	Evaluation of the proposed means for dredged material placement at the site of final use.
	Evaluation of the ability to prevent overfilling of the site of final use.
Facility Administration and Maintenance	Evaluation of the proposed management of all construction operations and post-construction maintenance.
	Evaluation of the proposed inspection and supervision of contractors working on site.
Regulatory, Mitigation and Monitoring Requirements	Determination of the need for Federal and State permits or reviews.
	Determination of the need for local approvals.
	Evaluation of the proposed mitigation and monitoring plans to ensure compliance with all applicable Federal and State regulations and policies.

Capping or Confined Aquatic Disposal

Capping or Confined Aquatic Disposal (CAD) generally refers to capping polluted sediments but can also include nearshore fill or wetland creation projects where polluted sediments are not used as cover material. CAD projects must include consideration of siting, design and monitoring (Table 20). Polluted sediments must be placed at a CAD site with acceptable levels of dispersion, and the cap must be successfully placed and maintained. The evaluation process for a CAD project includes selection of an appropriate site, characterization of both polluted and capping sediments, selection of equipment and placement techniques, prediction of material dispersion during placement, determination of the required cap thickness, evaluation of cap stability against erosion and bioturbation, and development of a monitoring program to assess the effectiveness of the capping project (LTMS, 1996).

TABLE 20: ISSUES RELATED TO CONFINED AQUATIC DISPOSAL AND CAPPING SITES TO BE ADDRESSED DURING PROJECT-SPECIFIC REVIEW

Factor to be Considered	Issues to be Addressed During Project-specific Review.
Site Selection	Depositional/erosional characteristics • Identify if site is depositional or erosional to assess dispersion during cap placement • The potential for later cap erosion The need for armoring or long-term cap maintenance.
	Current velocities • Water column currents (affect dispersion during cap placement) • Bottom currents (affect resuspension; erosion of mound and cap) • Storm-induced waves (affect maximum bottom current velocities)
	Bathymetry that may confine the material and reduce dispersion and erosion • Natural or man-made depressions • Other features including constructed subaqueous berms
	Other siting issues • Location relative to sensitive resources • Capacity to meet the disposal need • Depth and width needed to maintain the spread of material during placement • Water access • Potential for interference with navigation traffic or other activities
Design	Potential water column impacts during placement • Release of pollutants • Water column toxicity • Mass loss of pollutants • Initial mixing
	Efficacy of cap placement • Type of capping material • Dredging/placement method for polluted sediment • Dredging/placement method for cap material • Compatibility of site conditions, material types, and dredging/placement methods

Factor to be Considered	Issues to be Addressed During Project-specific Review.
	Long-term cap integrity • Physical isolation of pollutants • Bioturbation of the cap by benthos • Consolidation of the sediments (both cap and polluted sediments) • Long-term pollutant loss (due to advection/diffusion) • Potential for physical disturbance of the cap (e.g., by currents, waves, anchors, ship traffic)
	Cap composition and thickness • Thickness needed for physical isolation • Thickness needed for bioturbation • Consolidation of both confined and cap material • Potential need for cap armoring against worst case erosive events
Monitoring	Ensure polluted sediments are placed as intended, with acceptable levels of dispersion and release • Pre-disposal bathymetry surveys, as appropriate • Plume monitoring during placement
	Ensure cap material is placed as intended, and that required thickness is attained and maintained • Intermediate post-capping bathymetry surveys • Core samples through cap immediately after capping • Sediment toxicity testing
	Ensure cap remains effective in isolating the polluted material • Periodic post-capping bathymetry surveys • Periodic core samples through cap • Sediment toxicity testing and chemical measurements

Proper cap design and construction can avoid adverse impacts such as perforation of the cap by burrowing organisms and exposure of underlying contaminated sediment to the water column; inability of aquatic plants such as an eel grass, to become established over the cap; or prohibition by local planning agency of changing tidal prism. Potential for these impacts can be avoided by placement of a layer of rock or gravel over underlying sediment to exclude burrowing organisms, such as burrowing shrimp; placement of a layer of sand of appropriate grain size over the layer of armor rock or gravel; and dredging at site adjacent to the cap to remove an equal amount of bottom material to provide no net change in tidal prism. Anchoring of vessels over the cap can result in destruction of bottom habitat by anchors and keels; resuspension of bottom sediment by propeller wash; destruction of the cap, or depositing of trash or oil. These potential impacts can be avoided by marking the cap on navigation charts; excluding vessels from areas near the cap; or selection of dredging as the remediation alternative. Many of the mitigation measures outlined above to reduce or avoid impacts due to dredging and disposal are also appropriate for capping.

Placement of a cap could release pollutants into the marine environment if the design and deployment of capping materials are not properly done. Monitoring must be conducted to verify the integrity of the final cap.

Other water resources issues

Dredging equipment can cause turbulence in the water body and thus the dredging process can cause short-term adverse impacts to water quality from turbidity or from stirring up pollutants in the sediment. These impacts can be regulated through WDRs and can be reduced by requiring use of dredging equipment or operations that minimize the discharge of chemical pollutants during dredging (e.g., use of clam shell dredger, etc.), use of settling tanks to reduce excessive turbidity in discharge, use of silt curtains to reduce dispersal of turbidity plume beyond dredge site, coffer dams in small channels, and accurate positioning of disposal equipment during dredging. DFG also has dredging regulations to protect against adverse biological impacts.

At some sites, a portion of the cleanup activity will take place on the shoreline. Depending on the cleanup method selected for the shore line activity, minor changes in absorption rates, drainage patterns, and the rate of surface runoff may change. On land, excavation can be mitigated by performing all work during the dry season and using best management practices for the control of erosion.

In addition, runoff from excavation activities or disposal of dredged materials above sea level can adversely affect surface water quality. Impacts from land excavation can be reduced by doing work during the dry season or by implementing BMPs to reduce erosion. Most local governments also have erosion control ordinances and grading ordinances.

Changes in bottom contours brought by dredging or capping would probably have minimal effects on water circulation if properly managed. Relatively small areas are under consideration for modification at most of the sites. At larger sites, removal and placement will attempt to retain regional bottom depth and contour, except where bathymetry is planned for environmental improvement.

Dredging activities have the potential to destabilize channel slopes and undermine pilings. Standard engineering practices such as installation of sheet pile walls at the toe of the shore slope would reduce or avoid this impact.

Biological resources

Dredging, disposal, and capping all have the potential to cause adverse effects to biological resources in several ways: short-term habitat destruction and displacement of sensitive species, possibly during critical periods such as nesting, disturbance of sensitive spawning or migrating fish species due to turbidity, and "take" of endangered species.

As described in the Environmental Setting and Remediation at Toxic Hot Spots sections of this document, identified remediation alternatives occur in various types of habitats. As explained earlier in this FED, provisions of the cleanup plans are expected to result in the removal of pollutants that have adverse effects on plants and animals. This will improve habitat, and encourage development of and protect rare and endangered species as well as fish and wildlife generally. There is a possibility that the quality of the environment could be temporarily degraded and that there could be effects on endangered species if cleanup and mitigation projects are not carefully planned and executed. Potential adverse effects of identified remediation alternatives vary with different habitats, species, and time of year, as well as methods for remediating the site. Any potential adverse effects would be mitigated through consultation with the DFG and the USFWS. The SWRCB received a CESA consultation letter from DFG during the development and review of the Policy on Guidance for Development of Toxic Hot Spot Cleanup Plans (SWRCB, 1998a; 1998b). The DFG consultation letter reiterated that the toxic hot spot cleanup actions, if implemented by the RWQCBs, would most likely result in the long term in beneficial impacts for threatened and endangered species and the habitat upon which they depend, but it also noted the potential for short-term adverse impacts to threatened and endangered species during the cleanup effort itself if not properly planned. The DFG consultation letter requested that DFG continue to be informed and involved in the evolving toxic hot spot cleanup plans as they were prepared by the RWQCBs, and in fact deferred any final determination of impacts to threatened and endangered species until site specific cleanup plans were actually proposed. Similar DFG consultation letters were prepared for each Regional Toxic Hot Spots Cleanup Plan, again, requesting continued DFG involvement in the review of and comment upon threatened and endangered species potential impacts from project specific actions for cleanup at individual sites. DFG recognized that most negative biological resource impacts, if any, would be minimal and temporary if planned properly.

Table 21 is a list of Federal and State listed endangered and threatened animals which DFG staff (Puckett, pers. comm.) believes could possibly be present, or have habitat they depend on, and thus could possibly be adversely impacted, if only temporarily, during cleanup implementation at the toxic hot spots sites. (Remediation activities in the Central Valley/Delta region bring in many of the non-marine/estuarine species.) According to DFG, there could be others and some of those listed are probably not present at any of the 21 sites; but this provides a broad brush look at species that could be affected. Ultimately, the precise determination of what is present at a particular site will have to come with the definitive project for a site.

TABLE 21: ENDANGERED AND THREATENED ANIMALS THAT MAY BE PRESENT AT IDENTIFIED TOXIC HOT SPOTS

Organism	Classification			
	State	List Date	Federal	List Date
FISHES				
Winter-run chinook salmon[19] *(Oncorhynchus tshawytscha)*	SE[20]	9-22-89	FE[21]	3-23-94
Chinook salmon-Central valley fall/late fall-run ESU[22] *(Oncorhynchus tshawytscha)*			FPT[23,24]	3-9-98
Chinook salmon-So. Oregon & California coastal ESU[25] *(Oncorhynchus tshawytscha)*			FPT	3-9-98
Spring-run chinook salmon *(Oncorhynchus tshawytscha)*	ST	8-28-98[26]	FPT[27]	3-9-98
Coho salmon-Central California ESU *(Oncorhynchus kisutch)*	SE[28]	12-31-95	FT[29]	11-30-96
Coho salmon-Do. Oregon/No. California ESU[30] *(Oncorhynchus kisutch)*			FT	6-5-97
Steelhead-Central California Coast ESU[31] *(Oncorhynchus mykiss)*			FT	10-17-97
Steelhead-South/Central California Coast ESU[32] *(Oncorhynchus mykiss)*			FT	10-17-97
Steelhead-Southern California ESU[33] *(Oncorhynchus mykiss)*			FE	10-17-97
Steelhead-Central Valley ESU[34] *(Oncorhynchus mykiss)*			FT	5-18-98
Sacramento splittail *(Pogonichthys macrolepidotus)*			FPT	1-6-94

19 Federal: Sacramento River winter run chinook salmon

20 SE = State-listed Endangered

21 FE = Federally-listed Endangered

22 ESU = Evolutionarily Significant Unit

23 FPT = Federally proposed (Threatened)

24 Populations spawning in the Sacramento & San Joaquin Rivers and their tributaries

25 All naturally spawned coastal spring & fall chinook salmon spawning between Cape Blanco, Oregon (inclusive of the Elk River) and Pt. Bonita, California

26 The Fish & Game Commission has voted to list; administrative rulemaking is in progress

27 Federal: Central Valley Spring-Run ESU. Includes populations spawning in the Sacramento River & its tributaries

28 The State listing is limited to Coho south of San Francisco Bay

29 The federal listing is limited to naturally spawning populations in streams between Punta Gorda, Humboldt Co. & the San Lorenzo River, Santa Cruz Co.

30 Populations between Cape Blanco, Oregon and Punta Gorda, California

31 Federal: *Oncorhynchus (=Salmo) clarki seleniris*

32 Coastal basins from the Russian River, south to Soquel Creek, inclusive. Includes the San Francisco & San Pablo Bay basins, but excludes the Sacramento-San Joaquin River basins

33 Coastal basins from the Santa Maria River, south to the southern extent of the range (presently considered to be Malibu Creek)

34 The Sacramento and San Joaquin Rivers and their tributaries

Organism	Classification			
	State	List Date	Federal	List Date
Colorado Squawfish (*Ptychocheilus lucius*)	SE	6-27-71	FE	3-11-67
Unarmored threespine stickleback (*Gasterosteus aculeatus williamsoni*)	SE	6-27-71	FE	10-13-70
Tidewater goby (*Eucyclogobius newberryi*)			FE	2-4-94
Rough sculpin (*Cottus asperrimus*)	ST	1-10-74		
AMPHIBIANS				
Santa Cruz long-toed salamander (*Ambystoma macrodactylum croceum*)	SE	6-27-71	FE	3-11-67
California red-legged frog (*Rana aurora draytonii*)			FT	5-20-96
BIRDS				
California brown pelican[35] (*Pelecanus occidentalis californicus*)	SE	6-27-71	FE	10-13-70
Bald eagle (*Haliaeetus leucocephalus*)	SE(rev) SE	10-2-80 6-27-71	FT FE(rev) FE	8-11-95 2-14-78 3-11-67
Swainson's hawk (*Buteo swainsoni*)	ST	4-17-83		
Peregrine falcon (*Falco peregrinus*)			FPD FE (S/A)[36]	8-26-98 3-20-84
American peregrine falcon (*Falco peregrinus anatum*)	SE	6-27-71	FPD FE	8-26-98 10-13-70
California black rail (*Laterallus jamaicensis coturniculus*)	ST	6-27-71		
California clapper rail (*Rallus longirostris obsoletus*)	SE	6-27-71	FE	10-13-70
Light-footed clapper rail (*Rallus longirostris levipes*)	SE	6-27-71	FE	10-13-70
Western snowy plover[37] (*Charadrius alexandrinus nivosus*)			FT	4-5-93
California least tern (*Sterna antillarum browni*)	SE	6-27-71	FE	10-13-70
MAMMALS				
Salt-marsh harvest mouse (*Reithrodontomys raviventris*)	SE	6-27-71	FE	10-13-70

[35] Federal: Brown pelican, *Pelecanus occidentalis*

[36] "(S/A)" is the Federal code for "similarity of appearance". (Not included in counts of listed species)

[37] Federal status applies only to the pacific coastal population

Organism	Classification			
	State	List Date	Federal	List Date
Steller (=northern) sea lion (*Eumetopias jubatus*)			FT	4-5-90
Southern sea otter (*Enhydra lutris nereis*)			FT	1-14-77

Turbidity during dredging activities have the potential to disrupt spawning periods or the migration of fish species or exceedances of water quality objectives. Mitigation to reduce turbidity is discussed in the water quality section of this FED. Impacts to sensitive species can be further mitigated by avoiding dredging and excavation activities during periods when species are spawning or migrating through the remediation site.

Dredging and aquatic disposal normally can result in short-term impacts to benthic communities. However, these communities would be expected to fully recover within a relatively short term (typically 2-3 years).

Another potential adverse impact, which can usually be avoided by proper planning, is the possible disturbance of nesting activities of threatened or endangered bird species, such as snowy plovers, least terns, etc. Cleanup actions would obviously have to be planned to occur in time periods when it would not impact such nesting activities.

Sensitive species may be displaced by removing habitat or threat of burial or contamination of sensitive habitats due to excessive turbidity caused by dredging operations. Mitigation to reduce turbidity is discussed in the water quality section of this FED. Bird species (e.g., least terns) may also be impacted by sediment management activities. Any displaced habitats should be replaced nearby with equal or greater area and density, and restoration of the site or restoration of an offshore location should be required to mitigate for loss of any intertidal habitat.

While in general the DFG believes that remediation of the identified high priority toxic hot spots would benefit endangered species in California (SWRCB, 1998b), the DFG, and where appropriate the USFWS and NMFS, must be consulted as site-specific remediation plans are developed. Under the California

Endangered Species Act, no person can "take" endangered or threatened species, except in cases where the DFG issues an "incidental take" permit. Such a permit can only be issued if all of the following conditions are met (Attwater, 1999):

- The take is incidental to an otherwise lawful activity.

- The impacts of the take are minimized and fully mitigated.

- The permit is consistent with any applicable Department regulations.

- The applicant ensures adequate funding to implement the mitigation measures and for monitoring compliance with, and effectiveness of, those measures.

- Permit issuance would not jeopardize the continued existence of the species.

Mitigation actions DFG has typically required in association with incidental take authorizations and consultations have included:

- Protection of habitat of the affected species
- Establishment of an endowment to manage the protected habitat
- Provision of funds for enhancement of the protected land by fencing, initial trash cleanup, and related measures
- Implementation of various standardized construction avoidance measures
- Implementation of various standardized construction monitoring and reporting actions
- Implementation of other miscellaneous actions to reduce potential impacts; e.g., requiring that construction or operations employees be given orientation and training regarding the sensitive species, their habitats, and actions to be taken to minimize or avoid impact.

The USFWS or NMFS must also be consulted if the remediation is considered to be a federal action. The remediation alternatives that involve the disposal of dredged material in waters of the United States will require consultation with these agencies through CWA Section 404 permitting processes. Involvement of USFWS and NMFS is required in other projects if the actions are authorized, funded, or carried out by federal agencies.

A remediation project cannot proceed if it is determined that the project would jeopardize the continued existence of a endangered species.

Hazards and Polluted Sediments

In any action involving toxic pollutants, there is a potential for release of pollutants due to an accident or upset condition. The potential for such releases can be greatly reduced by proper planning. Measures to prevent releases of toxic pollutants include such things as pollution prevention technology (e.g., automatic sensors and shut-off valves, pressure and vacuum relief valves, secondary containment, air pollution control devices, double walled tanks and piping), access restrictions, fire controls, emergency power supplies, contingency planning for potential spills and releases, pollution prevention training and other types of mitigation appropriate to the cleanup plan.

In southern California, at least one high priority toxic hot spot may have been the site of disposal of ordinance. Dredging near a former explosives disposal area could pose a danger to people, equipment, and wildlife at the dredge site; and to the public at the disposal site. Risk of these potential hazards can be reduced by placing a grate at the dredge cutter head to reject large ordinance; disposal of dredge material where explosives could not cause harm; testing sediment for leakage of explosives; and inspection at disposal site.

Trucking hazardous explosive wastes over bridges or through neighborhoods has the potential to result in possibility of fire or explosion; exclusion of hazardous waste from certain neighborhoods; inability to get bridge-crossing permits in a timely manner. It may be necessary to select a remediation measure such as capping to avoid such hazards. Fuels, lubricating oils, and other petroleum products will be used during cleanup activity. Well established techniques for controlling spills, leaks, and drips will be incorporated in the work plans to assure the control of petroleum products and any other chemicals used during the cleanup activity.

Source Control

The RWQCBs identified source control as a potential remediation approach for some of the high priority toxic hot spots in the proposed Consolidated Plan (see Table 22). A wide range of potential source control measures were identified, and these control measures are summarized below in Table 22. Project proponents are not, of course, limited to these source control measures.

TABLE 22. SUMMARY OF POTENTIAL SOURCE CONTROL MEASURES IDENTIFIED IN CONSOLIDATED TOXIC HOT SPOTS CLEANUP PLAN

Site	Study	TMDLs	NPS BMPs	Storm water Urban runoff	Public Education	Point source discharges	Other existing plans, policies
Cañada de la Huerta	X						
Delta Estuary Mercury	X	X					
Delta Estuary Pesticides (3 THS)			X				
Humboldt Bay "H" Street							
Los Angeles Inner Harbor							
Los Angeles Outer Harbor							
Lower Newport Bay Rhine Channel		X					
Moss landing Harbor & Tributaries			X	X	X		X
Mugu Lagoon, Callegas Creek Tidal Prism							
San Diego Bay, 7th Street Channel							
San Francisco Bay, Castro Cove	X						
San Francisco Bay, Entire Bay	X	X			X		X

Site	Study	TMDLs	NPS BMPs	Storm water Urban runoff	Public Education	Point source discharges	Other existing plans, policies
San Francisco Bay, Islais Creek	X					X	
San Francisco Bay Mission Creek	X					X	
San Francisco Bay, Peyton Slough	X						X
San Francisco Bay, Point Potrero							
San Francisco Bay, Stege Marsh	X					X	
San Joaquin River, Dissolved O_2	X	X					
Santa Monica Bay, Palos Verdes Shelf					X		

Some of the actions outlined in the Consolidated Toxic Hot Spots Cleanup Plan are related to addressing sources of pollutants in order to reduce the threat on the marine environment. Source control must be accomplished through existing RWQCB authority and includes a wide range of potential actions such as TMDLs, best management practices, the SWRCB and RWQCB stormwater programs, point source treatment, and pretreatment. It is not possible to evaluate the environmental effects of source control per se; one must evaluate the specific source control measure on a site-specific basis. It is not reasonably feasible at this time to evaluate the environmental effects of these hypothetical source control projects or mitigation measures for such hypothetical actions. In addition, as stated earlier in this document, this FED is not intended to take the place of site-specific CEQA review.

While adverse impacts are a possible consequence of source control measures for some sites, these impacts may be minimized or avoided by the implementation of a watershed management approach that balances the potential impacts (and cost effectiveness) of correcting the toxic hot spots. The watershed management approach should involve point and nonpoint dischargers in addressing prevention and remediation of toxic hot spots. The Consolidated Toxic Hot Spots Cleanup Plan requires this approach to address prevention of toxic hot spots.

Consequently, the environmental impact of source control efforts that result from a watershed management effort should be analyzed on a site-specific basis once the sites have been selected, and the function and general designs of the actions or facilities have been determined.

Watershed management is actually a process, rather than a regulatory requirement, and it is not possible to evaluate the physical environmental effects of such a process. Compared to the more traditional programmatic, regulatory approach to water management the watershed approach looks at all types of pollution and all sources of pollution. In a collaborative, stewardship effort, local interests are engaged with State and Federal interests, and land managers to work with water managers to solve complex resource management problems. The purpose of watershed management is variously viewed as (1) a method for increasing participation at the local level in water quality protection, (2) an approach to reducing the impact of nonpoint sources, (3) a strategy for integrating management of all components of aquatic ecosystems, and (4) a process for optimizing the cost effectiveness of a number of point and nonpoint source control efforts.

Water shed management is not a new centralized program that replaces existing programs. The significant advantage of a watershed management approach is it encourages a collaborative process where diverse interests (i.e., individuals, landowners, growers, municipal agencies, industries, environmental groups and agencies) can work in conjunction with the SWRCB and the RWQCB staff to develop a consensus on approaches for addressing water quality problems. Further, watershed management provides a mechanism for considering social and economic interests in the context of solving water quality problems.

Taking a comprehensive approach to addressing pollution problems where point and nonpoint source pollution is considered together provides an opportunity to minimize environmental impacts of future pollutant reductions and consider cost-effectiveness together. It is impossible to predict the outcome of this combined process before it is completed. The potential impacts and mitigation depend on future decisions of watershed groups and the RWQCBs. It is apparent in Table 22 that in many cases, the RWQCB includes further study of the sources of toxic hot spot pollutants prior to selection of control measures. These studies are consistent with the Consolidated Toxic Hot Spots Cleanup Plan requirement to address prevention of toxic hot spots through a watershed management effort.

Total Maximum Daily Loads (TMDLs)

TMDLs are required for all waters listed pursuant to CWA Section 303(d)(1)(A). TMDLs establish the amount of a pollutant that may be discharged into a water body and still maintain water quality standards with seasonal variations and a margin of safety that takes into account any lack of knowledge concerning the relationship between effluent limitations and water quality. The TMDL process is defined in Federal regulations (40 CFR Section 130.7, revised as of July 1, 1996) and generally consists of five steps:

1. Identification by each state of water quality limited waters that do not now, or are not expected to, attain state water quality standards after implementation of technology-based effluent limitations, more stringent effluent limitations required by Federal, State, or local authority, and other pollution control

requirements (e.g., best management practices) required by local, State, or Federal authority, and identification of impairment;

2. Establishment of priority rankings for the development of TMDLs;

3. Development of waste load allocations for point sources, load allocations for nonpoint sources, and TMDLs;

4. Incorporation of the loadings in the RWQCB basin plans; and

5. Submittal of segments identified, priority ranking and loads established to U.S. EPA for approval.

Development of TMDLs can use the watershed approach to assess and identify water quality limited segments and pollutants causing impairment, identify sources, and allocate pollutant loads. The watershed approach may address a broader range of issues than the TMDLs, but the approach can: (1) result in achieving or maintaining water quality standards so that waters are not added to the 303(d) list; (2) result in water quality improvements, through means other than the TMDL process, so that waters can be removed from the 303(d) list; or (3) be used to develop TMDLs. A watershed group can develop a TMDL if the TMDL complies with applicable Federal requirements.

This Plan does not change the process for or technical development of TMDLs. It would be speculative to try in this FED to identify and evaluate potential environmental impacts of all possible means of implementing a TMDL that has not yet been established. TMDLs must be incorporated in RWQCB basin plans, and RWQCBs must comply with CEQA as part of the Basin Plan revision process.

Nonpoint Sources

Some of the RWQCB Toxic Hot Spot Cleanup Plans identify nonpoint source pollution control as an alternative for source control. Nonpoint source pollution control programs are used by the RWQCBs to protect beneficial uses in waters of the State affected by nonpoint source pollution dischargers. Currently, the SWRCB and RWQCBs are implementing these activities for control of nonpoint source pollution:

- Nonpoint Source Management Plan (adopted by the SWRCB in November 1988);
- Initiatives in Nonpoint Source Management (adopted by the SWRCB and submitted to USEPA in September 1995, implementing the Coastal Zone Act Reauthorization Amendments);
- Management Agency Agreement (MAA) with the Department of Pesticide Regulation (DPR) and the Pesticide Management Plan (PMP) (1997); and the
- Watershed Management Initiative.

The Nonpoint Source Management Plan is the foundation of the SWRCB/RWQCB nonpoint source pollution control program. The NPS Plan states that nonpoint sources are a major cause of water pollution in California and that effective management of nonpoint sources will require:

- An explicit long-term commitment by the SWRCB and the RWQCBs
- More effective coordination of existing SWRCB and RWQCB nonpoint source related programs
- Greater use of RWQCB regulatory authorities coupled with non-regulatory programs
- Stronger links between the local, State, and Federal agencies which have powers that can be used to manage nonpoint sources
- Development of new funding sources.

The NPS Management Plan provides a general approach to addressing all types of nonpoint source discharges. It does not address specific measures for individual types of nonpoint source discharges of sources of nonpoint source pollution. Three management approaches, frequently referred to as the Three-Tier Approach, are presented to address nonpoint source pollution problems. RWQCBs have the discretion to decide whether or what mix of the three options are appropriate to address any given nonpoint source pollution problem. Those management approaches are:

1. Discharger voluntary implementation of BMPs;

2. Regulatory based encouragement of BMP implementation; and

3. Adoption of effluent limitations in WDRs.

BMPs are methods, measures, or practices designed and selected to reduce or eliminate the discharge of nonpoint source pollution. BMPs include structural and non-structural controls, and operation and maintenance procedures which can be applied before, during and/or after pollution producing activities. The NPS Plan also states that "[i]n general the least stringent option that successfully protects or restores water quality will be employed, with more stringent measures considered if timely improvements in beneficial use protections are not achieved." The NPS Plan further states that "[w]hen necessary to achieve water quality objectives, RWQCBs will actively exercise their regulatory authority over nonpoint sources through enforcement of effluent limitations and other appropriate regulatory measures."

The Initiatives in Nonpoint Source Management (Initiatives) were developed in partial response to the Coastal Zone Act Reauthorization Amendments. CZARA requires states to develop and implement an enforceable nonpoint source program for reducing nonpoint source pollution from specific source and land-use categories in coastal areas. The U.S. EPA and the National Oceanic and Atmospheric Agency (NOAA) jointly prepared guidance documents with specific management measures that would fulfill CZARA requirements. Under the SWRCB's NPS Program, technical advisory committees (TAC) were formed to examine the U.S. EPA/NOAA management measures and their applicability to California. TACs were convened regarding: Confined Animals; Irrigated Agriculture; Pesticide Management; Plan Nutrient Management; Range Management; Abandoned Mines; Hydromodification; Wetlands and Riparian Areas; Marina and Recreational Boating; On-site Sewage Disposal Systems; and Urban Runoff. Each TAC prepared its own report with recommendations.

The Coastal Nonpoint Pollution Control Submittal consists of the NPS Plan and the Initiatives. This package was provided to the U.S. EPA and NOAA pursuant to Section 6217 of CZARA in September 1995. The Federal agencies have not taken final actin on the submittal.

The SWRCB and DPR have entered into a MAA to eliminate duplication of effort and inconsistency of actions dealing with pesticide use and water quality (SWRCB and DPR, 1997). The PMP describes how DPR and the County Agriculture Commissioners will work in cooperation with the SWRCB and the RWQCBs to protect water quality from the use of pesticides. The

PMP contains, among other things, provisions for outreach, compliance with water quality objectives, ground and surface water protection, self-regulatory and regulatory compliance. The MAA is a very useful tool for addressing nonpoint source runoff.

The Watershed Management Initiative (WMI) will guide a portion of SWRCB and RWQCB work and resource allocation decisions through a comprehensive perspective that considers water-related impacts within the context of a watershed. Under the WMI, each organization is preparing workplans (Chapters) that describe work activities and resource needs for the next five to seven years in targeted and nontargeted areas. The goals of the WMI are to:

1. Integrate water quality monitoring, assessment, planning, standard setting, permit writing, point source regulatory programs, nonpoint source management, ground water protection, and other programs at the SWRCB and RWQCBs to promote more efficient use of personnel and fiscal resources while ensuring maximum water quality protection benefits;

2. Provide water resource protection, enhancement, and restoration while balancing economic and environmental impacts by phasing in an integrated watershed management approach;

3. Promote cooperative relationships and better assist the regulated community and the public. This will require that the WMI approach include coordination with other Federal, State, and local agencies, as well as stakeholder participation in policy development and review; and

4. Reduce the impact of nonpoint source discharges on water quality through voluntary, collaborative decision-making at the local level that is open to all stakeholders.

The RWQCB basin plans provide additional discussion and provisions, such as, conditional waivers of WDRs for some types of nonpoint source discharges including agriculture, silviculture, mining, grazing, marinas and boating, highways, on-site septic systems, and erosion and sediment control. Additionally, the basin plans of San Francisco Bay, Central Valley, Santa Ana, and San Diego RWQCBs have prohibitions of discharge applicable to nonpoint sources.

Adoption of the Consolidated Toxic Hot Spots Cleanup Plan would not change the process and requirements for regulation of nonpoint source discharges nor would it change the methods for controlling nonpoint sources. Implementation of this Plan will be consistent with the SWRCB's Nonpoint Source Management Plan. Nonpoint source pollution control can best be achieved through the cooperative efforts of the dischargers, other interested persons, and the SWRCB and RWQCBs. The watershed management approach in the proposed Consolidated Toxic Hot Spots Plan embraces this approach.

Storm Water/Urban Runoff

The 1987 amendments to the CWA added Section 402(p) which specified that discharges of storm water from municipal separate storm sewer systems (MS4's) serving a population of 100,000 or more, and from industrial activities (specified at 40 CFR Section 122.26), must be in compliance with NPDES permits (i.e., WDRs).

MS4 Permitting

The RWQCBs have adopted NPDES storm water permits for MS4's required to be permitted and for facilities not suited for coverage under the General Industrial Permit (discussed below). The MS4 permits require the discharger to develop and implement a Storm Water Management Plan whose goal is to reduce the discharge of pollutants to the maximum extent practicable (MEP). MEP is the performance standard specified in Section 402(p) of the Clean Water Act. Components of the storm water management plan address public education and outreach; illicit connection/illegal discharge detection and elimination; fiscal resources; monitoring; and the BMPs which will be used. To date, the efforts of the municipalities subject to MS4 permits have been focused on implementation of BMPs to *reduce* pollutants, rather than on treatment of storm water to *remove* pollutants.

Industrial/construction permitting

The SWRCB has adopted two Statewide NPDES general storm water permits. The first, originally adopted on November 19, 1991, and subsequently reissued on April 17, 1997, addresses storm water discharges associated with 10 broad categories of industrial activities. This permit is known as the General Industrial Permit. The second, adopted on August 20, 1992, addresses storm water discharges associated with construction activities resulting in a land disturbance of at least five acres. This permit is known as the General Construction Permit. Both of these permits are implemented (inspections, report review, complaint investigation and enforcement) by the RWQCBs.

Both the General Industrial and Construction Permits are NPDES permits and must meet all applicable provisions of Sections 301 and 402 of the Clean Water Act. These permits require the implementation of management measures that will achieve the performance standard of best available technology economically achievable (BAT) and best conventional pollutant control technology (BCT). Both the General Industrial and Construction Permits require the development of a Storm Water Pollution Prevention Plan (SWPPP) and a monitoring plan. The General Industrial Permit requires that an annual report be submitted each July 1; the General construction Permit requires only filing of an annual certification.

Through the SWPPP, sources of pollutants are to be identified and the means to manage the sources to reduce storm water pollution are described. Because of the nature of storm water discharges and the typical lack of information upon which to base numeric water quality based effluent limitations, it has not been feasible for the SWRCB to establish numeric effluent limitations for storm water permits. The effluent limitations contained in the storm water permits (both MS4, and General Industrial and Construction Permits) are, therefore, narrative and include the requirement to implement the appropriate control practices and/or BMPs. BMPs can range from good housekeeping to structural controls.

The proposed Consolidated Toxic Hot Spots Cleanup Plan makes no changes in the existing storm water program at the SWRCB and RWQCBs or the way in which BMPs, BAT, or BCT would be implemented, and any of these measures can be developed through a watershed process.

Public Education

Public education is identified as a potential source control measure for several of the toxic hot spots. Public education may include informing people of the risks associated with the site (e.g., informing local persons who consume fish about the health advisories and ways to decrease their risk, posting "no swimming" signs, etc.). Public education can also be used to inform the public of product or replacement in order to decrease concentrations of pollutants. Examples could include use of dioxin free, paper, limiting use of fireplaces, substitution of mercury containing products such as thermometers. No adverse environmental effects are foreseen due to public education.

Point Source Discharges

Further controls on point source discharges are listed as a potential source control alternative. This source control alternative is only discussed in the Plans as one of several options that may be warranted after further study to delineate the sources of the pollutants of concern for the toxic hot spot. If it is determined that it is necessary to reduce a point source discharge in order to restore beneficial uses at a designated toxic hot spot, these reductions may be accomplished in various ways. Discharge reductions can be accomplished through (1) treatment process optimization (measures facilities can implement to modify or adjust the operating efficiency of the existing wastewater treatment process - such measures usually involve engineering analysis of the existing treatment process to identify adjustments to enhance pollutant removal or reduce chemical additional); (2) waste minimization/pollution prevention costs (conducting a facility waste minimization or pollution prevention study); (3) pretreatment (conducting study of sources and reducing inflow from indirect discharges); or (4) new or additional treatment systems. The construction of additional treatment systems has the most potential for adverse environmental effects, and a CEQA compliance is required for such facility changes.

Actual construction of additional treatment systems for publicly owned or industrial treatment facilities have the potential to result in a wide range of environmental impacts. In order to assess such impacts, first one must know the specific processes that will be added (e.g., settling basins, new biological treatment units, or other treatment (cf., SWRCB, 1998b)); and the environmental setting (land use; geologic characteristics; air quality; fish, wildlife, and plant communities including endangered species; wetlands, ground water characteristics; agricultural land; cultural resources [e.g., archaeological, paleontological, etc.]; floodplain).

Next, it is necessary to identify primary and secondary impacts the facility may have on surface and ground water quality, air quality, geologic stability, soils (erosion) important vegetation types, fish and wildlife, aesthetics, noise, recreation, open space, cultural resources, threatened or endangered species, energy, transportation, public services, population, and housing. In addition to evaluating these potential impacts, impacts of sludge disposal and outfalls must be evaluated.

In the process of planning and CEQA review, most potential impacts due to construction or modification of treatment facilities are mitigated to less than significant levels. Between 1992 and 1997, the SWRCB Division of Clean Water Programs considered approximately 50 CEQA documents for construction or modification of wastewater facilities. Potential environmental impacts were less than significant for about 80 percent of these projects. About 20 percent of the projects had at least one environmental impact that could not be mitigated to a less than significant level. For these projects, both the discharger and the SWRCB determined that the benefits of the project outweighed the unavoidable impacts, and so the project was approved. (Personal communication, Wayne Hubbard, Division of Clean Water Programs, SWRCB, August 1997.)

Implementation of Existing Plan and Policies

A number of the cleanup plans cite existing programs and policies that will work to reduce sources of pollutants of concern in toxic hot spots. Examples include the Water Quality Protection Program of the Monterey Bay National Marine Sanctuary and the San Francisco RWQCB Mercury Strategy. These programs and policies have their own environmental review and regulatory approval processes, and it is not appropriate to attempt to evaluate them in this FED.

Cumulative Impacts

A listing of other actions that are underway at or near the toxic hot spots is included in the section of this FED titled "Proposed Remediation Approach and Alternatives at Toxic Hot Spots." RWQCBs have developed remediation actions to build on or use the existing efforts to address the toxic hot spot.

It is not possible to assess the total volume of sediment that would be dredged for all high priority toxic hot spots because the information needed to make this estimate is not available for all sites. Some of the mitigation measures address the need to determine the sediment volume to be disposed (e.g., quantifying the volume, compare the volume to be disposed with disposal options available, etc.).

The existing body of laws, regulations, and programs described throughout this FED have established both the requirements to cleanup the identified high priority toxic hot spots and the regulatory framework for protection of the environment during remediation. Remediation and mitigation for any adverse impacts that occur due to remediation are complex matters that can only be determined on a site-specific basis while the actual remediation plans are being developed, impacts are quantified, appropriate mitigation determined, and appropriate legal mandates met. It is not possible to determine at this time whether, after mitigation is incorporated, remediation of the sites will result in any cumulatively considerable effects.

Regardless, from a CEQA compliance perspective, adoption of the proposed Plan does not contribute in a cumulatively considerable way to potential effects of remediation. To the extent that substantive effects to resources may occur, they would originate with the mandates and standards established by the existing body of laws, regulations, and programs that require remediation and environmental protection. SWRCB adoption of the Plan would not contribute to cumulative adverse effects to the environment.

Growth-Inducing Impacts

The proposed Consolidated Toxic Hot Spots Cleanup Plan has no effect on parameters that are typically evaluated in addressing potential growth inducement, such as generation of employment opportunities, provision of housing supply, generation of the sale of goods and services, removal of growth obstacles, expansion of infrastructure, or extension of utilities. The proposed Plan would not result in any substantial growth-inducing impacts.

Mitigation For Potentially Significant Adverse Effects of Cleanup

The resources that may be adversely affected by dredging, disposal, and/or capping are protected by a number of existing regulations and agency policies, as well as "policy-level mitigation measures" incorporated in the Toxic Hot Spot Consolidated Cleanup Plan. Based on the regulatory requirements to protect the environment and policy-level mitigation, persons implementing remediation will take a number of steps to ensure that potentially significant environmental impacts are minimized or avoided during dredging, disposal, and capping activities (Table 23).

The policy-level mitigation measures contained in the Consolidated Plan differ from project-specific mitigation measures in that they address potential adverse impacts on a broad and generic level. In this regard, they help direct how and when site-specific measures may be needed to avoid or mitigate potential impacts, but they do not replace the need for site-specific environmental review or mitigation measures.

Many of the policy-level mitigation measures discussed in this document are restatements of existing federal and/or state laws and policies. Project proponents will evaluate proposed remediation plans consistent with these federal and state requirements (e.g., CEQA, Clean Water Act, Porter-Cologne Water Quality Control Act, etc.). The inclusion and coordination of these measures as part of the Cleanup Plans should help to minimize adverse environmental effects.

TABLE 23: POTENTIALLY SIGNIFICANT ADVERSE IMPACTS AND MITIGATION MEASURES.

Type of Remediation Activity	Environmental Factor	Potentially Significant Impact	Mitigation Measures
Dredging, Disposal, Capping, Confined Aquatic Disposal	Air Quality	Emissions from dredging, excavation; transport, disposal, and capping equipment	Use electric dredging equipment; purchase air credits; schedule remediation for time of year that will cause least impacts to air quality; optimize the mode of transportation to reduce air emissions; evaluate and minimize the relative impacts of hauling dredged material by alternate means; favor sites closer to dredge sites; minimize number of trips necessary to transport dredged material to disposal site or rehandling facility; meet requirements of air management plans.
Dredging, Disposal, Capping, Confined Aquatic Disposal		Potential for increased odors if dredged material is reused.	Design and locate reuse facility or other facility to remove impact.
Dredging, Disposal, Capping, Confined Aquatic Disposal	Surface Water	Short-term impact on aquatic resources from high concentrations of chemical concentrations or turbidity	Require the use of dredging equipment or operations that minimize the discharge of chemical pollutants during dredging/capping; reduce impacts by accurate positioning of disposal equipment during dredging; use silt curtains to reduce dispersal beyond dredge/excavation site; use coffer dams in small channels use large settling tanks to reduce excessive turbidity; monitor dredging and disposal activities to assess project is being implemented as authorized and whether disposal of dredged/capping material stays within disposal area or is transported out of the disposal area.
Dredging, Disposal		Runoff from excavation or disposal above sea level	Comply with SWRCB/RWQCB storm water programs and WDRs. Construct storm water system that directs runoff away from sensitive resources and implement BMPs for improve water quality.
Capping, Confined		Leaching of pollutants from capped area into	Require a monitoring program to ensure polluted sediments are placed as intended, cap material is placed correctly and the cap is effective in

Type of Remediation Activity	Environmental Factor	Potentially Significant Impact	Mitigation Measures
Aquatic Disposal		surface sediments and water.	isolating polluted sediments.
Dredging, Disposal		Changes in currents or course/direction of water movements	Removal and placement will attempt to retain regional bottom depth and contour, except where bathymetry is planned for environmental improvement.
Dredging, Disposal	Geology and groundwater	Destabilizing channel slopes and undermining pilings	Use BMPs or standard building practices to reduce instability of pilings and wharves.
		Destabilizing sediments under cap	Incorporate into design, the site depositional/erosional characteristics, current velocities, bathymetry, depth and width to contain spread of materials, etc.
Dredging, Disposal, Capping, Confined Aquatic Disposal	Biological resources	Turbidity disrupting sensitive spawning or migrating fish species or excessive turbidity caused by dredging operation threatening burial or contamination of sensitive habitats; noise, light, or traffic causing seasonal disruption to nesting birds	See surface water mitigation for turbidity. Avoiding dredging operations during periods when species are spawning or migrating through project area; change schedule to avoid bird nesting season; operate during daylight hours; use of silt curtains to reduce dispersal of turbidity plume beyond immediate area.
Dredging, Disposal, Capping, Confined Aquatic Disposal		Sensitive species may be displaced by removing habitat or threat or burial or contamination of sensitive habitats due to excessive turbidity caused by dredging operation.	See surface water mitigation for turbidity. Any displaced habitats should be replaced nearby with equal or greater area and density. Require restoration of the site or restoration of an offshore location to mitigate for loss of intertidal habitat.

Type of Remediation Activity	Environmental Factor	Potentially Significant Impact	Mitigation Measures
Dredging, Disposal, Capping, Confined Aquatic Disposal		Endangered species	For "incidental take" - habitat protection, funding to protect and/or manage habitat, training of construction/operation employees to avoid impacts, implementation of standardized avoidance measures. No project if it would result in jeopardizing continued existence of an endangered species.
Dredging, Disposal, Capping, Confined Aquatic Disposal	Transportation	Access to berths by ships or recreational boating could be altered.	Coordinate/schedule dredging disposal activities with terminal managers/harbor masters. Ensure adequate access channels are available for shipping and other harbor/bay use; operate when vessel traffic minimal; use smaller dredges.
Dredging, Disposal, Capping, Confined Aquatic Disposal	Noise	Operation of dredging operations may cause noise impacts.	Comply with local noise ordinances. Reduce or eliminate noise by using silencers or mufflers on dredging equipment. Consider use of electrical dredging equipment. Reduce noise during night hours. Use smaller dredges.
Dredging, Disposal, Capping, Confined Aquatic Disposal	Hazards and Polluted wastes	Accidental spills/releases from dredging operations	Develop procedures and requirements for loading and unloading polluted sediments to eliminate potential for spillage. Establish in cleanup plan, cleanup procedures if spillage/release occurs.
Disposal		Leaching of pollutants into groundwater.	Dry sediments in areas where impermeable liner or membrane blocks leaching.

Type of Remediation Activity	Environmental Factor	Potentially Significant Impact	Mitigation Measures
Disposal		Disposal of polluted sediments may exceed landfill capacities or acceptance criteria.	The areal extent and volume of sediment should be characterized so realistic estimates are available to plan disposal. Reevaluate if impact still exists. Once these estimates still exceed capacities, plan for alternate use of polluted sediments to remove impact. Consider, as appropriate, confined aquatic disposal, wetland restoration, levee reuse. Consider and mitigate site-specific impacts of other alternatives
		Dredging near former explosives disposal area - danger of injury to people, equipment, and wildlife at dredge site; danger to public at disposal site.	Placing grate at dredge cutter head to reject large ordinance; disposal of dredge material where explosives could not cause harm; testing sediment for leakage of explosives; inspection at disposal site.
Dredging, Disposal, Capping, Confined Aquatic Disposal		Trucking hazardous or explosive wastes over bridges or through neighborhoods - possibility of fire or explosion, exclusion of hazardous waste from certain neighborhoods, inability to get bridge-crossing permits in timely manner.	Selection of feasible alternative mitigation measure such as capping, or in-situ or ex-situ treatment near dredge site.

Unavoidable Adverse Impacts

It is too speculative to determine that toxic hot spot remediation will not result in any significant adverse impacts that cannot be mitigated to a level where there is no impact or the impact is less than significant. In this FED, we have identified potentially significant impacts that could occur due to the remediation alternatives identified in the Consolidated Toxic Hot Spots Cleanup Plan. We have incorporated into the Plan, mitigation that could be used to lessen or avoid such potential effects. As long as the mitigation measures of the proposed Plan are considered, and all applicable laws, and local, State, and Federal regulations and policies are complied with, remediation is not expected to result in significant adverse environmental impacts.

As stated earlier in this document, this FED is not meant to take the place of site-specific CEQA compliance, including site-specific determination as to what mitigation is necessary to avoid significant adverse impacts or reduce them to less than significant levels. We recognize that a site-specific evaluation of environmental effects of remediation, and whether mitigation measures can reduce impacts to less than significant levels, is necessary before it is possible to determine with certainty whether there will be significant adverse effects of remediation.

The action of adoption of the Consolidated Toxic Hot Spots Cleanup Plan by the SWRCB will not result in significant adverse impacts. Any adverse environmental effects that may occur due to remediation under the proposed Plan would be substantially the same as environmental effects of remediation if the Plan is not adopted. As explained earlier in this section of the FED, both the regulatory framework requiring remediation and the regulatory framework protecting the environment against adverse affects of remediation, are unchanged by the adoption of the proposed Plan. In other words, the Plan will neither affect the requirements for remediation nor the way in which the environment is protected against adverse effects through permitting, CEQA, WDRs, etc. It can be reasonably argued that by listing potential mitigation measures in the Plan, these mitigation measures will be considered as site-specific remediation efforts are developed, and may, therefore lessen or avoid the potential for adverse effects.

ENVIRONMENTAL CHECKLIST

1. Project title: Consolidated Toxic Hot Spots Cleanup Plan

2. Lead agency name and address: State Water Resources Control Board
   901 P Street
   Sacramento, CA 95814

3. Contact person and phone number: Craig J. Wilson, (916) 657-0671

4. Project location: Please refer to the FED for description (Project Definition and Figure 1)

5. Project sponsor's name and address: State Water Resources Control Board
   901 P Street
   Sacramento, CA 95814

6. General plan designation: Not Applicable 7. Zoning: Not Applicable

8. Description of project: Please refer to the Project Description Section of the FED.

9. Surrounding land uses and setting: Please refer to the FED for description (Environmental Setting at Toxic Hot Spots)

10. Other public agencies whose approval is required: Office of Administrative Law (for the regulatory provisions of the Consolidated Toxic Hot Spots Cleanup Plan only)

ENVIRONMENTAL FACTORS POTENTIALLY AFFECTED:

The environmental factors checked below would be potentially affected by this project, involving at least one impact that is a "Potentially Significant Impact" as indicated by the checklist on the following pages.

[ ] Land Use and Planning	[ ] Transportation/Circulation	[ ] Public Services
[ ] Population and Housing	[ ] Biological Resources	[ ] Utilities and Service Systems
[ ] Geological Problems	[ ] Energy and Mineral Resources	[ ] Aesthetics
[ ] Water	[ ] Hazards	[ ] Cultural Resources
[ ] Air Quality	[ ] Noise	[ ] Recreation
	[ ] Mandatory Findings of Significance	

Environmental Impacts:

I. **LAND USE AND PLANNING.** *Would the proposal:*	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
a. Conflict with general plan designation or zoning? (*source #:* 1)	[ ]	[ ]	[ ]	[X]
b. Conflict with applicable environmental plans or policies adopted by agencies with jurisdiction over the project? (2)	[ ]	[ ]	[ ]	[X]
c. Be incompatible with existing land use in the vicinity? (1)	[ ]	[ ]	[ ]	[X]
d. Affect agriculture resources or operations (e.g. impacts to soils or farmlands or impacts from incompatible land uses)? (3)	[ ]	[ ]	[ ]	[X]
e. Disrupt or divide the physical arrangement of an established community (including a low- income or minority community)? (1)	[ ]	[ ]	[ ]	[X]
II. **POPULATION AND HOUSING.** *Would the proposal:*				
a. Cumulatively exceed official regional or local population projections? (4)	[ ]	[ ]	[ ]	[X]
b. Induce substantial growth in an area either directly or indirectly (e.g., through projects in an undeveloped area or extension of major infrastructure)? (4)	[ ]	[ ]	[ ]	[X]
c. Displace existing housing especially affordable housing? (4)	[ ]	[ ]	[ ]	[X]
III. **GEOLOGIC PROBLEMS.** *Would the proposal result in or expose people to potential impacts involving:*				
a. Fault rupture? (5)	[ ]	[ ]	[ ]	[X]
b. Seismic ground shaking? (5)	[ ]	[ ]	[ ]	[X]
c. Seismic ground failure, including liquefaction? (5)	[ ]	[ ]	[ ]	[X]
d. Seiche, tsunami, or volcanic hazard? (5)	[ ]	[ ]	[ ]	[X]
e. Landslides or mudflows? (5)	[ ]	[ ]	[ ]	[X]
f. Erosion, changes in topography or unstable soil conditions from excavation, grading or fill? (6)	[ ]	[X]	[ ]	[ ]
g. Subsidence of the land? (5)	[ ]	[ ]	[ ]	[X]
h. Expansive soils? (5)	[ ]	[ ]	[ ]	[X]
i. Unique geologic or physical features? (5)	[ ]	[ ]	[ ]	[X]

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
IV. WATER. *Would the proposal result in:*				
a. Changes in absorption rates, drainage patterns, or the rate and amount of surface runoff? (6)	[ ]	[X]	[ ]	[ ]
b. Exposure of people or property to water related hazards such as flooding? (5)	[ ]	[ ]	[ ]	[X]
c. Discharge into surface water or other alteration of surface water quality (e.g. temperature, dissolved oxygen or turbidity)? (6)	[ ]	[X]	[ ]	[ ]
d. Changes in the amount of surface water in any water body? (6)	[ ]	[ ]	[ ]	[X]
e. Changes in currents or the course or direction of surface water movements? (6)	[ ]	[X]	[ ]	[ ]
f. Change in the quantity of ground waters, either through direct additions or withdrawals, or through interception of an aquifer by cuts or excavations or through substantial loss of ground water recharge capability? (5)	[ ]	[ ]	[ ]	[X]
g. Altered direction or rate of flow of ground water? (5)	[ ]	[ ]	[ ]	[X]
h. Impacts to ground water quality? (6)	[ ]	[X]	[ ]	[ ]
i. Substantial reduction in the amount of ground water otherwise available for public water supplies? (5)	[ ]	[ ]	[ ]	[X]
V. AIR QUALITY. *Would the proposal:*				
a. Violate any air quality standard or contribute to an existing or projected air quality violation? (7)	[ ]	[X]	[ ]	[ ]
b. Expose sensitive receptors to pollutants? (7)	[ ]	[ ]	[ ]	[X]
c. Alter air movement, moisture, or temperature, or cause any change in climate? (8)	[ ]	[ ]	[ ]	[X]
d. Create objectionable odors? (7)	[ ]	[X]	[ ]	[ ]
VI. TRANSPORTATION/CIRCULATION. *Would the proposal result in:*				
a. Increased vehicle trips or traffic congestion? (5)	[ ]	[ ]	[ ]	[X]
b. Hazards to safety from design features (e.g. farm equipment)? (5)	[ ]	[ ]	[ ]	[X]
c. Inadequate emergency access or access to nearby uses? (5)	[ ]	[ ]	[ ]	[X]
d. Insufficient parking capacity on- site or off- site? (5)	[ ]	[ ]	[ ]	[X]
e. Hazards or barriers for pedestrians or bicyclists? (5)	[ ]	[ ]	[ ]	[X]
f. Rail, waterborne or air traffic impacts? (9)	[ ]	[X]	[ ]	[ ]

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
g. Conflicts with adopted policies supporting transportation (e.g., bus turnouts, bicyclists racks)? (5)	[ ]	[ ]	[ ]	[X]
VII. BIOLOGICAL RESOURCES. *Would the proposal result in impacts to:*				
a. Endangered, threatened or rare species or their habitats (including but not limited to plants, fish, insects, animals, and birds)? (10)	[ ]	[X]	[ ]	[ ]
b. Locally designated species? (10)	[ ]	[X]	[ ]	[ ]
c. Locally designated natural communities (e.g. oak forest, coastal habitat, etc.)? (10)	[ ]	[X]	[ ]	[ ]
d. Wetland habitat (e.g. marsh, riparian and vernal pool)? (11)	[ ]	[X]	[ ]	[ ]
e. Wildlife dispersal or migration corridors? (10)	[ ]	[X]	[ ]	[ ]
VIII. ENERGY AND MINERAL RESOURCES. *Would the proposal:*				
a. Conflict with adopted energy conservation plans? (12)	[ ]	[ ]	[ ]	[X]
b. Use non- renewable resources in a wasteful and inefficient manner? (12)	[ ]	[ ]	[ ]	[X]
c. Result in the loss of availability of a known mineral resource that would be of future value to the region and the residents of the State? (12)	[ ]	[ ]	[ ]	[X]
IX. HAZARDS. *Would the proposal involve*:				
a. A risk of accidental explosion or release of hazardous substances (including, but not limited to: oil, pesticides, chemicals or radiation)? (13)	[ ]	[ ]	[ ]	[X]
b. Possible interference with an emergency response plan or emergency evacuation plan? (5)	[ ]	[ ]	[ ]	[X]
c. The creation of any health hazard or potential health hazard? (5)	[ ]	[ ]	[ ]	[X]
d. Exposure of people to existing sources of potential health hazards? (13)	[ ]	[ ]	[ ]	[X]
e. Increased fire hazard in areas with flammable brush, grass, or trees? (5)	[ ]	[ ]	[ ]	[X]
X. NOISE. *Would the proposal result in:*				
a. Increases in existing noise levels? (14)	[ ]	[X]	[ ]	[ ]
b. Exposure of people to severe noise levels? (14)	[ ]	[ ]	[ ]	[X]

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
XI. PUBLIC SERVICES. *Would the proposal have an effect upon or result in a need for new or altered government services in any of the following areas:*				
a. Fire protection? (15)	[ ]	[ ]	[ ]	[X]
b. Police protection? (15)	[ ]	[ ]	[ ]	[X]
c. Schools? (15)	[ ]	[ ]	[ ]	[X]
d. Maintenance of public facilities, including roads? (15)	[ ]	[ ]	[ ]	[X]
e. Other governmental services? (15)	[ ]	[ ]	[ ]	[X]
XII. UTILITIES AND SERVICE SYSTEMS. *Would the proposal result in a need for new systems or supplies or substantial alterations to the following utilities:*				
a. Power or natural gas? (16)	[ ]	[ ]	[ ]	[X]
b. Communications systems? (16)	[ ]	[ ]	[ ]	[X]
c. Local or regional water treatment or distribution facilities? (16)	[ ]	[ ]	[ ]	[X]
d. Sewer or septic tanks? (17)	[ ]	[X]	[ ]	[ ]
e. Storm water drainage? (17)	[ ]	[X]	[ ]	[ ]
f. Solid waste disposal? (17)	[ ]	[X]	[ ]	[ ]
g. Local or regional water supplies? (17)	[ ]	[ ]	[ ]	[X]
XIII. AESTHETICS. *Would the proposal:*				
a. Affect a scenic vista or scenic highway? (5)	[ ]	[ ]	[ ]	[X]
b. Have a demonstrable negative aesthetic effect? (5)	[ ]	[ ]	[ ]	[X]
c. Create light or glare? (5)	[ ]	[ ]	[ ]	[X]
XIV. CULTURAL RESOURCES. *Would the proposal:*				
a. Disturb paleontological resources? (5)	[ ]	[ ]	[ ]	[X]
b. Disturb archaeological resources? (5)	[ ]	[ ]	[ ]	[X]
c. Affect historical resources? (5)	[ ]	[ ]	[ ]	[X]
d. Have the potential to cause a physical change which would affect unique ethnic cultural values? (5)	[ ]	[ ]	[ ]	[X]
e. Restrict existing religious or sacred uses within the potential impact area? (5)	[ ]	[ ]	[ ]	[X]

XV. RECREATION. *Would the proposal:*

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
a. Increase the demand for neighborhood or regional parks or other recreational facilities? (18)	[ ]	[ ]	[ ]	[X]
b. Affect existing recreational opportunities? (18)	[ ]	[ ]	[ ]	[X]

XVI. MANDATORY FINDINGS OF SIGNIFICANCE

a. Does the project have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self- sustaining levels, threaten to eliminate a plant or animal community. Reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory? (19)	[ ]	[X]	[ ]	[ ]
b. Does the project have the potential to achieve short- term, to the disadvantage or long- term, environmental goals? (20)	[ ]	[ ]	[ ]	[X]
c. Does the project have impacts that are individually limited, but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects). (21)	[ ]	[ ]	[ ]	[X]
d. Does the project have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly? (22)	[ ]	[ ]	[ ]	[X]

XVII. EARLIER ANALYSES.

a. Earlier analyses used.	The SWRCB analyzed the environmental impacts of the Water Quality Control Policy for Guidance on the Development of Regional Toxic Hot Spot Cleanup Plans (SWRCB, 1998a). The impacts related to the specific definition of a toxic hot spot, ranking criteria, potential remediation activities, prevention activities, and benefits of remediation were addressed. The documents are available upon request.
b. Impacts adequately addressed.	The environmental impacts of the specific definition of a toxic hot spot, ranking criteria, remediation approaches, prevention activities, benefits of remediation, and cleanup plan contents were addressed in the earlier analysis described above. No mitigation measures were proposed because no impacts were identified.
c. Mitigation measures.	None used.

DETERMINATION

Based on the evaluation in the FED (Potential Adverse Environmental Effects Section), I find that SWRCB adoption of the proposed Consolidated Toxic Hot Spots Cleanup Plan will not have a significant adverse effect on the environment.

April 2, 1999
Date

Stanley M. Martinson, Chief
Division of Water Quality
State Water Resources Control Board

Attachment to CEQA Environmental Checklist

1. (I.a., c., e.) General plans and zoning delineate those areas that will be developed, and the type and density of development to be allowed. There is nothing in the proposed Plan that requires the property in the area of remediation activities to be used in any way.

2. (I.b.) The proposed Plan provides that remediation activities will occur within existing local, State, and Federal laws and policies. It does not impose new regulatory requirements that would cause conflicts with existing plans or policies.

3. (I.d.) Remediation of toxic hot spots would not cause impacts to soils or farmlands or create incompatible uses. Any needed source reduction of pesticides would be consistent with the existing SWRCB/RWQCB framework for reducing nonpoint sources which is best achieved through the cooperative efforts of the dischargers, other interested parties, and the SWRCB and RWQCBs; and the Memorandum of Understanding with the Department of Pesticide Regulation.

4. (II. a.,b.,c.) See discussion of growth-inducing impacts.

5. (III.a.,b.,c.,d.,e.,g.,h.,i.; IV.b.,f.,g.,i.; VI.a.,b.,c.,d.,e.,g.; IX.b.,c.,e.; XIII.a.,b.,c.; XIV.a.,b.,c.,d.,e.): See discussion of potential impacts of constructing or modifying publicly owned wastewater or industrial treatment facilities.

6. (III.f.;IV.a.,c.,d.,e.,h.) See discussion of potential impacts to water resources.

7. (V.a.,b.,d.) See discussion of potential impacts to air quality, and exposure to hazards.

8. (V.c.) There is no evidence that remediation of toxic hot spots significantly impacts temperature, humidity, precipitation, winds, cloudiness, or other atmospheric conditions.

9. (VI.f.) See discussion of potential impacts to waterborne traffic.

10. (VII.a.,b.,c.,e.) See discussion of potential impacts to biological resources.

11. (VII.d.) See discussion of potential impacts to water resources (including wetlands).

12. (VIII.a.,b.,c.) There is no evidence that remediation would conflict with any energy conservation plans, use resources in a wasteful manner, or result in loss of a known mineral resource.

13. (IX.a.,d.) See discussion of potential hazards.

14. (X.a.,b.) See discussion of noise impacts.

15. (XI.a.,b.,c.,d.,e.) Remediation of toxic hot spots will not result in the need for new government services for fire or police protection, education, or maintenance of public services.

16. (XII.a.,b.,c.) Remediation of toxic hot spots would not result in a need for new systems or substantial alterations to the following utilities: power or natural gas, communications, local or regional water supplies.

17. (XII.d.,e.,f.,g.) Source control for toxic hot spots could result in a need for new systems or alterations to these types of utilities and service systems. See discussion of the potential need for these systems.

18. (XV.a.,b.) Cleanup of toxic hot spots would not create additional demand for parks or recreational facilities, but would have a positive impact on existing recreational opportunities such as fishing and swimming.

19. (XVI.a.) See discussion of biological effects.

20. (XVI.b.) See discussion of cumulative impacts.

21. (XVI.c.) See discussion of cumulative impacts.

22. (XVI.d.) See discussion of potential hazards.

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