Final

Functional Equivalent Document

Water Quality Control Policy for Guidance on the Development of Regional Toxic Hot Spot Cleanup Plans

September 1998

Division of Water Quality

STATE WATER RESOURCES CONTROL BOARD
CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY

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STATE WATER RESOURCES CONTROL BOARD

FINAL FUNCTIONAL EQUIVALENT DOCUMENT

WATER QUALITY CONTROL POLICY FOR GUIDANCE ON THE DEVELOPMENT OF REGIONAL TOXIC HOT SPOT CLEANUP PLANS

SEPTEMBER 1998

STATE WATER RESOURCES CONTROL BOARD
RESOLUTION NO. 98 - 090

ADOPTION OF THE
WATER QUALITY CONTROL POLICY
FOR GUIDANCE ON THE DEVELOPMENT
OF REGIONAL TOXIC HOT SPOT CLEANUP PLANS

WHEREAS:

1. The Bay Protection and Toxic Cleanup Program (BPTCP) was established by the State Water Resources Control Board (SWRCB) to implement the requirements of Section 13390 et seq. of the Water Code.

2. Water Code Section 13394 requires the SWRCB and the Regional Water Quality Control Boards (RWQCBs) to develop regional and consolidated statewide toxic hot spot cleanup plans.

3. To facilitate the consistent development of the regional toxic hot spot cleanup plans, a Water Quality Control Policy (Policy) has been developed pursuant to Water Code Section 13140 for guidance on the development of regional toxic hot spot cleanup plans.

4. The SWRCB prepared and circulated a draft Functional Equivalent Document supporting the proposed Policy in accordance with provisions of the California Environmental Quality Act and Title 14, California Code of Regulations Section 15251(g).

5. In compliance with Water Code Section 13147, the SWRCB held public hearings in Newport Beach, California, on May 5, 1998 and in Sacramento, California, on May 11, 1998 on the Water Quality Control Policy and has carefully considered all testimony and comments received.

6. The SWRCB determined that the adoption of the proposed Policy will not have a significant adverse effect on the environment.

7. The SWRCB staff has prepared a final Functional Equivalent Document which includes the proposed Water Quality Control Policy and responses to the comments received.

8. The SWRCB consulted with the Department of Fish and Game (DFG) on the potential impacts of the amendments on fish and wildlife resources, including threatened and endangered species. DFG found that adoption of the proposed Policy will not jeopardize the continued existence of any endangered or threatened species, or result in the destruction or adverse modification of habitat essential to the continued existence of the species. The adoption of the policy will not result in any taking of any endangered or threatened species incidental to the proposed Policy.

9. The SWRCB has consulted with DFG and the Office of Environmental Health Hazard Assessment on the development of criteria to rank toxic hot spots.

10. The SWRCB has completed a scientific peer review by University of California scientists of the draft Functional Equivalent Document as required by Section 57004 of the Health and Safety Code.

11. The regulatory provisions of the Water Quality Control Policy do not become effective until the regulatory provisions are approved by the Office of Administrative Law (OAL).

THEREFORE BE IT RESOLVED THAT:

The SWRCB:

1. Approves the final Functional Equivalent Document: Water Quality Control Policy for Guidance on the Development of Regional Toxic Hot Spot Cleanup Plans.

2. Adopts the Water Quality Control Policy for Guidance on Development of Regional Toxic Hot Spot Cleanup Plans (attached).

3. Will continue to consult with DFG on compliance with the California Endangered Species Act during the development of the Regional and Consolidated Toxic Hot Spot Cleanup Plans.

4. Intends that, with respect to registered pesticides, any actions of the SWRCB and the RWQCBs related to the development of cleanup plans shall be consistent with the Management Agency Agreement between the SWRCB and DPR.

5. Authorizes the Executive Director or his designee to submit the Water Quality Control Policy to OAL for their approval.

CERTIFICATION

The undersigned, Administrative Assistant to the Board, does hereby certify that the foregoing is a full, true, and correct copy of a resolution duly and regularly adopted at a meeting of the State Water Resources Control Board held on September 2, 1998.

Maureen Marché
Administrative Assistant to the Board

PREFACE

The State Water Resources Control Board (SWRCB) is required by the California Water Code to develop a Statewide consolidated toxic hot spot cleanup plan by June 30, 1999.

This document presents the Policy for guidance on development of the toxic hot spot cleanup plans. This final Functional Equivalent Document (FED) explores various alternatives, provides options and recommendations, and evaluates the environmental impacts of the Policy.

This Policy provides guidance to the Regional Water Quality Control Boards (RWQCBs) on development of Toxic Hot Spot (THS) Cleanup Plans. The SWRCB held two public hearings (May 5 and 11, 1998) on the draft FED. Responses to comments received have been developed and the draft proposed Policy has been revised.

The RWQCBs will implement the Policy subsequent to approval of the regulatory provisions of the Policy by the Office of Administrative Law.

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LIST OF ABBREVIATIONS

AET	Apparent Effects Threshold
APA	Administrative Procedure Act
ASTM	American Society for Testing Materials
BMP	Best Management Practice
BPTCP	Bay Protection and Toxic Cleanup Program
CalEPA	California Environmental Protection Agency
CCR	California Code of Regulations
CEQA	California Environmental Quality Act
CFR	Code of Federal Regulations
CWA	Clean Water Act (federal)
cy	cubic yard
CZARA	Coastal Zone Act Reauthorization Amendments
DDT	1,1,1-trichloro-2,2,2-bis(p-chlorophenyl)-ethane
DFG	Department of Fish and Game
DHS	Department of Health Services
DPR	Department of Pesticide Regulation
EBE	Enclosed Bays and Estuaries
EDL	Elevated Data Level
EIR	Environmental Impact Report
EMAP	Environmental Monitoring and Assessment Program
EPA	U.S. Environmental Protection Agency
EqP	Equilibrium Partitioning
ERL	Effects Range Low
ERM	Effects Range Median
FDA	U.S. Food and Drug Administration
FED	Functional Equivalent Document
g	gram(s)
gpd	gallons per day
H_2S	Hydrogen sulfide
HRS	Hazard Ranking System
kg	kilogram(s)
l	liter(s)
lf	linear foot
LTMS	Long Term Management Strategy
MAA	Management Agency Agreement
MDL	minimum detection level
mg	milligram(s)
MG	million gallons
MGD	million gallons per day
mg/l	milligrams per liter (parts per million)

MOU	Memorandum of Understanding
MTRL	Maximum Tissue Residue Level
NAS	National Academy of Sciences
ng/l	nanograms per liter (parts per trillion)
NOAA	National Oceanic and Atmospheric Administration
NOEL	No Observed Effect Level
NPDES	National Pollutant Discharge Elimination System
OAL	Office of Administrative Law
OEHHA	Office of Environmental Health Hazard Assessment
PAH	Polynuclear Aromatic Hydrocarbon
PCB	Polychlorinated biphenyl
PEL	Probable effects level
PMP	Pesticide Management Plan
POTW	publicly owned treatment work
RfD	reference dose
RWQCB	Regional Water Quality Control Board
sf	square foot
SRF	State Revolving Fund
SMW	State Mussel Watch
SWRCB	State Water Resources Control Board
TBD	to be determined
TEL	Threshold Effects Level
THS	Toxic Hot Spot
TMDL	Total Maximum Daily Load
TOC	Total Organic Carbon
ug/l	micrograms per liter
WDR	Waste Discharge Requirement

FINAL WATER QUALITY CONTROL POLICY

Revisions based on the comments received are presented in ~~strikeout~~ (for removed text) and <u>underline</u> (for added text).

State of California

STATE WATER RESOURCES CONTROL BOARD

WATER QUALITY CONTROL POLICY

FOR GUIDANCE ON DEVELOPMENT OF REGIONAL TOXIC HOT SPOT CLEANUP PLANS

FINAL

Adopted and Effective

________________ 1998

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WATER QUALITY CONTROL POLICY
FOR GUIDANCE ON DEVELOPMENT OF
REGIONAL TOXIC HOT SPOT CLEANUP PLANS

INTRODUCTION

The State Water Resources Control Board (SWRCB) and the Regional Water Quality Control Boards (RWQCBs) are mandated to identify toxic hot spots in the enclosed bays and estuaries of each of the seven coastal regions of the State (California Water Code Chapter 5.6, Section 13390 *et seq.*). The coastal RWQCBs are mandated to develop Regional Toxic Hot Spot Cleanup Plans specifying where and how each identified toxic hot spot will be remediated.

The Water Quality Control Policy for Guidance on Development of Regional Toxic Hot Spot Cleanup Plans is intended to provide guidance on the development of the Regional cleanup plans. The Policy contains a specific definition of a toxic hot spot, general ranking criteria, ~~and~~ the mandatory contents of the cleanup plans, and issues to be considered by the SWRCB in the development of the consolidated toxic hot spot cleanup plan. The principles contained in this Policy apply to all enclosed bays, estuaries and coastal waters.

RWQCBs shall prepare their regional toxic hot spot cleanup plans in accordance with this Policy. Any site-specific variance from the Policy shall be approved by the SWRCB Executive Director.

CONTENTS OF REGIONAL TOXIC HOT SPOT CLEANUP PLANS

The Regional Toxic Hot Spot Cleanup Plans shall contain (at a minimum) the following information:

1. Introduction

   The Introduction shall contain an identification of the Region. In general terms, the Bay Protection and Toxic Cleanup Program (BPTCP) goals (Chapter 5.6 of the California Water Code), authority and requirements to develop cleanup plans (Water Code Section 13394) shall be presented.

2. Toxic Hot Spot Definition

   The Regional cleanup plans shall then present the specific definition of a Toxic Hot Spot (THS) presented in this Policy.

3. General Criteria For Ranking Toxic Hot Spots

   The Water Code requirements for ranking criteria and the ranking criteria in this Policy shall be presented.

4. Monitoring Approach

   The BPTCP has used effects-based measurements of impacts using the sediment quality triad (sediment toxicity, benthic community structure and measures of chemical concentrations in sediments) to identify toxic hot spots in California enclosed bays and estuaries. The BPTCP has used these measures in a two-step process. The first step is to screen sites using toxicity tests, benthic community structure, or measures of chemicals in sediments or tissues. In the second step, the highest priority sites with a response in any of the measures are retested to confirm the observed response.

   The description of the monitoring approach shall be presented in the cleanup plan. If there are Region-specific modifications of the approach the modifications shall be briefly described.

5. A priority ranking of all THS (including a description of each THS including a characterization of the pollutants present at the site).

   The RWQCBs shall use the definition of a candidate and known toxic hot spot listed in this Policy to identify toxic hot spots. The RWQCBs shall then rank sites using the Ranking Criteria in this Policy. The RWQCBs shall create one list of candidate toxic hot spots and rank the list using a matrix of the ranking criteria. For the Regional Toxic Hot Spot Cleanup Plans, areas of concern and other sites where information are unavailable shall not be ranked. RWQCBs may list sites that do not meet the definition of a toxic hot spot in a separate section under "Areas of Concern." Areas of Concern are sites with insufficient information available to declare as a candidate or known toxic hot spots.

For each candidate toxic hot spot listed in the Regional Toxic Hot Spot Cleanup Plan the following information shall be presented for each toxic hot spot:

A. Water body name. The name shall conform to the water body name in the RWQCB Basin Plan.

B. Segment Name. The RWQCBs shall list a descriptive name in the water body segment where the toxic hot spot is located if the segment name is more descriptive than the water body name.

C. Site Identification. The RWQCBs shall list a station or site identifier that can be linked to a monitoring station location (*e.g.*, BPTCP monitoring station, State Mussel Watch station, discharger self monitoring station, or any other appropriate identifier).

D. Reason for Listing. The RWQCBs shall list the reason for the site or station to be listed. The value given shall be the appropriate trigger value(s) in the definition of a Toxic Hot Spot that is (are) the cause for the listing.

E. Pollutants present at the site. The RWQCBs shall also list which chemicals are present at sufficiently high levels to be of concern.

F. Report reference substantiating toxic hot spot listing. All references supporting the designation of the toxic hot spot shall be listed with the other information required for designation of a toxic hot spot. The references shall include, but not be limited to: author, year of publication, title of report, and other identifying information [*e.g.*, name of journal (including volume and pages), RWQCB file number, agency report, or other identifier that will allow the report to be independently located].

6. Each candidate toxic hot spot with a "High" priority ranking shall be listed separately and the following information compiled for the site by the RWQCBs:

   A. An assessment of the areal extent of the toxic hot spots.

      The RWQCB shall characterize the areal extent of the toxic hot spot. For the proposed cleanup plans, the RWQCB shall estimate the boundary, size and/or volume of the toxic hot spot. In determining the areal extent the RWQCB shall consider a temporal component (*i.e.,* the historic versus ongoing nature of the toxic hot spot) and the mix of chemicals present as well as any available information on toxicity and benthic community composition that would assist in characterizing the areal extent of the toxic hot spot. When considering sediments, the RWQCB shall consider the volumes to be addressed and depth of polluted sediments present at the site.

   B. An assessment of the most likely sources of pollutants (potential dischargers).

      RWQCBs shall list potential dischargers that are likely to have discharged or deposited the pollutants identified in the toxic hot spot lists.

      Potential discharger identification shall be dependent on factors such as, site location, pollutant type, mix of chemicals found to be present at the site, and identification and location of the potential discharger.

      In some cases, after a site is identified as a toxic hot spot, there may not be any identified potential discharger to assume the responsibility of cleanup. In such cases the identified toxic hot spot would remain reported as a toxic hot spot in the cleanup plan lists. ~~The RWQCB and the SWRCB would assume the role of leadership to initiate cleanup through the adoption of the Consolidated Statewide Toxic Hot Spot Cleanup Plan.~~

   C. A summary of actions that have been initiated by the RWQCBs to reduce the accumulation of pollutants at existing THSs and to prevent the creation of new THSs.

The summary of actions shall contain descriptions of any issued waste discharge requirements, National Pollutant Discharge Elimination System (NPDES) permits, general permits (*e.g.,* construction, industrial stormwater, *etc.*), cleanup and abatement orders, cease and desist orders, administrative civil liability orders, actions taken or initiated by other State or Federal agencies (*e.g.,* Department of Defense Base Closure, Damage Assessment activities of the National Oceanic and Atmospheric Administration, etc.), or any other actions.

D. Preliminary assessment of actions required to remedy or restore a THS ~~to an unpolluted condition~~ including recommendations for remedial actions.

The RWQCBs shall evaluate the alternatives listed in the ~~Cleanup~~ Remediation Methods section of this Policy. After evaluating the ~~cleanup~~ remediation alternatives the RWQCBs shall list their assessment of the actions that could be implemented.

In developing this preliminary list of actions the RWQCBs shall list, to the extent possible, potential environmental impacts of the proposed actions (either in the plan or in a separate report). These impacts could include, but are not limited to: impacts of sediment disposal, secondary impacts of dredging, disposal, pollutant releases from capped sites, pollutant releases from disposal facilities (both aquatic and upland), pollutant release during treatment or as a by-product of treatment (gaseous, solid and liquid), potential impacts of constructing new facilities to treat effluents, sludge disposal, possible air quality impacts, alterations in sewer systems, etc.

During implementation of the consolidated cleanup plan, the RWQCBs shall work with responsible parties to determine the appropriate and reasonable cleanup or remediation level.

E. An estimate of the total cost to implement the cleanup plan.

RWQCBs shall estimate costs of cleanup plan implementation using the estimates provided in this Policy or other referenced source. RWQCBs may deviate from the cost estimate in this Policy if justified in writing in the cleanup plan. If a potential discharger has been identified, the RWQCB shall require in the cleanup plan that the discharger prepare a proposal for site remedial actions. The proposal for site remediation shall include, but not be limited to, assessment of the areal extent of the toxic hot spot, cleanup actions and monitoring to assess effectiveness of any implemented cleanup actions. The RWQCB will also present a list of benefits (consistent with the guidance in this Policy) derived by implementing the cleanup plan.

F. An estimate of recoverable costs from potential dischargers.

The costs recoverable from potential dischargers shall be developed by the RWQCBs, if possible. The costs shall be justified in the cleanup plan.

G. A two-year expenditure schedule identifying funds to implement the plans that are not recoverable from potential dischargers.

The RWQCBs shall develop a brief workplan for the implementation of the cleanup plans for sites without potential dischargers identified. The workplan shall contain costs and estimated schedule for: finding polluted sediments or water (monitoring), assessment of areal extent of the toxic hot spot, implementation of remedial actions including, but not limited to, sediment removal and disposal, treatment of removed sediments, or capping of polluted sediments, possible changes in WDRs, suggestions for improvements in wastewater discharge, or recommendations for implementing watershed management approaches. The expenditure plan shall also contain a funding proposal for assessing the effectiveness of remediation.

SPECIFIC DEFINITION OF A TOXIC HOT SPOT

The following specific definition provides a mechanism for identifying and distinguishing between "candidate" and "known" toxic hot spots. A candidate toxic hot spot is considered to have enough information to designate a site as a known toxic hot spot except that the candidate hot spot has not been approved by the RWQCB and the SWRCB. Once a candidate toxic hot spot has been adopted into the consolidated statewide toxic hot spot cleanup plan then the site shall be considered a known toxic hot spot and all the requirements of the Water Code shall apply to that site.

Candidate and known toxic hot spots are locations (sites in waters of the State) in enclosed bays, estuaries or the ocean. Dischargers (e.g., publicly owned treatment works, industrial facilities, power generating facilities, agricultural land, storm drains, etc.) are not toxic hot spots.

Candidate Toxic Hot Spot

A site meeting any one or more of the following conditions is considered to be a "candidate" toxic hot spot.

1. The site exceeds water or sediment quality objectives for toxic pollutants that are contained in appropriate water quality control plans or exceeds water quality criteria promulgated by the U.S. Environmental Protection Agency (U.S. EPA).

   This finding requires chemical measurement of water or sediment, or measurement of toxicity using tests and objectives stipulated in water quality control plans. Determination of a toxic hot spot using this finding should rely on recurrent measures over time (at least two separate sampling dates). Suitable time intervals between measurements must be determined.

2. The water or sediment exhibits toxicity associated with toxic pollutants that is significantly different from the toxicity observed at reference sites (*i.e.*, when compared to the lower confidence interval of the reference envelope or, in the absence of a reference envelope, is significantly toxic as compared to controls (using a t-test) and the response is less than ~~80~~ 90 percent of the minimum significant difference for each specific test organism ~~control value~~), based on toxicity tests acceptable to the SWRCB or the RWQCBs.

To determine whether toxicity exists, recurrent measurements (at least two separate sampling dates) should demonstrate an effect. Appropriate reference and control measures must be included in the toxicity testing. The methods acceptable to and used by the BPTCP may include some toxicity test protocols not referenced in water quality control plans (*e.g.*, the BPTCP Quality Assurance Project Plan). Toxic pollutants should be present in the media at concentrations sufficient to cause or contribute to toxic responses in order to satisfy this condition.

3. The tissue toxic pollutant levels of organisms collected from the site exceed levels established by the United States Food and Drug Administration (FDA) for the protection of human health, or the National Academy of Sciences (NAS) for the protection of human health or wildlife. When a health advisory against the consumption of edible resident non-migratory organisms has been issued by Office of Environmental Health Hazard Assessment (OEHHA) or Department of Health Services (DHS), on a site or water body, the site or water body is automatically classified a "candidate" toxic hot spot if the chemical contaminant is associated with sediment or water at the site or water body.

   Acceptable tissue concentrations are measured either as muscle tissue (preferred) or whole body residues. Residues in liver tissue alone are not considered a suitable measure for candidate toxic hot spot designation. Animals can either be deployed (if a resident species) or collected from resident populations. Recurrent measurements in tissue are required. Residue levels established for one species for the protection of human health can be applied to any other consumable species.

   <u>Shellfish:</u> Except for existing information, each sampling episode should include a minimum of three replicates. The value of interest is the average value of the three replicates. Each replicate should be comprised of at least 15 individuals. For existing State Mussel Watch information related to organic pollutants, a single composite sample (20-100 individuals), may be used instead of the replicate measures. When recurrent measurements exceed one of the levels referred to above, the site is considered a candidate toxic hot spot.

Fin-fish: A minimum of three replicates is necessary. The number of individuals needed will depend on the size and availability of the animals collected; although a minimum of five animals per replicate is recommended. The value of interest is the average of the three replicates. Animals of similar age and reproductive stage should be used.

4. Impairment measured in the environment is associated with toxic pollutants found in resident individuals.

   Impairment means reduction in growth, reduction in reproductive capacity, abnormal development, histopathological abnormalities. Each of these measures must be made in comparison to a reference condition where the endpoint is measured in the same species and tissue is collected from an unpolluted reference site. Each of the tests shall be acceptable to the SWRCB or the RWQCBs.

   Growth Measures: Reductions in growth can be addressed using suitable bioassay acceptable to the SWRCB or RWQCBs or through measurements of field populations.

   Reproductive Measures: Reproductive measures must clearly indicate reductions in viability of eggs or offspring, or reductions in fecundity. Suitable measures include: pollutant concentrations in tissue, sediment, or water which have been demonstrated in laboratory tests to cause reproductive impairment, or significant differences in viability or development of eggs between reference and test sites.

   Abnormal Development: Abnormal development can be determined using measures of physical or behavioral disorders or aberrations. Evidence that the disorder can be caused by toxic pollutants, in whole or in part, must be available.

   Histopathology: Abnormalities representing distinct adverse effects, such as carcinomas or tissue necrosis, must be evident. Evidence that toxic pollutants are capable of causing or contributing to the disease condition must also be available.

5. Significant degradation in biological populations and/or communities associated with the presence of elevated levels of toxic pollutants.

This condition requires that the diminished numbers of species or individuals of a single species (when compared to a reference site) are associated with concentrations of toxic pollutants. The analysis should rely on measurements from multiple stations. Care should be taken to ensure that at least one site is not degraded so that a suitable comparison can be made.

Known Toxic Hot Spot

A site meeting any one or more of the conditions necessary for the designation of a "candidate" toxic hot spot that has gone through a full SWRCB and RWQCB hearing process, is considered to be a "known" toxic hot spot. A site will be considered a "candidate" toxic hot spot until approved by the SWRCB as a "known" toxic hot spot in the consolidated toxic hot spot cleanup plan.

RANKING CRITERIA

A value for each criterion described below shall be developed provided appropriate information exists or estimates can be made. Any criterion for which no information exists shall be assigned a value of "No Action". The RWQCB shall create a matrix of the scores of the ranking criteria. The RWQCBs shall determine which sites are "High" priority based on the ~~six~~ five general criteria (below) keeping in mind the value of the water body. The RWQCBs shall provide the justification or reason a rank was assigned if the value is an estimate based on best professional judgment.

Human Health Impacts

Human Health Advisory issued for consumption of non-migratory aquatic life from the site (assign a "High"); Tissue residues in aquatic organisms exceed FDA/DHS action level or U.S. EPA screening levels ("Moderate").

Aquatic Life Impacts

For aquatic life, site ranking shall be based on an analysis of the ~~preponderance of~~ substantial information available ~~(*i.e.,* weight of evidence)~~. The measures that shall be considered are: ~~the sediment quality triad (~~sediment chemistry, sediment toxicity, ~~and~~ biological field assessments (including benthic community analysis), water toxicity, toxicity identification evaluations (TIEs), and bioaccumulation.

Stations with hits in any two of the biological measures if associated with high chemistry, assign a "High" priority. A hit in one of the measures associated with high chemistry is assigned "moderate", and high sediment or water chemistry only shall be assigned "low". In analyzing the substantial information available, RWQCBs should take into consideration that impacts related to biological field assessments (including benthic community structure) are of more importance than other measures of impact.

***Water Quality Objectives*[1]**

Any chemistry data used for ranking under this section shall be no more than 10 years old, and shall have been analyzed with appropriate analytical methods and quality assurance.

Water quality objective or water quality criterion: Exceeded regularly (assign a "High" priority), occasionally exceeded ("Moderate"), infrequently exceeded ("Low").

Areal Extent of Toxic Hot Spot

Select one of the following values: More than 10 acres, 1 to 10 acres, less than 1 acre.

~~***Pollutant Source***~~

~~Select one of the following values: Source(s) of pollution identified (assign a "High" priority), Source(s) partially known ("Moderate"), Source is unknown ("Low").~~

Natural Remediation Potential

Select one of the following values: Site is unlikely to improve without intervention ("High"), site may or may not improve without intervention ("Moderate"), site is likely to improve without intervention ("Low").

[1] Water quality objectives to be used are found in Regional Water Quality Control Board Basin Plans or the California Ocean Plan (depending on which plan applies to the water body being addressed). Where a Basin Plan contains a more stringent value than the statewide plan, the regional water quality objective will be used.

TABLE 1: NAS, FDA, AND U.S. EPA LIMITS RELEVANT TO THE BPTCP (NG/G WET WEIGHT)

Chemical	NAS Recommended Guideline[2] (whole fish)	FDA Action Level or Tolerance[3] (edible portion)	USEPA Screening Values[4] (edible portion)
Total PCB	500	2000**	10
Total DDT	50	5000	300
aldrin	*	300**,***	-
dieldrin	*	300**,***	7
endrin	*	300**,***	3000
heptachlor	*	300**,***	-
heptachlor epoxide	*	300**,***	10
lindane	50	-	80
chlordane	50	300	80
endosulfan	50	-	20,000
methoxychlor	50	-	-
mirex	50	-	2000
toxaphene	50	5000	100
hexachlorobenzene	50	-	70
any other chlorinated hydrocarbon pesticide	50	-	
dicofol	-	-	10,000
oxyfluorfen	-	-	800
dioxins/dibenzofurans	-	-	$7x10^{-4}$
terbufos	-	-	1000
ethion	-	-	5000
disulfoton	-	-	500
diazinon	-	-	900
chlorpyrifos	-	-	30,000
carbophenothion	-	-	1000
cadmium	-	-	10,000
selenium	-	-	50,000
mercury	-	1000**(as methyl mercury)	600

*Limit is 5 ng/g wet weight. Singly or in combination with other substances noted by an asterisk.
**Fish and shellfish.
***Singly or in combination for shellfish

[2] National Academy of Sciences. 1973. Water Quality Criteria, 1972 (Blue Book). The recommendation applies to any sample consisting of a homogeneity of 25 or more fish of any species that is consumed by fish-eating birds and mammals, within the same size range as the fish consumed by any bird or mammal. No NAS recommended guidelines exist for marine shellfish.

[3] U.S. Food and Drug Administration. 1984. Shellfish Sanitation Interpretation: Action Levels for Chemical and Poisonous Substances. A tolerance, rather than an action level, has been established for PCB.

[4] U.S. Environmental Protection Agency. 1993. Guidance for assessing chemical contaminant data for use in fish advisories. Volume 1. EPA 823-R-93-002. Office of Water. Washington, D.C.

Overall Ranking

The RWQCB shall list the overall ranking for the candidate toxic hot spot. Based on the interpretation and analysis of the five previous ranking criteria, ranks shall be established by the RWQCBs as "high", "moderate" or "low."

TOXIC HOT SPOT REMEDIATION ~~SEDIMENT CLEANUP~~ METHODS

Each ~~known and~~ candidate toxic hot spot shall be evaluated to determine which technique or techniques would best remediate the toxic hot spot. In determining the remedial action(s), each RWQCB shall identify remediation techniques that are technically feasible and reasonably cost-effective. Selection of the alternatives involves choosing the remediation option that is appropriate for the site (*i.e.,* protective of its beneficial uses). This section contains approaches for addressing both sediment and water remediation activities.

Sediment Remediation Methods

The use of remediation technologies and controls is still emerging. Generally, the field has been dominated by tools developed for navigation dredging, and few full scale treatment systems have been implemented.[5] No one option shall be selected in the cleanup plans especially if a discharger is identified as being responsible for the site (in order to comply with Water Code Section 13360).

Tables 2 through 12 list many of the types of remediation that shall be considered by the RWQCBs in developing the regional toxic hot spot cleanup plans for remediation of sediments in enclosed bays, estuaries and the ocean. For each type of remediation technology, the Tables present: (1) the state of the practice, (2) advantages and effectiveness, (3) limitations of the methods, and (4) any identified research needs.

Each RWQCB shall provide an analysis of a range of treatment technologies or alternatives for comparison of the cost effectiveness. The RWQCBs may elect to not consider one or

[5] National Research Council. 1997. Contaminated sediments in ports and waterways: Cleanup strategies and technologies. Committee on Contaminated Marine Sediments, Marine Board, Commission on Engineering and Technical Systems, National Research Council. National Academy Press, Washington, D.C. 295 pp.

more of the alternatives (below) if the alternative is not feasible for the site.

1. Treatment of the site sediments only.

   Site treatment involves the physical or chemical alteration of material. The treatment must reduce or eliminate the toxicity, mobility, or volume of polluted material. Treatment may be either (a) *in situ*, or (b) *ex situ*. In situ treatment requires uniform treatment and confirmation of effectiveness; however, *in situ* methods generally have not been considered effective in marine sediments.

   Ex situ treatment requires a treatment area, or a dedicated site to assure effectiveness.

   Types of treatment include:

   - *in situ* bioremediation (Table 2),
   - soil washing and physical separation (Table 3),
   - chemical separation and thermal desorption (Table 4),
   - immobilization (Table 5),
   - thermal and chemical destruction (Table 6), and
   - *ex situ* bioremediation (Table 7).

   The treatment choice shall be pollutant specific. The choice depends upon the chemical characteristics of the pollutants, as well as physical and chemical characteristics of the sediments; for example, clay content, organic carbon content, salinity, and water content. Some treatment options produce by-products which require further handling. If the safety and effectiveness of treatment options are not well known, bench tests and pilot projects shall be performed prior to authorization of the use of such treatment methods.

2. Dredging: Sediment Removal and Disposal or Reuse

   Dredging may be combined with containment or off-site disposal (Table 8). Selection of the method depends upon the concentration of pollutants and the amount of resuspension of sediments caused by the dredge at the removal site and at the disposal site. To reduce the transport of polluted sediment to

Table 2: In-Situ Bioremediation

State of Practice (system maturity, known pilot studies, etc.)	Applicability	Advantages/Effectiveness	Limitations	Research Needs
(a) None documented for marine sediments; (b) examples from freshwater sediment are limited to special cases on pilot scale, e.g., chemical stimulation of dehalogenation (but no degradation) of PCBs in the Houseatonic River, Connecticut; (c) stimulation of degradation with addition of active microbes in Hudson River, New York.	(a) Pollutant is biologically available; (b) concentration of pollutant appropriate for bioactivity, e.g., sufficiently high to serve as substrate or not high enough to be toxic; (c) limited number or classes of pollutants that are biodegradable; less known for complex mixtures; (d) site is reasonably accessible for management and monitoring; (e) rapid solution is not required.	Based on experience from soil systems, it offers the potential for (a) complete degradation and elimination of organic pollutants; (b) reduced toxicity of sediment from partial biotransformation; (c) less materials handling, which can result in substantially lower costs; (d) no need for placement sites; (e) favorable public response and acceptability.	(a) Not a proven technology for sediments (freshwater or marine); (b) likely to require manipulation and disturbance of sediment; (c) can require containment which limits volume that is treatable; (d) can require long time periods, especially in temperate waters; (e) ineffective for low level pollution; (f) not applicable to areas of high turbulence or sheer; (g) not applicable for high molecular weight polyaromatic hydrocarbons.	(a) Fundamental understanding of biodegradation principles in marine environments; (b) bioavailability of sorbed pollutants and the effect of aging; (c) exploration of anaerobic degradation processes for the largely impacted near-shore anoxic sediments; (d) laboratory, pilot, and field demonstration of effectiveness for marine sediments; (e) interaction of physical, chemical, and microbiological processes on biodegradation, e.g., sediment composition, hydrodynamics; (f) analysis of cost-effectiveness; (g) exploration of combining in-situ bioremediation with capping.

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Table 3: Soil Washing and Physical Separation

State of Practice (system maturity, known pilot studies, etc.)	Applicability	Advantages/Effectiveness	Limitations	Research Needs
Well developed by mining industry and frequently used for sediments.	Where pollutant is predominantly associated with fine-grained material that is a small fraction of the total solids.	(a) Mature technology that can reduce volumes of polluted material requiring subsequent treatment; (b) soil washing can be used to recover Confined Disposal Facility space for later reuse.	Original sediments must have a significant proportion of sand for the process to be cost effective.	None identified.

Table 4: Chemical Separation and Thermal Desorption

State of Practice (system maturity, known pilot studies, etc.)	Applicability	Advantages/Effectiveness	Limitations	Research Needs
(a) Pilot plant studies conducted on metal desorption by acid-leaching solutions and at least one full-scale implementation; (b) pilot and full-scale application of organics separation by liquid solvents and supercritical fluids; (c) organic chemical thermal desorption also has had full-scale demonstration; (d) thermal desorption used at Waukegan Harbor.	Suitable for weakly bound organics and metals.	Pollutant is removed and concentrated.	(a) Batch extraction during separation requires multiple cycles to achieve high removal; (b) fluid-solid separation is difficult for fine-grained materials; (c) a separate reactor is needed to remove the pollutant from the extracting fluid so that the extracting fluid can be reused; (d) thermal desorption requires temperatures that will vaporize water, and sediment particles must be eliminated from gaseous discharge; (e) pollutant removal from the gas phase following thermal desorption is another treatment process that is required.	Systems integration for complete pollutant isolation or destruction.

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Table 5: Immobilization

State of Practice (system maturity, known pilot studies, etc.)	Applicability	Advantages/Effectiveness	Limitations	Research Needs
Extensive knowledge based on inorganic immobilization within solid wastes and dry soils.	Chemical fixation and immobilization of trace metals.	(a) Chemical isolation from biologically accessible environment; (b) process is simple and there is a history of use for sludge.	(a) Sediment should have moisture content of less than 50 percent, and solidified volumes can be 30 percent greater than starting material; (b) limited applicability to organic pollutants; (c) high organic pollutant levels may interfere with treatment for metals immobilization; (d) need for placement of solidified sediments.	(a) Studies of long-term effectiveness for pollutant isolation; (b) develop sediment placement options, especially for beneficial uses.

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Table 6: Thermal and Chemical Destruction

State of Practice (system maturity, known pilot studies, etc.)	Applicability	Advantages/Effectiveness	Limitations	Research Needs
Thermal oxidation in flame and thermal reduction in nonflame reactors have been extensively tested and demonstrated.	Process destroys organic pollutants in sediment samples at efficiencies of greater than 99.99 percent but at very high costs.	Very effective.	(a) Very expensive; (b) metals mobilized into the gas phase require gas phase scrubbing; (c) water content of sediment increases energy costs.	(a) process control to prevent upsets and effluent gas treatment for metals containment; (b) facility design to control the destruction process.

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Table 7: Ex Situ Bioremediation

State of Practice (system maturity, known pilot studies, etc.)	Applicability	Advantages/Effectiveness	Limitations	Research Needs
(a) Limited experience; (b) transfer of soil-based technologies to marine sediments is not proved and may not be directly applicable because of the different biogeochemistry of marine sediments; (c) but general trends should translate; (d) examples from freshwater sediment have been carried out at the pilot scale in the assessment and remediation of polluted sediments program, as well as in Europe; (e) PCBs were treated ex situ at a Sheboygan River site.	(a) Pollutant is biologically available; (b) concentration of pollutant appropriate for bioactivity (e.g., sufficiently high to serve as substrate, not high enough to be toxic); (c) limited number or classes of pollutants are biodegradable; less known for complex mixtures; (d) site is reasonable accessible for management and monitoring; (e) rapid solution is not required.	Based on experience from freshwater systems, it offers the potential for (a) degradation (as opposed to mass transfer) of some organic pollutants; (b) possible reduction of toxicity from biotransformation in those cases in which complete mineralization does not occur; (c) containment of polluted material allowing for an engineered system and enhanced rates, when compared to in situ biotransformations; (d) public acceptability.	(a) Far from a proven technology--all work with marine sediments is at the bench-scale; (b) requires handling of polluted sediment; (c) slow compared to chemical treatment; (d) ineffective for low levels of pollution, and does not remove 100 percent of pollutants; (e) not applicable for very complex organics, such as high-molecular-weight compounds; (f) susceptible to matrix effects on bioavailability.	(a) Fundamental understanding of biodegradation principles in engineered systems; (b) exploration of aerobic/anaerobic combinations or comparisons; (c) laboratory, pilot, and field demonstrations; (d) analysis of cost effectiveness; (e) exploration of bioremediation as part of more extensive treatment trains.

Table 8: Confined Disposal Facility

State of Practice (system maturity, known pilot studies, etc.)	Applicability	Advantages/Effectiveness	Limitations	Research Needs
(a) The most commonly used placement alternative for polluted sediments; (b) hundreds of sites nationwide for navigation dredging projects; (c) often used for pretreatment prior to final placement or as final sediment placement site for remediation projects.	Applicable to a wide variety of sediment types and project conditions.	(a) Low cost compared to ex situ treatment; (b) compatible with a variety of dredging techniques, especially direct placement by hydraulic pipeline; (c) proper design results in high retention of suspended sediments and associated pollutants; (d) engineering for basic containment normally involves conventional technology; (e) controls for pollutant pathways usually can be incorporated into site design and management; (f) conventional monitoring approaches can be used; (g) site can be used for beneficial purposes following closure, with proper safeguards.	(a) Does not destroy or detoxify pollutants unless combined with treatment; (b) control of some pollutant loss pathways may be expensive.	(a) Design approaches, such as covers and liners, needed for low cost pollutant controls; (b) design criteria for treatment of releases or control strategies for high profile contaminates; (c) methods for site management to allow restoration of site capacity and potential use of treated materials.

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other areas, silt curtains constructed of geotextile fabrics may be utilized to minimize migration of the resuspended sediments beyond the area of removal. Consideration must also be given to temporary loss of benthic organisms at the removal site and at the disposal site.

Selection of the dredging method shall take into account the physical characteristics of the sediments, the sediment containment capability of the methods employed, the volume and thickness of sediments to be removed, the water depth, access to the site, currents, and waves. Consideration shall also be given to placement site of the material once it is removed.

Typical dredging methods include mechanical or hydraulic dredging. Mechanical dredging often employs clamshell buckets and dislodges sediments by direct force. Sediments can be resuspended by the impact of the bucket, by the removal of the bucket, and by leakage of the bucket. Mechanical dredging generally 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 very high percentage of water at the end of the pipe.

Removal and consolidation often involves a diked structure which retains the dredged material (Tables 9 and 10). Considerations include:

A. construction of the dike or containment structure to assure that pollutants do not migrate,

B. the period of time for consolidation of the sediments,

C. disturbance or burying of benthic organisms,

D. disposal to an off-site location, either upland (landfill), in-bay, or ocean. 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.

Table 9: Contained Aquatic Disposal

State of Practice (system maturity, known pilot studies, etc.)	Applicability	Advantages/Effectiveness	Limitations	Research Needs
Limited application. Reviews exist concerning (a) necessary data, equipment, and procedures; (b) engineering considerations; (c) guidelines for cap armoring design; (d) predicting chemical containment effectiveness.	(a) Costs and environmental effects of relocation are factors; (b) suitable types and quantities of cap material are available; (c) hydrologic conditions will not compromise the cap; (d) cap can be supported by original bed; (e) appropriate for sites where excavation is problematic or removal efficiency is low; (f) cap material is compatible with existing aquatic environment.	(a) Eliminates need to remove polluted sediments; (b) cost effective for sites with large surface areas; (c) effective in containing pollutants by reducing bioaccessibility; (d) promotes in situ chemical or biological degradation; (e) maintains stable geochemical and geohydraulic conditions, minimizing pollutant release to surface water, groundwater, and air.	(a) Laboratory and field validation of capping procedures and tools; (b) analysis of data from existing and ongoing field demonstrations to support capping effectiveness; (c) test for chemical release during bed placement and consolidation; (d) tests to evaluate and simulate the effects of cap penetration by deep burrowing organisms; (e) simulate and evaluate consequences of mixing; (f) potential loss of pollutants to the water column may require controls during placement.	(a) Design criteria for treatment of releases or control strategies for high-profile pollutants; (b) improved methods for evaluation of potential pollutant release pathways; (c) develop reliable cost estimates.

Table 10: Landfills

State of Practice (system maturity, known pilot studies, etc.)	Applicability	Advantages/Effectiveness	Limitations	Research Needs
Used for several dredged material and Superfund projects involving polluted sediments.	(a) Small volumes; (b) where no other alternatives or sites are available.	(a) Does not require acquisition of permanent placement site; (b) may be most cost effective for small volumes; (c) effectiveness is inherent in the site license.	(a) Lack of landfill capacity in most regions of the country; (b) requires handling and transport to the landfill; (c) restriction on free liquids requires dewatering as a pretreatment step.	Improved methods for rehandling, dewatering, and transporting dredged sediments.

3. Containment of Polluted Sediments

Containment can prevent human or ecological exposure, or prevent migration of pollutants. Containment can be either in-place capping, or removal and consolidation at a disposal structure (Tables 9 and 11). Containment options such as capping clearly reduce the short-term exposure, but require long-term monitoring to track their effectiveness.

The considerations for stabilization of sites using sub-aqueous capping to contain toxic waste at a site includes:

A. Capping provides adequate coverage of polluted sediments and capping materials can be easily placed.

B. The integrity of the cap should be assured to prevent burrowing organisms from mixing of polluted sediments (bioturbation).

C. The ability of the polluted sediment to support the cap, *i.e.*, causing settlement or loading.

D. The bottom topography causing sloping or slumping of the capped material during seismic events.

E. Cap erosion or disruption by currents, waves, bioturbation, propeller wash, or ship hulls.

F. Future use of capped area, *i.e.*, use as shipping channel.

4. No Remediation

This alternative consists of two elements: (a) institutional or ~~access~~ interim controls ~~(or "natural remediation")~~ and (b) the natural remediation or no-action alternative. The first element, institutional controls, could include, but is not limited to, posting of warning signs, or monitoring of water, sediments, or organisms. This element would be protective of human health by providing warning signs for fishing, *etc.*, but not protective of aquatic life.

Table 11: In-Place Capping

State of Practice (system maturity, known pilot studies, etc.)	Applicability	Advantages/Effectiveness	Limitations	Research Needs
Less than 10 major in situ capping projects in North America have been completed (more than 20 worldwide). Reviews exist concerning (a) necessary data, equipment, and procedures; (b) engineering considerations; (c) guidelines for design of cap armor; and (d) predicting effectiveness of chemical containment.	(a) Pollutant sources have been substantially abated; (b) natural recovery is too slow; (c) costs and environmental effectiveness of relocation are too high; (d) suitable types and quantities of cap material are available; (e) hydrologic conditions will not compromise the cap; (f) cap can be supported by original bed; (g) appropriate for sites where excavation is problematic or removal efficiency is low.	(a) Eliminates need to remove polluted sediments; (b) effective in containing pollutants by reducing bioaccessibility; (c) promotes in situ chemical or biological degradation; (d) maintains stable geochemical and geohydraulic conditions, minimizing pollutant release to surface water, groundwater, and air; (e) relatively easy to implement; (f) eliminates bioturbation and resuspension; (g) reduces pollutant release to water column; (h) easily replaced or repaired; (i) in shallow water, creates wetlands, dry lands, or reduces water column depth.	(a) Cap incompatible with bottom material can alter benthic community; (b) subject to erosion by strong currents and wave action; (c) subject to penetration/destruction by deep burrowing organisms; (d) destroys/changes benthic communities/ecological niches; (e) requires ongoing monitoring for cap integrity; (f) dilutes pollutants in original bed if subsequent removal/remediation is required.	(a) Analysis of data from existing and ongoing field demonstrations to support capping effectiveness; (b) controls for chemical release during bed placement and consolidation; (c) test to simulate and evaluate consequences of episodic mixing, such as anchor penetration, propeller wash, and/or mechanical penetration.

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The second element is the " natural remediation or no-action alternative". If by no action, the toxic hot spot is to be left in place, because to move it, or to disturb it in any way would be detrimental, then "no action" shall be considered as the last alternative. The ~~no~~ natural remediation/no-action alternative shall be considered only after all other alternatives have been studied ~~(Table 12)~~.

If the ~~no~~ natural remediation/no-action alternative is to be implemented, the RWQCB shall consider all the factors specified in Table 12 plus determine the following: (a) point source discharges have been controlled, (b) the costs and environmental effects of moving and treating polluted sediment are too great, (c) hydrologic conditions will not disturb the site, (d) the sediment will not be remobilized by human or natural activities, such as by shipping activity or bioturbation, (e) notices to abandon the site have been issued to appropriate federal, state, and local agencies and to the public, (f) the exact location of the site and a list of chemicals causing the toxic hot spot and their quantities are noted on deeds, maps, and navigational charts, and (g) a monitoring program is established to measure changes in discharge rates from the site.

If a ~~no~~ natural remediation alternative is considered, RWQCBs shall provide an assessment of the geographic extent of the pollution, the depth of the pollution in the sediment, compelling evidence that no treatment technologies shall be applied and that only the ~~no~~ natural remediation alternative is feasible at the site, and a cleanup cost comparison of all other treatment technologies versus the no-remediation alternative.

If a ~~no~~ natural remediation alternative is considered, the following information shall be provided in the Regional cleanup plan:

A. Sources of pollution which caused the toxic hot spot to exist.

B. A monitoring program description, specifying the duration of the monitoring, and all organizations which will carry it out.

C. Monitoring program which will show whether rates of pollutant release and the area of influence of the pollutants are not accelerating.

D. Detailed assessment containing proof that all of the following statements are true:

(1) Pollutant discharge has been controlled.

(2) Burial or dilution processes are rapid.

(3) Sediment will not be remobilized by human or natural activities.

(4) Environmental effects of cleanup are equal to or more damaging than leaving the sediment in place.

(5) Unpolluted sediments from the drainage basin will integrate with polluted sediments through a combination of dispersion, mixing, burial, and/or biological degradation.

(6) Polluted sediments at the site will not spread.

(7) The site will be noted on appropriate maps, charts, and deeds to document the exact location of the site.

For no-remediation alternatives, a map of the area shall be required to be provided by potential discharger(s) to the U.S. Army Corps of Engineers, U.S. Coast Guard, National Oceanic and Atmospheric Administration, Coastal Commission, State Lands Commission, and harbor authorities to be included on official navigational charts and other maps to document the exact location of the site and the depth of the site and the pollutants encountered.

Table 12: Natural Recovery

State of Practice (system maturity, known pilot studies, etc.)	Applicability	Advantages/Effectiveness	Limitations	Research Needs
Selected for James River, New York Kepone pollution and considered at Port of Tacoma, Washington site.	(a) Bed is stable or depositional; (b) chemical release rates are low; (c) interim controls can maintain safety to health and environment; (d) pollution level at active surface is low, but areal extent is large; (e) most of the pollution is below the bioturbed zone; (f) pollutants are underlain by low permeability strata; (g) site is not subject to dredging or other disturbance; (h) source of pollution has been abated.	(a) There may be less environmental risk to await natural capping than to attempt sediment removal; (b) removal may cause physical harm to bottom communities as well as suspend and disperse pollutants; (c) cleanup cost may be prohibitive because of large area and low level of pollution; (d) low cost.	(a) Effectiveness of in-bed processes that govern chemical containment and/or destruction is poorly known; (b) bed remains subject to resuspension by storms or anthropogenic processes; (c) should only rarely be used in beds of flowing streams; (d) not appropriate if dredging is required or bulk quantities of chemicals, such as non-aqueous liquids or solids, are present.	(a) Develop scientific principles to describe the process of natural recovery; (b) based on a literature survey, document the success, failure, effectiveness, *etc.*, of sites that have undergone natural recovery either by design or default; (c) develop accepted measuring protocols to determine in situ chemical flux from bed sediment to the overlying water column; (d) develop protocols for assessing the relative contribution of the five or more mechanisms for chemical release or movement from bed sediments.

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Remediation Methods for Water-related Toxic Hot Spots

The three basic approaches which may be practiced independently or concurrently are pollution prevention, pretreatment and recycle and reuse. The RWQCBs shall develop prevention activities tailored to local conditions and the tools available. The RWQCBs shall also provide enough flexibility to dischargers so they can select the most cost-effective approaches for addressing wastewater-related problems. If the RWQCBs have more recent or site-specific information on treatment technology, the RWQCB may use an alternative approach. If the RWQCB cannot determine which prevention tools will be most effective, the selection of methods to address water-related toxic hot spots should be made during the implementation of watershed management approaches that contrast alternate ways to solve the identified problems.

A large number of technically feasible wastewater treatment methods are available. In developing the cleanup plans the RWQCBs shall base their assessments of possible treatment technologies on the effectiveness of removing the pollutant(s) of concern. No one option shall be selected in the cleanup plans especially if discharger(s) are identified as being responsible for the toxic hot spot (in order to comply with Water Code Section 13360). Methods for addressing stormwater and nonpoint sources are emerging and RWQCBs should use their best judgment in suggesting approaches (and their costs).

~~SEDIMENT CLEANUP~~ REMEDIATION COSTS

Sediment Cleanup Costs

Total costs for various remedial technologies is dependent upon many factors, some of the most important being pollutant concentration, cleanup level, physical characteristics of the sediment, and the volume of material to be remediated. In addition, overall costs of remediation should also include monitoring to evaluate the effectiveness of cleanup. Due to the large number of variables associated with remedial actions and availability of disposal sites, the costs for any cleanup will necessarily be project specific.

Tables 13 and 14 provide a qualitative assessment of the various categories of technology. RWQCBs shall use either the estimates in Table 13 and Table 14 or use project-specific estimates of cleanup costs. Obtaining new estimates will allow a more realistic comparison of the cost-effectiveness and benefits of the selected alternatives.

Wastewater Treatment System, Stormwater, or Nonpoint Source Costs

The costs for implementing the waste water treatment technologies and best management practices are discharge- and site-specific. In developing estimates the RWQCBs shall use the EPA Treatability Manual, applicable National Research Council reports, site-specific estimates, or delay the development of cost estimates if the toxic hot spot will be addressed as part of a watershed management effort. If cost estimates are delayed the RWQCBs shall develop cost estimates for developing and coordinating the watershed planning effort.

BENEFITS OF REMEDIATION

In developing the regional toxic hot spot cleanup plans the RWQCBs will list the benefits that will be derived by remediating candidate toxic hot spots. It is acknowledged that the benefits to be developed by the RWQCBs are qualitative estimates. The list of possible benefits of remediation are presented in Table 15.

Table 13: Qualitative Comparison of the State of the Art in Remediation Technologies

Feature technology	State of Design Guidance	Number of Times Used	Scale of Application	Cost (per cubic yard)	Limitations
Natural recovery	Nonexistent	2	Full scale.	Low.	Source control Sedimentation Storms.
In place containment	Developing rapidly	<10	Full scale.	<$20.	Limited technical guidance. Legal/regulation uncertainty.
In place treatment	Nonexistent	~2	Pilot scale.	Unknown.	Technical problems. Few proponents. Need to treat entire volume.
Excavation and containment.	Substantial and well developed	Several hundred	Full scale.	$20 to $100.	Site availability Public assistance.
Excavation and treatment	Limited and extrapolated from soil	<10	Full scale.	$50 to $1,000.	High cost. Inefficient for low concentration. Residue toxic. Need for treatment train.

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Table 14: Comparative Analysis of Sediment Technology Categories

Approach	Feasibility	Effective	Practicality	Cost
INTERIM CONTROL				
Administrative	0	4	2	4
Technological	1	3	1	3
LONG-TERM CONTROL				
In Situ				
Natural recovery	0	4	1	4
Capping	2	3	3	3
Treatment	1	1	2	2
Sediment Removal and Transport	2	4	3	2
Ex Situ Treatment				
Physical	1	4	4	1
Chemical	1	2	4	1
Thermal	4	4	3	0
Biological	0	1	4	1
Ex Situ Containment	2	4	2	2

SCORING	**Feasibility**	**Effective**	**Practicality**	**Cost**
0	<90%	Concept	Not acceptable, very uncertain	$1,000/yd
1	90%	Bench		$100/yd
2	99%	Pilot		$10/yd
3	99.9%	Field		$1/yd
4	99.99%	Commercial	Acceptable, certain	<$1/yd

Table 15. 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

PREVENTION OF TOXIC HOT SPOTS

In the process of developing strategies to remediate ~~cleanup~~ toxic hot spots related to both sediment and water, the RWQCBs shall focus on approaches that rely on existing State and Federal programs to address identified toxic hot spots. In ~~revising Waste Discharge Requirements~~ addressing prevention activities for point and nonpoint sources of pollution, the RWQCBs shall:

1. Consider use of any established prevention tools such as (a) voluntary programs, (b) interactive cooperative programs, and (c) regulatory programs, individually or in any combination that will result in an effective toxic hot spot prevention strategy. The RWQCBs shall consider site-specific and pollutant-specific strategies to address the toxic hot spot including, but not limited to: pollution prevention audits, studies to specifically identify sources of pollutants, total maximum daily load development, watershed management approaches, pretreatment, recycle and reuse, revised effluent limitations, prohibitions, implementation of best management practices, etc.

2. Promote a watershed management protection approach focused on hydrologically defined areas (watersheds) rather than areas defined by political boundaries (counties, districts, municipalities), that take into account all waters, surface, ground, inland, and coastal and address point and nonpoint sources of pollution that may have influence or has been identified to have influenced the identified toxic hot spots. Link the cleanup plan to implementation of the Watershed Management Initiative and the SWRCB Strategic Plan.

3. Encourage the participation and input of, interdisciplinary groups of interested parties (including all potential dischargers) that are able to cross over geographical and political boundaries to develop effective solutions for preventing toxic hot spots.

4. Use prevention strategies that provide enough flexibility to be used as watershed protection plans where there are none established or have the ability to join with a watershed protection plan that is already being implemented to address the toxic hot spot. Solutions developed shall also be developed for, and applied at sites where it will do the most prevention and where it will be the most cost-effective at mitigating and preventing toxic hot spots at a watershed level.

Pesticide residues should not be considered under the Bay Protection and Toxic Cleanup Program if they are detected in the water column in a pattern of infrequent pulses moving by the sampling location. Such detections will be addressed using cooperative approaches such as the Management Agency Agreement between the SWRCB and the Department of Pesticide Regulation, the NPS Management Plan, and existing authorities including the Porter-Cologne Water Quality Control Act and Clean Water Act.

SITE-SPECIFIC VARIANCES

A site-specific variance to this Policy may be granted if an alternate approach for developing a cleanup plan for one or more sites within the jurisdiction of a RWQCB is needed. In all cases, when a RWQCB takes an alternate approach, the RWQCB shall provide the following information to the SWRCB prior to incorporation into the regional toxic hot spot cleanup plan:

1. A description of the provision not followed.

2. A description of the new approach used. The proposed alternative program, method, or process shall be clearly identified.

3. Any specific circumstances on which the RWQCB relied to justify the finding necessary for the variance.

4. Clear evidence that the alternative approach will better protect beneficial uses.

No variance from this Policy shall be effective unless approved by the SWRCB Executive Director.

ISSUES TO BE CONSIDERED IN THE DEVELOPMENT OF THE CONSOLIDATED TOXIC HOT SPOT CLEANUP PLAN

The SWRCB is required to develop a consolidated toxic hot spot cleanup plan. The regional toxic hot spot cleanup plans that are developed with this Policy will not become effective until the consolidated plan is completed. In developing the consolidated plan the SWRCB will consider several issues including, but not limited to:

1. Approaches for consolidating and compiling regional toxic hot spot cleanup plans.

2. Removing locations from and reevaluating the list of known toxic hot spots.

3. Guidance to the RWQCBs on considerations when reevaluating waste discharger requirements in compliance with Water Code Section 13395.

4. Findings concerning implementation of the plan and the need for establishment of a toxic hot spot cleanup program to fund remediation activities (consistent with Water Code Section 13394(i)).

TEMPLATE FOR PROPOSED REGIONAL TOXIC HOT SPOT CLEANUP PLANS

The regional toxic hot spot cleanup plan shall be formatted as presented below.

FINAL

~~PROPOSED~~ REGIONAL TOXIC HOT SPOT CLEANUP PLAN

REGIONAL WATER QUALITY CONTROL BOARD
< > REGION

Part I

I. Introduction

- Region Description
- Legislative Authority
- Limitations

II. Toxic Hot Spot Definition

- Codified Definition of A Toxic Hot Spot
- Specific Definition of A Toxic Hot Spot

III. Monitoring Approach

IV. Criteria For Ranking Toxic Hot Spots

- Human Health
- Aquatic Life
- Water Quality Objectives
- Other Factors

V. Future Needs

Part II

IV. Candidate Toxic Hot Spot List

Water body name	Segment Name	Site Identification	Reason for Listing	Pollutants present at the site.	Report reference

Reference list

V. Ranking Matrix (Pollutant Source has been deleted from the matrix.)

Water body Name	Site Identification	Human Health Impacts	Aquatic Life Impacts	Water Quality Objectives	Areal Extent	Remediation Potential	Overall Ranking

Part III

V. High Priority Candidate Toxic Hot Spot Characterization

For each high priority Candidate Toxic Hot Spot, the following information shall be presented:

A. An assessment of the areal extent of the THS.

B. An assessment of the most likely sources of pollutants (potential discharger).

C. A summary of actions that have been initiated by the Regional Boards to reduce the accumulation of pollutants at existing THSs and to prevent the creation of new THSs.

D. Preliminary Assessment of Actions required to remedy or restore a THS ~~to an unpolluted condition~~ including recommendations for remedial actions.

E. An estimate of the total cost and benefits of ~~to~~ implementing the cleanup plan.

F. An estimate of recoverable costs from potential dischargers.

G. A two-year expenditure schedule identifying funds to implement the plans that are not recoverable from potential dischargers.

FINAL FUNCTIONAL EQUIVALENT DOCUMENT

WATER QUALITY CONTROL POLICY FOR GUIDANCE ON THE DEVELOPMENT OF REGIONAL TOXIC HOT SPOT CLEANUP PLANS

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 Spot Cleanup Plans and site ranking criteria.

The State Water Resources Control Board (SWRCB) and the Regional Water Quality Control Boards (RWQCBs) will use a three phase process for adoption of the Regional and Statewide Toxic Hot Spot Cleanup Plans. The three phases are:

1. The SWRCB will adopt 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 will develop one document as formal guidance on the development of toxic hot spot cleanup plans. This document will be 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 will be 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).

For adoption of the Policy, the BPTCP will use the procedures for adopting and revising Water Quality Control Plans.

2. The RWQCBs will adopt the regional toxic hot spot cleanup plans.

   Each RWQCB completed proposed toxic hot spot cleanup plans by the January 1, 1998 deadline (RWQCB, 1997a; 1997b; 1997c; 1997d; 1997e; 1997f; 1997g). The RWQCBs will update, revise and finalize the proposed regional toxic hot spot cleanup plans.

   The RWQCBs will adopt the regional toxic hot spot cleanup plans using the normal procedures for a RWQCB action (i.e., the public will be given an opportunity to comment on the draft plan, the plan will be revised (if necessary) in response to the comments received, and the plan will be adopted by resolution of the RWQCB). The RWQCB need not adopt the plans pursuant to CEQA.

   After the regional plan is adopted, it will then be forwarded to the SWRCB for incorporation into the statewide consolidated plan. The regional cleanup plans will not be effective until approved by the SWRCB (and all CEQA and APA requirements are met).

3. The SWRCB will compile and adopt the consolidated toxic hot spot cleanup plan.

   The SWRCB will develop the Statewide cleanup plan. The Plan will consist of the consolidated list of toxic hot spots as well as the Water Code-mandated strategies for addressing the toxic hot spots. The SWRCB is required to make specific findings in the Statewide plan (Water Code Section 13394). The SWRCB will also develop a FED to facilitate CEQA and APA compliance and to provide technical justification to withstand peer review (as required by law). All CEQA review of the Regional actions will be completed at the SWRCB with the assistance of the RWQCB staff (e.g., assistance with response to comments, etc.).

   The SWRCB will use the same procedures used for adoption of the Policy in Phase 1 for adoption of the Statewide consolidated toxic hot spot cleanup plan.

The consolidated Statewide toxic hot spot cleanup plan will be submitted to the Legislature.

Purpose

The purpose of this Functional Equivalent Document (FED) is to present alternatives and SWRCB staff recommendations for the development of a Water Quality Control Policy to guide the Regional Water Quality Control Boards (RWQCBs) in the completion of the regional toxic hot spot cleanup plans. The topics addressed in the FED include: toxic hot spot definition, toxic hot spot ranking criteria, toxic hot spot cleanup planning (e.g., site characterization, source identification, remedial action alternatives, etc.) and toxic hot spot prevention (e.g., watershed management).

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 Water Quality Control Policy for guidance on the development of regional toxic hot spot cleanup plans 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.

The SWRCB has prepared a "program" environmental document for the proposed Policy because the Policy will be applied to sites throughout the State. This "program" approach is authorized by Title 14, California Code of Regulations (CEQA Guidelines) Section 15168(a) which 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." Section 15168(b) of the CEQA Guidelines states that the advantages of using a program approach are to:

1. Provide an occasion for a more exhaustive consideration of effects and alternatives than would be practical in an EIR on an individual action,

2. Ensure consideration of cumulative impacts that might be slighted in a case-by-case analysis,

3. Avoid duplicative reconsideration of basic policy considerations,

4. Allow the Lead Agency to consider broad policy alternatives and program-wide mitigation measures at an early time when the agency has greater flexibility to deal with basic problems or cumulative impacts, and

5. Allow reduction in paperwork.

The "Discussion" section of the CEQA Guidelines that follows Section 15168 also supports this approach and states:

> "...The program EIR can be used effectively with a decision to carry out a new governmental program or to adopt a new body of regulations in a regulatory program. The program EIR enables the agency to examine the overall effects of the proposed course of action and to take steps to avoid unnecessary adverse environmental effects. This approach offers many possibilities for agencies to reduce their costs of CEQA compliance and still achieve high levels of environmental protection."

These sections of the CEQA Guidelines refer to Program EIRs. However, as part of a certified regulatory program, the proposed Policy is exempt from Chapter 3 of CEQA - the chapter that requires state agencies to prepare EIRs and Negative Declarations. (Resources Code Section 21080.5.) 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.

Because a certified regulatory program is exempt from the requirement to prepare an EIR or Negative Declaration but must comply with other CEQA requirements, the SWRCB will prepare its functionally equivalent environmental document following CEQA guidelines for a "program" FED. The environmental impacts that may occur as a result of the development of the Policy are summarized in an Environmental Checklist and analyzed in the Environmental Impacts section of the FED.

The SWRCB held two public hearings on the draft FED (DWQ/SWRCB, 1998a). The first hearing was held in Newport Beach on May 5, 1998 and the second hearing was held in Sacramento on May 11, 1998. The hearing record closed on May 15, 1998. The SWRCB has responded to the comments received and the responses are listed in the Response to Comment section of the final 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 Regional Water Quality Control Boards (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 seven 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.

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.

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 spot 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.

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 SWRCB, coastal RWQCBs, DFG and the Office of Environmental Health Hazard Assessment (OEHHA) staff.

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) fee-paying 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[1]
Progress Report	January 1, 1996
Regional Toxic Hot Spot Cleanup Plans	January 1, 1998
Statewide Toxic Hot Spot Cleanup Plan	June 30, 1999

[1]This deadline was not met. The SWRCB requested an extension until February 28, 1995. The BPTCP completed a draft ranking criteria by the February deadline; however, the BPTCP Advisory Committee requested that the deadline be further extended so discussions on very controversial topics could be concluded.

Scope of FED

The FED was developed with a consideration of: existing State statute, regulations, and policies; the current approaches of the RWQCBs; and the recommendations of the BPTCP Advisory Committee and Scientific Planning and Review Committee.

The final FED contains eight major sections: Introduction, Project Description, Environmental Setting, Issue Analysis, Environmental Effects of the Proposed Policy, Environmental Checklist, Comments and Responses, and References.

PROJECT DESCRIPTION

Project Definition

The project is a Statewide Water Quality Control Policy that includes provisions for:

1. A specific definition of a toxic hot spot
2. Criteria to rank sites
3. Mandatory requirements for Regional Toxic Hot Spot Cleanup Plan
4. Remediation actions and costs
5. Toxic Hot Spot prevention strategies
6. Issues to be considered in the development of the Statewide Toxic Hot Spot Cleanup Plan
7. Site-specific variances from the Policy

The proposed Policy is applicable to the surface waters of California in Regions 1, 2, 3, 4, 5, 8, and 9. Figure 1 is a map of this area.

Statement Of Goals

The SWRCB's goals for this project are to:

1. Provide more consistent statewide approaches for identification of toxic hot spots;
2. Provide approaches to address the identified toxic hot spots; and
3. Provide methods to assist the RWQCBs attain the highest water quality that is reasonable and protect the quality of the coastal waters in the State from degradation.

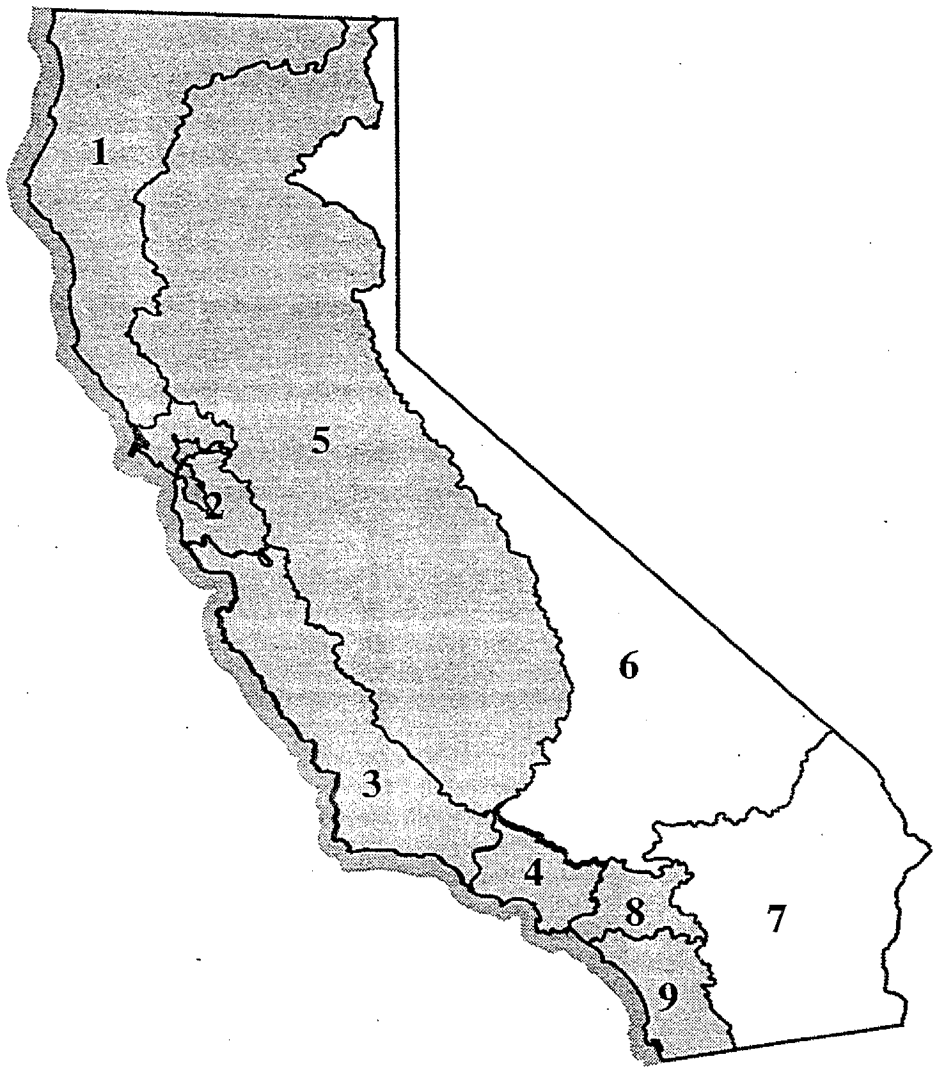

FIGURE 1: AREA THAT THE POLICY IS APPLICABLE.

Proposed Action

The proposed action is SWRCB adoption of the proposed Water Quality Control Policy outlined in the Project Definition (above).

The proposed Policy is being developed as a part of a phased approach to development of a Statewide Consolidated Toxic Hot Spot Cleanup Plan. (This phased approach and components of a Water Quality Control Policy are also explained in the Introduction to this FED and Issue 1.) Under Phase 1 of development of the consolidated cleanup plan, the SWRCB will issue a Policy that provides specific guidance on the development of regional toxic hot spot cleanup plans.

In Phase 2, the RWQCBs will develop and adopt Regional Toxic Hot Spot Cleanup Plans pursuant to the Policy. Phase 3 will be the formal development of the Statewide Toxic Hot Spot Cleanup Plan by the SWRCB. The SWRCB will compile the regional cleanup plans, make additional findings as required by the California Water Code and, after compliance with CEQA and the APA, submit the consolidated Statewide plan to the California Legislature.

ENVIRONMENTAL SETTING

California presents a variety of environmental conditions ranging from snow-covered peaks of the Sierra Nevada, to hot dry deserts (with a huge variation in between these two extremes) to the Pacific Ocean, one of the world's most scenic coastlines.

For water quality management, Section 13200 of the Porter-Cologne Water Quality Control Act (Porter-Cologne) divides the State into nine different hydrologic regions. The activities of the BPTCP are focused on the Regions that border coastal waters including the Sacramento-San Joaquin River Delta. Brief descriptions of the Regions and the water bodies addressed by this FED are presented below. The sources of the information provided in this section are the RWQCB basin plans, proposed regional toxic hot spot cleanup plans (RWQCB, 1997a; 1997b; 1997c; 1997d; 1997e; 1997f; 1997g), and status reports on the BPTCP (SWRCB, 1993; 1996).

North Coast Region (Region 1)

The North Coast Region is defined in Section 13200(a) of Porter-Cologne as follows: North Coast region, which comprises all basins including Lower Klamath Lake and Lost River Basins draining into the Pacific Ocean from the California-Oregon state line southerly to the southerly boundary of the watershed of the Estero de San Antonio and Stemple Creek in Marin and Sonoma Counties.

The North Coast Region is divided into two natural drainage basins, the Klamath River Basin and the North Coastal Basin. The North Coast Region covers all of Del Norte, Humboldt, Trinity, and Mendocino Counties, major portions of Siskiyou and Sonoma Counties, and small portions of Glenn, Lake, and Marin Counties.

The North Coast Region encompasses a total area of approximately 19,390 square miles, including 340 miles of scenic coastline and remote wilderness areas, as well as urbanized and agricultural areas.

The North Coast Region is characterized by distinct temperature zones. Along the coast, the climate is moderate and foggy and the temperature variation is not great. For example, at Eureka, the seasonal variation in temperature has not exceeded 63° F for the period of record. Inland, however, seasonal temperature ranges in excess of 100°F have been recorded.

Precipitation over the North Coast Region is greater than for any other part of California, and damaging floods are a fairly frequent hazard. Particularly devastating floods occurred in the North Coast area in December of 1955, in December of 1964, and in February of 1986.

Ample precipitation in combination with the mild climate found over most of the North Coast Region has provided a wealth of fish, wildlife, and scenic resources. The mountainous nature of the Region, with its dense coniferous forests interspersed with grassy or chaparral covered slopes, provides shelter and food for deer, elk, bear, mountain lion, furbearers and many upland bird and mammal species. The numerous streams and rivers of the Region contain anadromous fish, and the reservoirs, although few in number, support both coldwater and warmwater fish.

Tidelands, and marshes too, are extremely important to many species of waterfowl and shore birds, both for feeding and nesting. Cultivated land and pasture lands also provide supplemental food for many birds, including small pheasant populations. Tideland areas along the north coast provide important habitat for marine invertebrates and nursery areas for forage fish, game fish, and crustaceans. Offshore coastal rocks are used by many species of seabirds as nesting areas.

Major components of the economy are tourism and recreation, logging and timber milling, aggregate mining, commercial and sport fisheries, sheep, beef and dairy production, and vineyards and some wineries.

In all, the North Coast Region offers a beautiful natural environment with opportunities for scientific study and research, recreation, sport and commerce.

Approximately two percent of the total population of California reside in the North Coast Region. The largest urban centers are located in the Eureka area of Humboldt county and in the Santa Rosa area of Sonoma county, which has experienced the highest population change of all the counties. The major industries of the region are logging and timber milling/production, vineyards and some wineries. The area is also home to many wood product manufacturing facilities, including pulp mills.

The North Coast Region has a wide distribution of bays and estuaries. Beginning at the Smith River in northern Del Norte County and ranging south to the Estero de San Antonio in northern Marin County, the Region encompasses a large number of major river estuaries. Other north coast streams and rivers with significant estuaries include the Klamath River, Redwood Creek, Little River, Mad River, Eel River, Noyo River, Navarro River, Elk Creek, Gualala River, Russian River and Salmon Creek (this creek mouth also forms a lagoon). Northern Humboldt County coastal lagoons include Big Lagoon and Stone Lagoon. The two largest enclosed bays in the North Coast Region are Humboldt Bay and Arcata Bay (both in Humboldt County). Another enclosed bay, Bodega Bay, is located in Sonoma County near the southern border of the Region.

The areas of concern and a proposed list of candidate toxic hot spots are presented in the proposed regional toxic hot spot cleanup plan (RWQCB, 1997a).

San Francisco Region (Region 2)

Section 13200(b) of the Porter-Cologne Act defines the San Francisco Bay Region as that which comprises San Francisco Bay, Suisun Bay, from Sacramento River and San Joaquin River westerly from a line which passes between Collinsville and Montezuma Island and follows thence the boundary common to Sacramento and Solano counties and that common to Sacramento and Contra Costa counties to the westerly boundaries of the watershed of Markely Canyon in Contra Costa county, all basins draining into the bays and rivers westerly from this line, and all basins draining into the Pacific Ocean between the southerly boundary of the north coastal region and the southerly boundary of the watershed of Pescadero Creek in San Mateo and Santa Cruz counties.

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 waters 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 region's waterways, wetlands and bays form the centerpiece of the fourth largest metropolitan area in the United States, including all or major portions of Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, Solano and Sonoma counties.

The San Francisco Bay RWQCB has jurisdiction over the part of the San Francisco estuary which includes all of the San Francisco Bay segments extending east to the Delta (Winter Island near Pittsburg). Coastal embayments including Tomales Bay and Bolinas Lagoon are also located in this Region. The Central Valley RWQCB has jurisdiction over the Delta and rivers extending further eastward.

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.

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.

The areas of concern and a proposed list of candidate toxic hot spots are presented in the proposed regional toxic hot spot cleanup plan (RWQCB, 1997b).

Central Coast Region (Region 3)

The Central Coast Region is described by Porter Cologne Section 13200(c) as comprising all basins, including Carrizo Plain in San Luis Obispo and Kern counties, draining into the Pacific Ocean from the southerly boundary of the watershed of Pescadero Creek in San Mateo and Santa Cruz counties to the south easterly boundary, located in the westerly part of Ventura county, of the watershed of Rincon Creek.

The Central Coast Regional Board has jurisdiction over a 300-mile long by 40-mile wide section of the State's central coast. Its geographic area encompasses all of Santa Cruz, San Benito, Monterey, San Luis Obispo, and Santa Barbara Counties as well as the southern one-third of Santa Clara County, and small portions of San Mateo, Kern, and Ventura Counties. Included in the region are urban areas such as the Monterey Peninsula and the Santa Barbara coastal plain; prime agricultural lands as the Salinas, Santa Maria, and Lompoc Valleys; National Forest lands, extremely wet areas like the Santa Cruz mountains; and arid areas like the Carrizo Plain.

Historically, the economic and cultural activities in the basin have been agrarian. Livestock grazing persists, but it has been combined with hay cultivation in the valleys. Irrigation, with pumped local ground water, is very significant in intermountain valleys throughout the basin. Mild winters result in long growing seasons and continuous cultivation of many vegetable crops in parts of the basin.

While agriculture and related food processing activities are major industries in the region, oil production, tourism, and manufacturing contribute heavily to its economy. The northern part of the region has experienced a significant influx of electronic manufacturing, and the southern part has been heavily influenced by offshore oil exploration and production. Total population of the region is estimated to be 1.22 million people.

Water quality problems frequently encountered in the Central Coastal Basin include excessive salinity or hardness of local ground waters. Increasing nitrate concentration is a growing problem in a number of areas, both in ground water and surface water. Surface waters suffer from bacterial contamination, nutrient enrichment, and siltation in a number of watersheds. Pesticides are of concern in agricultural areas and associated downstream water bodies.

Water bodies on the central coast are varied. Enclosed bays and harbors in the Region include Morro Bay, Elkhorn Slough, Tembladero Slough, Santa Cruz harbor, Moss Landing Harbor, San Luis Harbor, and Santa Barbara Harbor. The Region also is characterized by several small estuaries including the Santa Maria River estuary, San Lorenzo River estuary, Big Sur River estuary, and many others.

The areas of concern and a proposed list of candidate toxic hot spots are presented in the proposed regional toxic hot spot cleanup plan (RWQCB, 1997c).

Los Angeles Region (Region 4)

Los Angeles Region is described by Porter Cologne, Section 13200(d) to comprise all basins draining into the Pacific Ocean between the southeasterly boundary, located in the westerly part of Ventura County, of the watershed of Rincon Creek and a line which coincides with the southeasterly boundary of Los Angeles county from the ocean to San Antonio Peak and follows thence the divide between the San Gabriel River and Lytle Creek drainages to the divide between Sheep Creek and San Gabriel River drainages.

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 BPTCP, 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.

The areas of concern and a proposed list of candidate toxic hot spots are presented in the proposed regional toxic hot spot cleanup plan (RWQCB, 1997d).

Central Valley Region (Region 5)

Section 13200(g) of the Porter Cologne earmarks the Central Valley Region as comprising all basins including Goose Lake Basin draining into the Sacramento and San Joaquin Rivers to the easterly boundary of the San Francisco Bay Region near Collinsville. The Central Valley Region has offices in the Sacramento Valley and the San Joaquin Valley.

The two basins are bound by the crests of the Sierra Nevada on the east and the Coast Range and Klamath Mountains on the west. They extend about 400 miles from the California-Oregon border southward to the headwaters of the San Joaquin River. These two river basins cover about one fourth of the total area of the State and over 30 percent of the State's irrigable land. The Sacramento and San Joaquin Rivers furnish roughly 50 percent of the State's water supply. Surface water from the two drainage basins meets and forms the Delta, which ultimately drains into the San Francisco Bay.

The Delta, the area of primary focus for the BPTCP, is a maze of river channels and diked islands covering roughly 1,150 square miles, including 78 square miles of water area. Two major water projects located in the South Delta, the Federal Central Valley Project and the State Water Project, deliver water from the Delta to Southern California, the San Joaquin Valley, Tulare Lake Basin, the San Francisco Bay area, as well as within the Delta boundaries. The legal boundary of the Delta is described in Section 12220 of the Water Code.

The areas of concern and a proposed list of candidate toxic hot spots are presented in the proposed regional toxic hot spot cleanup plan (RWQCB, 1997e).

Santa Ana Region (Region 8)

The Santa Ana Region is described by Porter Cologne Section 13200(e) as comprising all basins draining into the Pacific Ocean between the southerly boundary of Los Angeles Region and a line which follows the drainage divide between Muddy and Moro Canyons from the ocean to the summit of San Joaquin Hills; thence along the divide between lands draining into Newport Bay and into Laguna Canyon to Niguel Road; thence along Niguel Road and Los Aliso Avenue to the divide between Newport Bay and Aliso Creek drainages; thence along the divide and the southeasterly boundary of the Santa Ana River drainage to the divide between Baldwin Lake and Mojave Desert drainages; thence along that divide to the divide between the Pacific Ocean and Mojave Desert drainages.

The Santa Ana Region is the smallest of the nine regions in the state (2800 square miles) and is located in southern California, roughly between Los Angeles and San Diego. Although small geographically, the region's four-plus million residents (1993 estimate) make it one of the most densely populated regions.

The climate of the Santa Ana Region is classified as Mediterranean: generally dry in the summer with mild, wet winters. The average annual rainfall in the region is about fifteen inches, most of it occurring between November and March.

The enclosed bays in the Region include Newport Bay, Bolsa Bay (including Bolsa Chica Marsh), and Anaheim Bay.

The areas of concern and a proposed list of candidate toxic hot spots are presented in the proposed regional toxic hot spot cleanup plan (RWQCB, 1997f).

San Diego Region (Region 9)

The San Diego Region is described by Porter Cologne Section 13200(f) as comprising all basins draining into the Pacific Ocean between the southern boundary of the Santa Ana Region and the California-Mexico boundary.

The San Diego Region is located along the coast of the Pacific Ocean from the Mexican border to north of Laguna Beach. 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 coastal strip. Six deep water sewage outfalls and one across the beach discharge from the new border plant at the Tijuana River empty into the ocean. Two harbors, Mission Bay and San Diego Bay, support major recreational and commercial boat traffic. Coastal lagoons are found along the San Diego County coast at the mouths of creeks and rivers.

Weather patterns are Mediterranean in nature with an average rainfall of approximately ten inches per year occurring along the coast. Almost all the rainfall occurs during wet cool winters. The Pacific ocean generally has cool water temperatures due to upwelling. This nutrient-rich water supports coastal beds of giant kelp.

The cities of San Diego, National City, Chula Vista, Coronado, and Imperial Beach surround San Diego Bay in the southern portion of the Region. The Bay is long and narrow, 15 miles in length and 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 80 surface ships and submarines.

Coastal waters include bays, harbors, estuaries, beaches, and open ocean. Deep draft commercial harbors include San Diego Bay and Oceanside Harbor and shallower harbors include Mission Bay and Dana Point Harbor. Tijuana Estuary, Sweetwater Marsh, San Diego River Flood Control Channel, Kendal-Frost wildlife reserve, San Dieguito River Estuary, San Elijo Lagoon, Batiquitos Lagoon, Agua Hedionda Lagoon, Buena Vista Lagoon, San Luis Rey

Estuary, and Santa Margarita River Estuary are the important estuaries of the region.

There are thirteen principal stream systems in the region originating in the western highlands and flowing to the Pacific Ocean. From north to south these are Aliso Creek, San Juan Creek, San Mateo Creek, San Onofre Creek, Santa Margarita River, San Luis Ray River, San Marcos Creek, Escondido Creek, San Dieguito River, San Diego River, Sweetwater River, Otay River, and the Tijuana River. Most of these streams are interrupted in character having both perennial and ephemeral components due to the rainfall pattern in the region. Surface water impoundments capture flow from almost all the major streams.

The areas of concern and a proposed list of candidate toxic hot spots are presented in the proposed regional toxic hot spot cleanup plan (RWQCB, 1997g).

ISSUE ANALYSIS

The staff analysis of each issue addressed during the development of the Water Quality Control Policy is formatted consistently to provide the SWRCB with a summary of the topic or issue as well as alternatives for their action. All comments received and the responses are presented in a separate section after the Environmental Checklist.

Each issue analysis contains the following sections:

Issue:	A brief description of the issue or topic.
Present Policy:	A summary of any existing Statewide 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 should be adopted by the SWRCB.

Issue 1: ***Authority and Reference for Guidance on Developing Toxic Hot Spot Cleanup Plans***

Present Policy: None.

Issue Description: In order to be developed fairly and consistently, the Statewide and Regional THS cleanup plans should be developed and implemented consistent with existing Plans and Policies of the SWRCB and RWQCBs. The only way to ensure consistency is for the SWRCB to require the conformance of the plan development to a set of guidelines. If the guidance is mandatory then the SWRCB must adopt the guidance (e.g., a Statewide Plan or Policy) in accordance with the requirements of CEQA and the APA.

The SWRCB should consider the format of the guidance it will issue to the RWQCBs.

Alternatives:

1. <u>The SWRCB should consider incorporating the guidance for developing toxic hot spot cleanup plans into a Statewide Water Quality Control Plan.</u>

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 BPTCP guidance, 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 would not allow the SWRCB and RWQCBs to meet the legislatively mandated deadlines.

2. <u>The SWRCB should adopt a stand-alone Policy for guidance on developing cleanup plans. The SWRCB should adopt</u>

language that identifies the statutory authority to adopt a Policy, where the Policy applies, and variance provisions.

The SWRCB has the authority to adopt Policy for Water Quality Control (please refer to 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...."

Implementation of a clearly worded Policy with limited flexibility in interpretation would ensure consistent development of the toxic hot spot cleanup plans on a Statewide basis. However, if the Policy is too specific it may preclude site-specific circumstances encountered by the RWQCBs. If a Policy is developed, it should allow for site-specific variances similar to the exception process in the California Ocean Plan (1997a) or site-specific variances allowed pursuant to the California Underground Storage Tank Regulations (Title 23, Article 8, CCR Sections 2680 through 2681).

3. The State Water Board should not adopt any formal guidance to implement the BPTCP.

This alternative provides the most flexibility of any of the alternatives presented. This flexibility is advantageous with the variety of conditions that will be encountered by the RWQCBs. However, it is also likely that the Regional Toxic Hot Spot Cleanup Plans developed without specific guidance could be completed with widely varying interpretations of the toxic hot spot definition and ranking criteria, have variable formats, incomplete consideration of remediation alternatives, among other problems due to varying interpretations of the Water Code (Sections 13390 et seq.). This would make the task of developing the consolidated Statewide cleanup plan more difficult.

Staff Recommendation: Adopt Alternative 2.
Please refer to page "xlviii" of the proposed Water Quality Control Policy for the variance provisions.

Issue 2: ***Toxic Hot Spot Definition***

Present Policy: None.

Issue Description: One of the fundamental tasks of the BPTCP is the identification of toxic hot spots. The SWRCB needs to consider whether a specific definition of toxic hot spots is warranted. The issue is: Should the SWRCB implement a general definition of a toxic hot spot or should another definition that is more focused be used?

Background

Section 13391.5 of the Water Code defines toxic hot spots as "...locations in enclosed bays, estuaries, or adjacent waters in the 'contiguous zone' or the 'ocean' as defined in Section 502 of the Clean Water Act (33. U.S.C. Section 1362), the pollution or contamination of which affects the interests of the State, and where hazardous substances have accumulated in the water or sediment to levels which (1) may pose a substantial present or potential hazard to aquatic life, wildlife, fisheries, or human health, or (2) may adversely affect the beneficial uses of the bay, estuary, or ocean waters as defined in the water quality control plans, or (3) exceeds adopted water quality or sediment quality objectives."

Identification of toxic hot spots is a critical first step in the assessment, cleanup or remediation of polluted sites in California's enclosed bays and estuaries. To assist the SWRCB and RWQCBs staff, the SWRCB sponsored a technical workshop in February, 1991 in an effort to determine the criteria necessary to develop a Sediment Quality Assessment Strategy (Lorenzato et al., 1991). The workshop was attended by more than twenty scientific experts in sediment quality assessment from around the country, as well as observers from state and federal agencies, discharger organizations, and environmental groups. The participants' recommended higher and lower priorities for criteria that an ideal sediment quality assessment strategy should meet. These criteria are presented in Table 2.

Toxic Hot Spot Definition Considerations

One of the most important views expressed by the sediment quality assessment workshop participants was the adoption of a weight-of-evidence approach for the evaluation of sediment quality assessment information. A weight-of-evidence approach relies on a comprehensive judgment of chemical, physical, biological, toxicological, and modeling information to draw conclusions regarding the effects of pollutants on biological resources and human health. In order to implement this approach it is necessary for the toxic hot spot definition to include assessment of biological response as well as analysis of the chemical contamination of various media.

These measures can focus on several levels of biological organization from organism to community, from single celled organisms to the highest order predators. Any of these measures taken singly can provide limited insight into the quality of the estuarine or bay environment. When used together they will provide a much more comprehensive characterization of the environment of interest than any one measure used alone.

In 1995 and 1996, the BPTCP Scientific Planning and Review Committee reviewed the monitoring activities of the BPTCP (SPARC, 1997). The committee made several comments on the definition that were incorporated into the most current version included in this FED. The SPARC considered the monitoring activities scientifically defensible.

There are other programmatic and regulatory elements that also need to be considered in the development of a specific toxic hot spot definition, and include:

1. The definition must be able to distinguish between sites with either significant or little information on environmental impacts of toxic pollutants.

2. The definition must be testable using interpretable scientific procedures (i.e., either indicators of stress or actual measurements of impacts on beneficial uses).

TABLE 2: PRIORITIZED CRITERIA RECOMMENDED FOR A SEDIMENT QUALITY ASSESSMENT STRATEGY.[1]

Higher Priority
Differentiate between effects due to toxic substances and changes due to natural factors (describe the significant variability of exposure and response, including identification of major sources of variability).
Be of broad and local ecological relevance.
Detect the effects on biota from long-term exposures.
Consider the bioavailability, exposure potential, and/or bioaccumulation of toxic agents.
Be a tiered approach that utilizes multiple assessment tools and/or approaches, including a first tier that is rapid, sensitive, and overprotective.
Use of a suite of appropriate sensitive species.
Identify agent(s) causing toxicity in the field.
Clearly identify range above which impairment occurs and below which no impairment is predicted.
Identify and quantify potentially toxic agent(s).
Include a mechanism to evaluate efficacy and incorporate improvements.
Be scientifically defensible.

Lower Priority
Detect effects on biota from short-term exposures.
Be clearly described.
Specify the degree of certainty of protection which will be attained for sensitive organisms.
Be of low or moderate cost.[2]

[1] Priorities assigned based on information presented at the State Water Resources Control Board sponsored Sediment Quality Assessment Workshop held in February 1991.

[2] Costs were de-emphasized in an effort to define the most technically appropriate assessment approach. Cost limitations are to be considered by the SWRCB as part of its ongoing program management.

3. The definition should be usable with existing monitoring information as well as with any new monitoring information that may become available.

4. Biological response(s) of organisms is of greater importance than chemical measurement alone.

5. Biological response should be associated with the presence of non-naturally-occurring toxic pollutants (association of biological response with exposure to other physical or chemical agents alone, e.g., hydrogen sulfide (H_2S), grain size, total organic carbon (TOC), etc., is not sufficient to identify a toxic hot spot).

6. Actual loss of beneficial use is not necessary to designate a site as a toxic hot spot (i.e., indicators of pollutant effects are sufficient for the designation).

7. The very general term "interests of the State" is defined as the public health and welfare of the people of California. This definition includes protection of the environment, costs of remediation, and benefits of remediation.

8. Toxic hot spots are locations (sits in waters of the State) in enclosed bays, estuaries or the ocean. Sources of pollutants such as publicly owned treatment works, industrial facilities, agricultural land, storm drains, etc. are not toxic hot spots.

Alternatives:

1. Allow Regional Water Boards to apply only the statutory definition of toxic hot spot provided in Section 13391.5 of the Water Code.

The statutory definition of a toxic hot spot gives the RWQCBs significant latitude in considering which locations in the State are considered toxic hot spots. Using this definition would give the same "toxic hot spot" designation to sites with little information available and sites that are well studied. The RWQCBs would then be required to develop a cleanup plan that planned for the remediation or further prevention of toxic pollutants at these sites.

The statutory definition of a toxic hot spot is quite general, and could be subject to an interpretation that would allow large portions (if not all) of California's coastline, including enclosed bays and estuaries, to be designated as toxic hot spots. A very broad interpretation would not help the SWRCB and RWQCBs in planning for the cleanup or remediation of toxic hot spots because it would be difficult to focus efforts where regulatory response is needed most. It is very unclear how many toxic hot spots would be identified using the statutory definition. Conceivably, every water body that has been previously sampled could be designated as a toxic hot spot.

2. Apply a more specific definition of a toxic hot spot that is consistent with the intent of Section 13391.5 of the Water Code.

One of the most critical steps in the development of toxic hot spot cleanup plans is the identification of hot spots. Once they are identified the parties responsible for the sites could be liable for the cleanup of the site or further prevention of the discharges or activities that caused the toxic hot spot. The SWRCB should consider that before a site is listed as a known toxic hot spot (i.e., before the SWRCB has formally adopted the consolidated cleanup plan), the site should be considered a Candidate Toxic Hot Spot. If a candidate toxic hot spot is adopted by a RWQCB and subsequently by the SWRCB in the consolidated toxic hot spot cleanup plan then the toxic hot spot becomes a known toxic hot spot. This then triggers the requirement for the RWQCBs to reevaluate WDRs for the known toxic hot spot (Water Code Section 13395).

The specific definition of a toxic hot spot that follows combines consideration of statutory definition of a toxic hot spot, sediment quality assessment criteria from the SWRCB 1991 workshop, programmatic and regulatory criteria, SPARC review, and tools currently available to identify toxic hot spots.

Proposed Specific Definition

The proposed specific definition of a toxic hot spot is presented in the draft Water Quality Control Policy. Please refer to pages "xx" through "xxiii" for the complete text of the definition.

Rationale for the Specific Definition

Under this alternative, the definition of a toxic hot spot is separated into two parts: candidate and known, based on whether the RWQCBs and SWRCB have adopted cleanup plans identifying the site as a known toxic hot spot. A site should be considered a candidate toxic hot spot if it exhibits significant toxicity, high levels of bioaccumulation, impairment of resident organisms, degradation of biological resources, or water or sediment quality objectives are exceeded.

Discharger facilities are not toxic hot spots, nor can dischargers or be considered to be defined as a toxic hot spot because toxic hot spots are defined in the Water Code (Section 13391.5(e)) as "locations" in enclosed bays estuaries or the ocean where certain conditions are met.

Sites that are not well characterized (i.e., insufficient data to designate as a candidate toxic hot spot) shall be characterized as areas of concern. Any site designated as an area of concern will be a candidate for further monitoring to confirm preliminary indications of the site impairments.

Human Health

Toxic hot spots can be caused by pollutants that have the potential to cause impacts on human health. In California, if a fish advisory has been issued (by OEHHA or the California Department of Health Services) for a water body then it is acknowledged that the beneficial use for that water to protect human health via seafood consumption is impaired (i.e., the beneficial use has been lost because the public has been warned that fish tissue concentrations are high enough to be potentially harmful to human health). Several agencies (e.g., Office of Environmental Health Hazard Assessment and the Food and Drug Administration) have also published chemical specific values for tissue concentrations that are intended to protect human health (FDA, 1984; OEHHA, 1991; EPA, 1993f). These values are extremely useful in assessing the quality of fish or other organism tissue for consumption. When used carefully and consistently these considerations can assist in identifying locations where human health may be impacted.

Biological Indicators of Pollutant Effects

There is presently no single method, test, or procedure capable of adequately characterizing the many and varied adverse biological effects and ecological impacts contaminated sediments may cause. The most appropriate and scientifically defensible approach currently available appears to be choosing not one, but an array of tests that determine multiple endpoints using a number of individual species or ecological assemblages, and that can also assess various routes of exposure.

Toxicity Testing

The use of a number of different organisms ensures a greater opportunity to identify problematic conditions than reliance on a single organism. Toxicity can be assessed in relation to either complex mixtures or individual substances; it can also be evaluated on the basis of acute or chronic exposures in test systems. The determination of an array of toxicity testing endpoints ranging from lethality, through critical life stages, will allow the evaluation of a variety of effects.

Several species have been tested for acute toxicity to bedded (as opposed to suspended) sediment samples. For saline and brackish waters, tests for amphipods are well developed and widely used as acute, lethal tests (e.g., ASTM, 1993; De Witt et al., 1989; Nebecker et al., 1984). These amphipods have been used on field samples and laboratory spiked sediments. Chronic exposures have been tested with the polychaete Neanthes (Johns et al., 1990). Growth of the polychaete is measured in a 20-day exposure. Reduction in growth over this period has been shown to predict adverse effects on reproduction.

Direct measurement of reproductive effects is another means of characterizing biological impairment. Several tests developed for the measurement of adverse reproductive effects arising from exposure to polluted water have been adapted to characterize potential problem sediments. Most of these tests require the preparation of an elutriate (the mixing of sediment with water, subsequent settling, and then testing in the water separated from the settled sediments) (e.g., ASTM, 1987).

Interpretation of Toxicity Data

In the proposed toxic hot spot definition, toxicity data is assessed relative to a reference envelope that includes all sources of laboratory and field variation affecting toxicity test results. In the absence of a calculated reference envelope the toxicity data are compared to laboratory controls.

The reference envelope includes results from all reference sites in a particular area, past and present. The reference envelope approach has been used to determine whether the level of toxicity exceeds the lower confidence interval of the reference envelope. As more reference site toxicity results become available more will be known on the range of organism responses found within a reference site condition. This will provide a better tool for determining differences between the toxicity response at reference sites relative to the level of toxicity responses at impacted sites.

A "reference envelope" statistical approach has been employed (Smith, 1995; Fairey et al., 1996; Hunt et al., 1998) to identify samples that exhibit significantly greater toxicity than expected in a waterbody as a whole.

The reference envelope approach uses data from "reference sites" to characterize the response expected from sites in the absence of localized pollution. Using data from the reference site population, a tolerance limit is calculated for comparison with data from test sites. Samples with toxicity values greater than the tolerance limit are considered toxic relative to the ambient condition of the waterbody.

This relative standard established using reference sites is conceptually different from what might be termed the absolute standard of test organism response in laboratory controls. Rather than comparing sample data to characterize the variance component, the reference envelope approach compares sample data against a percentile of the reference population of data values, using variation among reference sites as the variance component (Figure 2). The reference envelope variance component, therefore, included variation among laboratory replicates, among field replicates, among sites, and among sampling events.

The reference stations are assumed to be a random sample from an underlying population of reference locations that serve as a standard for what we considered relatively non-impacted conditions (i.e., the reference sites support an undegraded benthic community and has relatively low toxic chemical concentrations). The toxicity measured at different reference locations will vary due to the different local conditions that can affect the toxicity results. In order to determine whether sediments from a test location are toxic, bioassay results for the test location are compared with bioassay results from the population of reference locations.

Assuming the bioassay results from the population of reference locations are normally distributed, an estimate of the probability that the test sediment is from the underlying reference station distribution can be made. For example, if the result for a test sediment was at the first percentile of the underlying reference location distribution (in the direction of toxicity), then there would be about a 1 percent chance that the test sediment was from the distribution of reference locations.

The toxicity level at the first percentile of the reference distribution is not known because there were only limited samples from the underlying distribution and only an estimate could be made of where the first percentile lies. If an estimate of the first percentile value was made a large number of times, using different random samples from the reference distribution, a (non-central t) distribution of estimates, with the distribution mode at the actual first percentile would be obtained (Figure 2). In Figure 2, from the distribution of estimates about one half of the time the estimate from the sample was above the actual first percentile. Ideally, identification of an estimated toxicity value would cover the actual first percentile for a large percentage of the estimates (say 95 percent of the time). Such a value can be obtained from the left tail of the distribution of estimates where 5 percent of the estimates

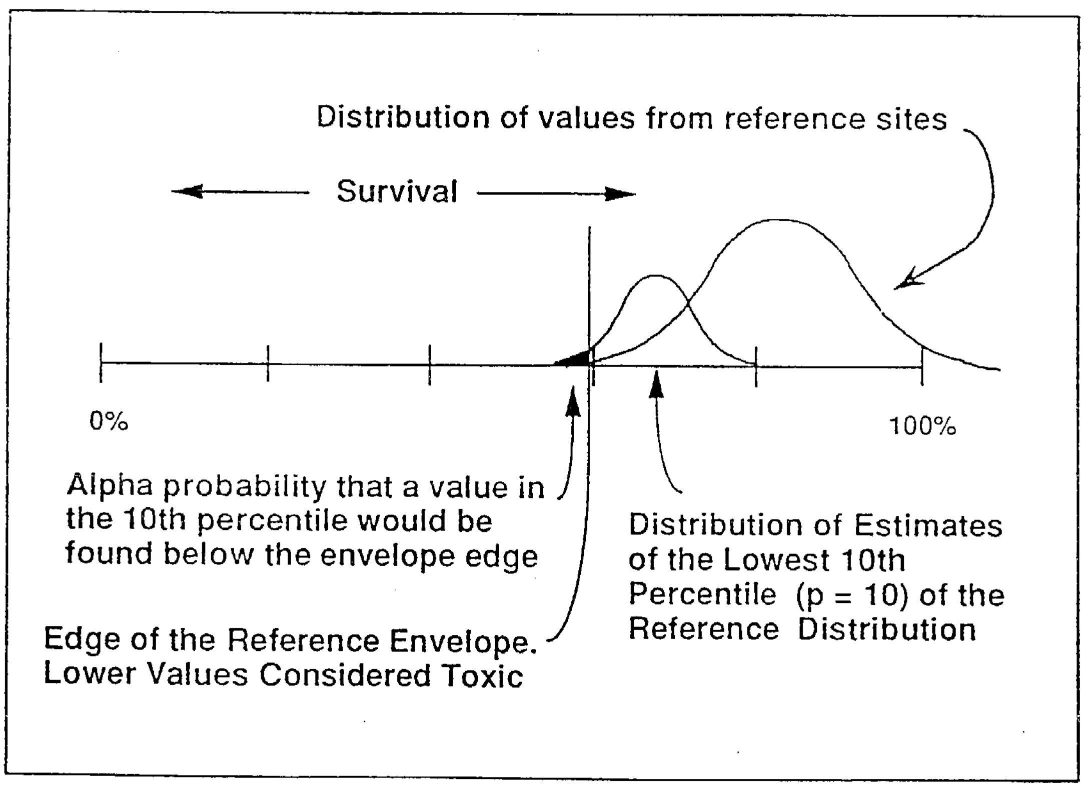

FIGURE 2: SCHEMATIC ILLUSTRATION OF THE REFERENCE ENVELOPE (LOWER TOLERANCE BOUND) TO DETERMINE TOXICITY RELATIVE TO PERCENTILE OF THE REFERENCE SITE DISTRIBUTION.

are less than the chosen value. The definition of "p" is the percentile of interest, and alpha is the acceptable error probability associated with an estimate of the p^{th} percentile. Thus, in this example, p=10 and alpha = .05.

The toxicity level can be computed that will cover the p^{th} percentile 1 minus alpha proportion of the time as the lower bound (L) of a tolerance interval (Vardeman, 1992) as follows:

$$L = X_r - [g_{a,p,n} * S_r]$$

where Xr is the mean of the sample of reference stations, S_r is the standard deviation of the toxicity results among the reference stations, and n is the number of reference stations. The g values, for the given alpha, p, and n values, can be obtained from tables in Hahn and Meeker (1991) or Gilbert (1987). S contains the within- and between-location variability expected among reference locations. If the reference stations are sampled at different times, then it is assumed that S will also incorporate space-time variability. When data are used from multiple sampling sites sampled at different times, bootstrapping techniques can and should be used to calculate an alternative statistic for “g” (i.e., the “K” values used in Hunt et al., 1998). When other variance components, such as space or time, account for a greater share of the variance, which happens frequently, the results between “g” and “K” analyses can diverge widely, giving radically different tolerance limits.

The "edge of the reference envelope" (L) represents a toxicity level used to distinguish toxic from non-toxic sediments. The value used for p will depend on the level of certainty needed for a particular regulatory situation.

Unexplained toxicity in samples from reference sites should be considered a problem (*i.e.*, the reference site no longer exhibits reference site characteristics) if toxicity occurs in more than 25 percent of reference samples, and should not be considered a problem if it occurred in less than 10 percent of reference site samples.

The reference envelope should include toxicity data from many different sampling times. Temporal variability should be included in the calculation of reference envelope if the data to do so are available.

The reference envelope for toxicity can include reference sites from a broad geographical area (as big as the entire West Coast) or be limited to the local study area, depending on specific study objectives.

To determine statistical significance, study site results should be compared to both:

1. the tolerance limit derived from a reference envelope that includes previous data, and

2. results from concurrently collected local reference site sample(s).

The RWQCBs should set reference envelope "p" values appropriate for their Regions. The "p" is the percentile of the reference distribution used to set tolerance limits.

Consideration for selection of "p" values include:

1. the degree of confidence that reference site samples are indicative of desired ambient water body conditions,

2. the level of degradation exhibited by reference site samples, and

3. the social and economic goals (impacts) associated with designating study sites as a toxic hot spot.

Low "p" values are appropriate for situations where there is high confidence that reference sites are indicative of desired environmental conditions, and the economic or social costs related to a finding of toxicity are high. Higher "p" values are more appropriate when reference sites are assumed to represent less than optimal conditions, or when policy impacts are less severe.

There may be greater uncertainty associated with the use of low "p" values. The lower the "p" value, the farther it extends into the tail of the reference population distribution, where deviations from normality are most extreme.

The reference envelope approach is strongly tied to an assumption of normality of the underlying data distribution, and that distribution should be checked as a matter of routine. Any suggestion of strong departure from a bell-shaped or triangular distribution (e.g., skewness, multiple modes, or a flat distribution) should be cause to use the reference envelope approach results with caution. If the reference envelope approach produces tolerance limits that are counter to best professional judgment, the following steps should be taken:

1. Check the data distribution, transform data if necessary.

2. Consider switching test protocols.

3. Check that reference sites were selected appropriately.

4. Check if the "p" value is appropriate. This may involve re-evaluation of reference sites, and/or policy considerations.

5. If unexplained reference site toxicity exists, it should be investigated.

In the absence of a "reference envelope", significant toxicity relative to the surrounding water body should be determined by using a t-test control approach.

Statistical significance in t-tests should be determined by dividing an expression of the difference between sample and control by an expression of the variance among replicates. A "separate variance" t-test should be used that adjusts the degrees of freedom to account for variance heterogeneity among samples. If the difference between sample and control is large relative to the variance among replicates, then the difference is determined to be significant. In many cases, however, low between-replicate variance will cause a comparison to be considered significant, even though the magnitude of the difference can be small. The magnitude of difference that can be identified as significant is termed the Minimum Significant Difference (MSD), which is dependent on the selected alpha level, the level of between-replicate variation, and the number of replicates specific to the experiment. With the number of replicates and alpha level held constant, the MSD varies with the degree of between-replicate variation. The "detectable difference" inherent to the toxicity test protocol can be determined by identifying the magnitude of difference that can be detected by the protocol 90 percent of the time (Schimmel et al., 1994; Thursby and Schlekat, 1993). This is equivalent to setting the level of statistical power at 0.90 for these comparisons. This is accomplished by determining the MSD for each t-test conducted, ranking them in ascending order, and identifying the 90th percentile MSD, the MSD that is larger than or equal to 90% of the MSD values generated.

Thursby et al. (1997) identify a value of 80% of the control as the detectable difference for the Ampelisca amphipod survival test in solid-phase sediments, and similar values have been derived for BPTCP test data and will and have been used in the reports.

Histopathology

Adverse effects may also be determined by visual means, for necropsy or for morphological deformities, defects, or other pathological changes in specific tissues or organs. Lesions in these tissues are often correlated with death, deformity, or poor general fitness (condition indices) of the animal, and include cancerous or precancerous transformations in tissues such as the gills, liver, reproductive organs, etc. (Okihiro and Hinton, 1996; Malins et al., 1987). Some abnormalities can, however, appear in the early stages of the development of more damaging pathologies that may be reversible (these are indications of exposure rather than actual adverse effects).

Benthic Community Analysis

Benthic community structure (organisms that live in the sediments) can be used to assess whether two sites with substantially similar physical characteristics differ in terms of the species present and numbers of individuals of each species. These types of measures focus on the population or community level. The results can then be analyzed using ordination techniques, principal component analysis, or other techniques to identify potential causes of any differences detected.

The analysis of community composition provides not only a direct assessment of impacts, but also an opportunity to identify indicator species, i.e., species that respond predictably or characteristically in the presence or absence of degraded conditions, such as those produced by a polluted benthic environment. Due to the myriad of forces influencing the composition of a community or population, it is often difficult to determine whether toxic pollutants are responsible for such changes.

To clarify whether toxicants are exerting significant effects, community analysis can be coupled with measures of individual organisms. The integration of community measures and toxicity tests provides for a weight-of-evidence that decreases the possibility of attributing adverse effects to pollutants when, in fact, they are not. The ability for individual toxicity testing methods or suites of toxicity tests to predict community level effects can also be evaluated. Benthic community analysis can also be used to evaluate reference conditions (Fairey et al., 1996). The BPTCP has used benthic community analysis to assess impacts on organisms (e.g., Fairey et al., 1996; Anderson et al., 1997).

Chemical Measures

The statutory definition of a toxic hot spot requires that the SWRCB and RWQCB focus on the effects of toxic pollutants. In the proposed specific definition of a toxic to spot the significance of chemical measures is subordinate to measures of effect (i.e., chemical measure alone will not cause a site to be designated a toxic hot spot (except as described below)). For a site to be designated a toxic hot spot, a determination of association of biological effect with measured chemistry that may contribute to the observed biological effect(s) must be made. There are several approaches available that allow a determination of chemical concentration in sediments can potentially contribute to the observed benthic or toxic effect.

1. Environmental Protection Agency (EPA) Sediment Quality Criteria (SQC)--Equilibrium Partitioning

   The EqP approach assumes that pollutants in sediments are generally in a state of thermodynamic equilibrium and that the relative concentration of a pollutant in any particular environmental compartment (sediment, pore water, ambient water, etc.) can be predicated using measured partitioning coefficients for specific substances in equilibrium equations. The EqP approach is currently limited to nonpolar, nonionic compounds although methods for metals are under development. EPA has published (EPA, 1993a; 1993b; 1993c; and 1993d) draft SQC that could be used for this purpose. Although not verified, EPA is pulling back some of the sediment values previously published. EPA used the SQC to evaluate chemical data in the National Sediment Quality Survey (USEPA, 1997b).

2. Effects Range Low (ERL), Effects Range Median (ERM), Probable Effects Level (PEL), Threshold Effects Level (TEL)

Two related efforts have been completed that provide an alternative approach for evaluating the quality of marine and estuarine sediments. These are the National Oceanic Atmospheric Administration (NOAA) (Long et al., 1995) and the sediment weight-of-evidence guidelines developed for the Florida Coastal Management Program (1992) and MacDonald, 1994).

Long et al. (1995) assembled data from throughout the country for which chemical concentrations had been correlated with effects. These data included spiked bioassay results and field data of matched biological effects and chemistry. The product of the analysis is the identification of two concentrations for each substance evaluated. One level, the Effects Range-Low (ERL) was set at the 10th percentile of the ranked data and was taken to represent the point below which adverse effects are not expected to occur. The second level, the Effects Range-Median (ERM), was set at the 50th percentile and interpreted as the point above which adverse effects are expected. A direct cause and effect linkage in the field data was not a requirement for inclusion in the analysis. Therefore, adverse biological effects recorded from a site could be attributed to both a high concentration of one substance and a low concentration of another substance if both substances were measured at the site. The adverse effect in field data could be caused by either one, or both, or neither of the two substances of concern.

The State of Florida efforts (1994) revised and expanded the Long and Morgan (1990) data set and then identified two levels of concern for each substance: the "TEL" or threshold effects level, and the "PEL" or probable effects level. Some aspects of this work represent improvements in the original Long and Morgan analysis. First, the data was restricted to marine and estuarine sites, thereby removing the ambiguities associated with the inclusion of freshwater sites. Second, a small portion of the original Long and Morgan (1990) database was excluded, while a considerable increase in the total data was realized due to inclusion of new information. The basic criteria for data acceptance and for classifying the information within the database were essentially the same as used by Long and Morgan (1990).

The development of the TEL and PEL differ from Long and Morgan's development of ERL and ERM in that data showing no effects were incorporated into the analysis. In the weight-of-evidence approach recommended for the State of Florida, two databases were assembled; a "no-effects" database and an "effects" database. The PEL was generated by taking the geometric mean of the 50th percentile value in the effects database and the 85th percentile value of the no-effects database. The TEL was generated by taking the geometric mean of the 15th percentile value in the effects database and the 50th percentile value of the no-effects database. By including the no effect data in the analysis, a clearer picture of the chemical concentrations associated with the three ranges of concern; no-effects, possible effects, and probable effects, can be established.

Predicting toxicity using the sediment values has recently been published (Long et al., 1998). The sediment values are reasonably good predictors of sediment toxicity and are most useful if accompanied by data from biological analyses, toxicological analyses, and other interpretative tools. These measures are most predictive of toxicity if several values are exceeded.

3. Apparent Effects Thresholds (AET) and scatterplots

The AET approach is an empirical method applying the triad of chemical, toxicological, and benthic community field survey measures to determine a concentration in sediments above which adverse effects are always expected (statistically significant adverse effects are predicted at $p<0.05$) (EPA 1989). Each suite of measures consists of chemical and toxicological measures taken from subsamples of a single sample and benthic analysis conducted on separate samples collected at the same time and place. A large suite of chemical measures and a large number of sites are required before an AET value can be estimated. The method assumes a single toxicant is responsible for effects measured at a given site. In addition, the value generated is by design, an effect level rather than a protective level. While above the AET one can expect adverse effects, the method does not recognize that below the AET adverse effects may be attributed to the substance of concern. A major limitation of the method is that the observed relationships between effects and chemical concentrations are based on correlations only (the relationship does not demonstrate cause and effect).

4. Correlations

   Correlations between toxicity or benthic community effects and chemical concentration can be used to show the relationship between these factors. Correlation analysis is most useful in assessing which chemicals study-wide (or throughout a specific dataset) may contribute to toxicity or benthic effects (Fairey et al., 1996; Anderson et al., 1997).

5. Multivariate Analysis

   Patterns of occurrence of pollutants can be identified using multivariate techniques (cf. Anderson et al., 1988). Procedures such as Principal Components Analysis can be used to reduce a dataset from a large number of individual measurements which are often correlated with each other to a small number of uncorrelated factors, each group representing a group of pollutants that have a similar pattern distribution. These groups can be used in scatterplots, correlation calculations or subsequent multivariate analysis.

6. Sediment Toxicity Identification Evaluation

   Sediment toxicity identification evaluation (TIE) methods can be used to make a better estimate of the cause-and-effect relationship between chemicals and toxicity. TIEs provides strong scientific evidence that a chemical or group of chemicals is causing toxicity. When a specific discharger is identified and the chemical of concern is known, a study can be performed to link the observed effects with the chemical on a site-by-site basis.

7. Weight-of-Evidence

   Use any available sediment guidelines outlined in 1 through 4. This approach relies on a substantial amount of evidence with all available chemical screening levels to indicate when effects produced by specific pollutants are likely to occur. This approach combined with biological measures of effect (i.e., the Sediment Quality Triad) is a very strong tool for designating toxic hot spots (SPARC, 1997; Chapman et al., in press; Fairey et al., 1996; Anderson et al., 1997).

The BPTCP has used individual measures such as the PEL or ERM, ERM and PEL quotients (cf. Fairey et al., 1996; Anderson et al., 1997) as the values to make determinations of association between chemicals and toxicity.

The specific definition does not stipulate which chemical values to use because the environmental and pollution-related conditions are so variable throughout the State. By not specifying the precise values to use the SWRCB is allowing the RWQCBs to exercise their discretion in making the determination if observed biological effects are associated with toxic pollutants.

Water and Sediment Quality Objectives

The statutory definition of a toxic hot spot requires that if a site exceeds water or sediment quality objectives, the site is considered to be a toxic hot spot. By definition, water quality or sediment quality objectives are established for the reasonable protection of beneficial uses. Narrative water quality objectives are in the various Basin Plans and numeric water quality objectives are contained in the California Ocean Plan and some basin plans (e.g., the San Francisco Bay Basin Plan). If the California Toxics Rule is promulgated, the EPA criteria applicable to California Bays and Estuaries will apply.

Sediment quality objectives are not contained in the Basin Plans but there are narrative water quality objectives in the Ocean Plan that apply to sediments.

3. Apply a more specific toxic hot spot definition that is consistent with the intent of Section 13391.5 of the Water Code that does not include the category of "Candidate" toxic hot spot.

As in alternative 2, one of the most critical steps in the development of toxic hot spot cleanup plans is the identification of hot spots. Once they are identified the parties responsible for the sites could be liable for the cleanup of the site or further prevention of the discharges or activities that caused the hot spot. Because the cost of cleanup or added prevention could be very high, the SWRCB should consider categorizing toxic hot spots to distinguish between sites that have little or no information (potential toxic hot spots) and areas with significantly more information (known toxic hot spots). Under this alternative, sites would be categorized as either known or potential toxic hot spots as presented in SWRCB (1993).

Under this alternative, the definition of a toxic hot spot is separated into two parts, potential and known, based on the amount of information available and the confidence we have in the interpretation of the information and whether the RWQCBs have adopted cleanup plans identifying the site as a known toxic hot spot. A site would be considered a known toxic hot spot if it exhibits significant toxicity, high levels of bioaccumulation, impairment of resident organisms, degradation of biological resources, or water or sediment quality objectives are exceeded.

The disadvantage of this alternative is that potential dischargers may be considered to be liable for the hot spot before the RWQCBs have adopted a cleanup plan.

Staff Recommendation: Adopt Alternative 2.

Issue 3: ***Criteria to Rank Toxic Hot Spots in Enclosed Bays and Estuaries of California***

Present Policy: None.

Issue Description: The development of criteria for the priority ranking of toxic hot spots in enclosed bays and estuaries is required by the California Water Code. This section reviews the statutory requirements, programmatic considerations, various ranking systems, and presents a recommended system for use in the Water Quality Control Policy.

The site ranking criteria proposals were first discussed at the January 7, 1993 SWRCB Workshop. At that workshop, the SWRCB directed the staff to conduct a staff workshop to solicit public comment. Staff workshops were held on January 26 and 28, 1993. Since that time the SWRCB has developed several versions of the ranking criteria (e.g., DWQ/SWRCB, 1995; SWRCB, 1997d). The SWRCB and RWQCB staff have discussed the ranking criteria with the BPTCP Advisory Committee and solicited their comments.

Background

The California Water Code, Section 13393.5, requires the State Water Board to develop and adopt criteria for the priority ranking of toxic hot spots in enclosed bays and estuaries. The criteria are to "take into account pertinent factors relating to public health and environmental quality, including but not limited to potential hazards to public health, toxic hazards to fish, shellfish, and wildlife, and 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."

The role of the ranking criteria is to provide a priority list of sites based on the severity of the identified problem. The Water Code calls for waste discharge requirements to be reevaluated in the ranked order. Water Code Section 13395 states, in part, that the Regional Boards shall "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 initiated within 120 days from, and the last shall be initiated within one year from, the ranking of toxic hot spots."

The priority ranking for each site is to be included in a Regional Toxic Hot Spot 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 list of ranked hot spots will be consolidated into a statewide prioritized list of toxic hot spots, and included in the consolidated toxic hot spot cleanup plan.

Within specified periods of time, waste discharge requirements for each source identified as contributing to a toxic hot spot are to be reviewed and revised (with certain exceptions) to prevent further pollution of existing toxic hot spots or the formation of new hot spots. The reevaluation of permits is to be conducted in the order established by the priority ranking of hot spots.

Assumptions and Limitations of the Ranking Criteria

The Water Code Section 13393.5 requires that the criteria take into account "pertinent factors relating to public health and environmental quality, including but not limited to, potential hazards to public health, toxic hazards to fish, shellfish, and wildlife, and 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."

In addition to the considerations stipulated in Water Code Section 13393.5, several assumptions were applied to the evaluation of the various alternative ranking systems.

Assumptions

1. Criteria should address broad programmatic priorities.

2. Ranking should be based on existing information at the time of ranking; additional studies should not be required for the purpose of setting priorities on candidate or known toxic hot spots.

3. Assessment of cost and feasibility of remedial actions for a site will be considered in toxic hot spot cleanup plans but factors that influence cost will be considered as part of the ranking criteria (e.g., estimates of areal extent of a toxic hot spot).

4. The best available scientific information will be used to evaluate the data available for site ranking.

Limitations

The ranking criteria are intended to provide the relative priority of a site within the group of sites considered to be candidate or known toxic hot spots. Since not all sites will have the same scope and quality of information available at the time of ranking, this placement should be founded in measures of the potential for adverse impacts. The determination that some adverse impacts are occurring at the sites will have been made previously to the ranking and in accordance with the definition of a toxic hot spot. While the ranking should reflect the severity of the demonstrated adverse impacts, the full scope of ecological and human health impacts will likely not be characterized at the time of ranking, and therefore, should not be the goal of the ranking criteria. These impacts may be addressed as part of the activities conducted pursuant to the cleanup plans. The ranking criteria should provide a mechanism to discriminate among all those sites considered to be toxic hot spots (using the Water Code definition or another more specific definition) and thereby provide for a placement of each site relative to other sites under consideration.

The ranking criteria are not to be used to define a toxic hot spot. The determination of whether a site qualifies to be considered a toxic hot spot is a previous step.

The ranking criteria are not to be used to define cleanup actions or establish cleanup levels. The actions to be undertaken to cleanup or remediate a site will be developed on a case-by-case basis for each site. The considerations to be addressed at all sites, together with special considerations for each site, will be described in the cleanup plans required by Water Code Section 13394.

Alternatives:

Four ranking systems are presented for consideration. Two of these systems were developed for purposes somewhat different than those of the BPTCP. These are the Clean Water Strategy used by the SWRCB in the past for resource allocation and the Hazard Ranking System used by US EPA for Superfund site prioritization. These systems are offered for consideration because they are established and have been used with success for their respective purposes.

1. <u>Use the Clean Water Strategy approach for ranking toxic hot spots.</u>

The SWRCB's Water Quality Coordinating Committee, in 1990, developed the Clean Water Strategy (Strategy) as a management tool to provide a common framework for applying the collective professional judgment of SWRCB and RWQCB staff to identify and prioritize water quality problems. The Strategy consists of six phases which, to date, have been partially implemented. These phases are: (1) collecting water quality information, (2) comparing and ranking the importance and the condition of water bodies, (3) setting priority on work required to address threats and impairments of water quality identified in Phase 1, (4) allocation of staff and contract resources to the list generated in Phase 3, (5) implementation of the funded work, and (6) review and assessment of results and products. CWS rankings are developed through a collective professional judgment process. This process uses criteria and numerical ratings to allow statewide staff to separate and group waters in five levels of importance (value of the resource) and within each level of importance, to group the severity of problems in five levels. The CWS does not rely on formulas or weighted criteria in developing rankings. The CWS process relies on a series of "bite size" judgments and groupings, which when combined result in general consensus on final rankings.

Phases 1 and 2 of the Strategy might be applied to satisfy the Water Code requirements for Toxic Hot Spot ranking in the BPTCP. While the basic purpose of the Strategy is to prioritize responses to water quality problems (similar to Toxic Hot Spot ranking) there are some fundamental differences in purpose and approach between the Strategy and the requirements of the BPTCP. The most fundamental difference is that the Strategy creates priorities for work based on ranking of entire water bodies whereas the Hot Spot Ranking is intended to address hot spots which, except in extraordinary cases, are likely to be localized areas. In addition, the Strategy must consider a number of water quality impairments other than those caused by toxic pollutants. For instance, depressed levels of dissolved oxygen should be considered in the Strategy but would be excluded for BPTCP purposes. A third difference is that the Strategy generates independent ranked lists for several classes of water bodies (such as rivers, lakes, and wetlands), while the BPTCP is required to rank hot spots together, irrespective of the type of water body (such as wetlands; fresh, brackish, and marine portions of estuaries; and bays). Finally, the Strategy rankings are designed to support Phases 3 and 4; i.e., proposed responsive actions and allocation of resources. In the BPTCP, determination of likely responsive actions to hot spot designations are included as part of Toxic Hot Spot Cleanup Plans and are not included in the ranking process.

Since the Strategy was developed before the BPTCP was established, it will likely be modified to incorporate new information from the BPTCP. A likely outcome of this modification will be that the toxic hot spot rankings will be included as one of the many factors used to develop water body rankings in the Strategy.

2. Use the ranking system developed for the federal Superfund Program (i.e., Hazard Ranking System).

The Hazard Ranking System (HRS) was developed as part of the implementation of the national Superfund program (US EPA, 1990). The HRS is designed to score the relative threat associated with actual or potential releases of hazardous substances from specific sites and to rank the site on the National Priority List for Superfund cleanup. The HRS provides a numerical value derived from the assessment of four different environmental pathways each evaluated for three specific factors. The pathways are: (1) ground water migration, (2) surface water migration, (3) soil exposure, and (4) air migration. The three factors are (1) the likelihood of release, (2) waste characteristics, and (3) targets. Through a series of steps, each pathway is assigned a numerical score which integrates the assessment of the three factors for that pathway. The pathway scores are then combined to produce the final site value. The site is ranked against other sites based on this final site value; larger numeric values receive a higher priority.

The actual derivation of a final site value is a rather complex process that requires a significant amount of site-specific information. Some steps in the process are common to all four pathways while others are specific to the particular pathway under consideration.

While the HRS provides a somewhat consistent treatment of sites for ranking purposes, the requirement of extensive evaluation makes it rather cumbersome and time consuming process. Furthermore, this system still requires a number of assumptions and professional judgment in order to complete the evaluation and ranking. The HRS was developed under guidance from Congress that the system "to the maximum extent feasible, . . . accurately assesses the relative degree of risk to human health and the environment posed by sites and facilities subject to review" (Fed. Reg. Vol 55, No. 241, pg 51532). Although this directive does not constitute a mandate for a full risk assessment before ranking, it has been interpreted to require a more detailed analysis (as evidenced by the HRS) than required for the purposes of the BPTCP. The level of details required to complete an HRS evaluation does not seem justified for BPTCP purposes.

Furthermore, the HRS is designed to emphasize threats to human health. For example, two of the three factors in the surface water-overland/flood migration path address human exposure (drinking water threat and human food chain threat), and one factor addresses environmental threats (sensitive environments). The scores for these factors further emphasize human health by allowing a maximum score for drinking water and food chain factors of 100 but only a maximum of 60 for environmental threats.

When scores are computed for the final site value, the emphasis clearly falls on human health considerations. This is in contrast to the BPTCP where human health and environmental (aquatic life and wildlife) considerations are given equal weight.

3. Use a ranking approach based on beneficial uses to be protected; chemical values in tissues, sediment and water; and other factors required by law (Weighted Numerical Toxic Hot Spot Ranking Criteria). These ranking criteria rank potential and candidate or known toxic hot spots separately.

The ranking system presented below has been designed to (1) provide a site-specific refinement of the Clean Water Strategy and (2) address specific requirements of the BPTCP (Water Code Sections 13390 et seq.).

Weighted Numerical Ranking Criteria

A value for each criterion described below should be developed provided appropriate information exists. Any criterion for which no information exists should be assigned a value of zero. The sum of the values for the six criteria will serve as the final ranking score. The maximum score is 80. In developing the score for each criterion an initial value is identified and then adjusted by one or two correction factors as appropriate. The Alternative 3 weighted criteria follow:

A. Human Health Impacts

Potential Exposure: Select from the following the applicable circumstance with the highest value:

Human Health Advisory issued for consumption of non-migratory aquatic life from the site (assign a value of 5); Tissue residues in aquatic organisms exceed FDA/DHS action level (3); Tissue residues in aquatic organisms exceed MTRL (2).

Potential Hazard: Multiply the exposure value selected by one of the following factors:

Pollutant(s) of concern is(are) known or suspected carcinogen[1] with a cancer potency factor or noncarcinogen with a reference dose (assign a value of 5); Pollutant(s) of concern is(are) not known or suspected carcinogens without a cancer potency factor or another pollutant potentially causing human toxicity (other than cancer)(3); other pollutants of concern (1).

B. Other Beneficial Use Impacts

1. Rare, threatened, or endangered species present: Select from the following the applicable circumstance with the highest value and one other value if applicable. Do not use any species twice:

   Endangered species exposed to or dependent on the site (assign a value of 5), Threatened or rare species exposed to or dependent on the site (4), Endangered, threatened or rare species occasionally present at the site (3).

   Multiply each identified value by 2 if multiple species are present in any category. Add all resultant values for final Criteria B1 value.

2. Demonstrated aquatic life impacts: Select one or more value(s):

[1] These are substances suspected of being carcinogenic as classified in the EPA Integrated Risk Information System (IRIS), by the Office of Environmental Health Hazard Assessment or by the Department of Health Services.

Community impairments associated with toxic pollutants (assign a value of 5), statistically significant toxicity demonstrated with acute toxicity tests contained in this policy or acceptable to the SWRCB or the RWQCBs (4), Statistically significant toxicity demonstrated in chronic toxicity tests acceptable to the BPTCP (3), reproductive impairments documented (2), toxicity is demonstrated only occasionally and does not appear severe enough to alter resident populations (1).

Multiply each value by 2 if the demonstrated effects exceed 80 percent of the organisms in any given test or 80 percent of the species in the analysis.

3. Chemical measures[2]:

Any chemistry data used for ranking under this section should be no more than 10 years old, and should have been analyzed with appropriate analytical methods and quality assurance.

i. Tissue residues exceed NAS guideline (assign a value of 3), at or above State Mussel Watch Elevated Data Level (EDL) 95 (2), greater than State Mussel Watch EDL 85 but less than EDL 95 (1).

ii. Water quality objective or water quality criterion: Exceeded regularly (greater than 50 percent of the time) (assign a value of 3), infrequently exceeded (less than or equal to 50 percent of the time) (2).

iii. Sediment values (sediment weight of evidence guidelines recommended for State of Florida): Above the Probable Effects Level (PEL)[3] (3), between the TEL[4] and PEL (2). For a substance with no calculated PEL: Above the effects range

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[2]The sediment values to be used in the ranking system are listed in Table 3. The tissue residue levels and criteria are available in various State Mussel Watch reports and the California Toxics Rule (EPA, 1997), respectively. Water quality objectives to be used are found in RWQCB Basin Plans (if available) or the California Ocean Plan (depending on which plan applies to the water body being addressed). Where a Basin Plan contains a more stringent value than the statewide plan, the regional water quality objective will be used.

[3]PEL is that concentration above which adverse biological effects are likely to occur. It is developed by taking the geometric mean of the 50th percentile value of the effects database and the 85th percentile value of the no-effects database.

[4]The Threshold Effects Level (TEL) is defined as the sediment concentration that is the upper limit of the minimal effects range. The value is derived by taking the geometric mean of 15th percentile of the ascending effects database and the 50th percentile of the ascending no-effects database.

median[5] (ERM) (2), between the effects range lowest 10 percent (ERL) and ERM (1).

If multiple chemicals are above their respective EDL 85, water quality objective or sediment value, select the chemical with the highest value for each of the criteria (i) through (iii) above. Add the values for (i) through (iii) (above) to derive the initial value. Multiply the initial value by 2 if multiple chemicals are suspected of contributing to the toxic hot spot.

C. Areal Extent of Toxic Hot Spot

Select one of the following values:

More than 250 acres (assign a value of 10), 50 to 250 acres (8), 10 to less than 50 acres (6), less than 10 acres (4).

D. Pollutant Source

Select one of the following values:

Source of pollution identified (assign a value of 5), Source partially accounted for (3), Source unknown (2), Source is an historic discharge and no longer active (1).

Multiply by 2 if multiple sources are identified.

E. Remediation Potential

Select one of the following values:

Site is unlikely to improve without intervention (4), site may or may not improve without intervention (2), site is likely to improve without intervention (1).

Multiply the selected value by one of the adjustment factors listed below:

Potential for immediate control of discharge contributing to the toxic hot spot or development of source control/waste minimization programs (assign a value of 4), potential for

[5]The ERM is analogous to the PEL. It is that concentration above which adverse effects are likely. It is developed by taking the 50th percentile of the ranked adverse effects data in the Long and Morgan database. The ERL is developed by taking the 10th percentile of the ranked adverse effects data.

implementation of an integrated prevention strategy involving multiple dischargers (3), site suitable for implementation of identified remediation methods (2). If site can not be classified (assign a value of 1).

Rationale for the Weighted Numerical Criteria

This section describes the rationale for each of the six criteria listed above.

Human Health Impacts

The human health impacts criterion has two parts: An estimate of potential exposure and an estimate of potential hazard. For the exposure estimate the highest score is given if a human health advisory has been issued. These advisories are an indication that aquatic life used for consumption is severely contaminated (i.e., the beneficial use is severely impaired). The FDA/DHS action levels receive a lower score because these values do not take into consideration the site-specific factors of the risk assessments used for human health advisory issued for a site. A tissue residue level above the MTRL does not by itself demonstrate a waterbody impairment. MTRLs receive the lowest scores because they are established for a specific consumption rate (6.5 g/day for the EPA Section 304(a) criteria and 23 g/day for the California Ocean Plan) and at a cancer risk level of one in one million.

The potential hazard factor assumes that the risk posed by known or suspected carcinogens with a cancer potency developed or an other pollutant of concern with a reference dose available is greater than the risk posed by pollutants without a cancer potency or reference dose available. This is consistent with the approach taken in the three Statewide Plans, EPA methods for calculating water quality criteria, and the approaches of OEHHA and DHS.

Other Beneficial Use Impacts

This criterion combines the various factors that should be considered in evaluating impacts on water quality, sediment quality, aquatic life and wildlife.

Rare, threatened or endangered species

This criterion evaluates the exposure or dependence of rare, threatened or endangered species at a known toxic hot spot. The highest value is assigned if an endangered species is exposed to or dependent upon a site and lower scores if threatened or rare species are exposed to or dependent upon a site. Exposure of endangered species to a site is considered more severe than regular or occasional presence of rare or threatened species.

If multiple species in the categories are present the value is multiplied by 2. This value was selected to reflect the additional complexity of the situation when more than one rare, threatened or endangered species is exposed or dependent upon a site.

Demonstrated Aquatic Life Impacts

This criterion is a measure of aquatic life impact from the most severe conditions to less severe conditions. Measurements of actual measured marine or bay community impairment indicates that there is a direct measurement of impact. These kinds of impairments are difficult to measure and would only be measurable at the most highly impacted sites. Lower values are assigned to acute (short-term) and chronic toxicity (long-term or sensitive life stage tests) which serve as indicators of actual impacts. Reproductive impairments and occasional toxicity are given the lowest values because of the difficulty in interpreting these effects on aquatic life populations.

If multiple species are effected the value is multiplied by 2 to reflect a more severe condition. This multiplier is also applied if over 80 percent of the test organisms are effected. This factor will allow for distinctions to be made between moderate and more severe responses of organisms.

Chemical Measures

This criterion has three parts: (i) Tissue residues, (ii) water quality objectives and water quality criteria, and (iii) sediment values. As described in the last section of this criterion, if multiple chemicals are suspected of contributing to the known toxic hot spot then the sum of (i) through (iii) is multiplied by "2". A chemical severity factor is added to the value generated above based on the substance with the most stringent water quality objective. This factor gives more weight to chemicals that have aquatic life effects at very low concentrations.

Tissue Residues and Water Quality Objectives

Tissue residue levels are very difficult to evaluate in terms of impact on aquatic life but some measures do exist to aid in the interpretation of chemicals bioaccumulated in fish or shellfish tissue. The NAS (1972) has evaluated tissue residues for several chemicals. In this criterion, if an NAS guideline is exceeded the highest score is received. Elevated data levels (EDLs) from State

Mussel Watch, are given lower values depending on whether the EDL is above 95 percent or 85 percent. EDLs are given lower scores because they do not measure actual effect on organisms. EDLs are included because State Mussel Watch information is generally available and these data are valuable in assessing the relative exposure of organisms to toxic pollutants.

The "water quality objective or water quality criterion" criterion gives a higher value when a water quality objective from the appropriate water quality control plan or the EPA water quality criteria are exceeded regularly. If an objective is infrequently exceeded a lower score is given.

The California Enclosed Bays and Estuaries Plan and the Inland Surface Waters Plan were nullified by the California Superior Court in 1994. The objectives in these plans should, therefore, not be used for developing rankings of toxic hot spots.

In order to provide assistance in interpretation of any available water quality monitoring information the U.S. Environmental Protection Agency (EPA) water quality criteria should be used. EPA has developed water quality criteria (i.e., Clean Water Act Section 304(a) criteria) for the protection of aquatic life and human health. For aquatic life, these criteria were derived by a complex method presented in Stephan et al. (1985). Most of the aquatic life criteria are expressed as four-day averages to be exceeded no more than once every three years on average.

For many priority pollutants, EPA has developed criteria for the protection of human health. These EPA criteria assume that human exposure to contaminants can result from both drinking water and edible aquatic species. Therefore, the criteria represent concentrations in water that protect against the consumption of aquatic organisms and drinking water containing chemicals at levels greater than those predicted to result in significant human health problems. EPA methods for calculating human health criteria date from 1980 when separate equations were presented for exposure resulting from the consumption of aquatic organisms only and from the combined consumption of aquatic organisms and drinking water (Federal Register 45(231): 79347-79356, November 28, 1980).

Most of the criteria listed in the National Toxics Rule for the protection of human health have been updated (new potency factor or reference dose taken from the Integrated Risk Information System (IRIS)).

Sediment Values

Two related efforts have been completed that provide an alternative approach for evaluating the quality of marine and estuarine sediments. These are the National Oceanic Atmospheric Administration (NOAA) (Long et al. 1995) and the sediment weight-of-evidence guidelines developed for the Florida Coastal Management Program (1993; MacDonald, 1994). Please refer to the section of the FED related to the rationale for the specific toxic hot spot definition for a description of these chemical measures.

<u>Areal Extent of Toxic Hot Spot</u>

The rationale for this criterion is to discount smaller sites because these sites will be difficult or perhaps may not be practical to remediate. This criterion is an estimate only. If the areal extent is completely unknown this criterion should be assigned a value of zero. While this estimate may over- or under-estimate the size of the toxic hot spot, we assume that one of the first steps in planning for a cleanup of a known toxic hot spot will be a characterization of the size of the hot spot before any remedial activity occurs.

<u>Pollutant Source and Remediation Potential</u>

These three criteria involve judgments of whether the sources of pollutants are identified, the likely remediation potential, and whether the State and Regional Water Boards are likely to be joined in site remediation by other agencies and the potential dischargers. These criteria will be based on the experience and judgment of the State and Regional Water Board staff.

The "pollutant source" criterion scores a site on the basis of knowledge of whether the source of pollutant is known. If the source is a result of a historic discharge (no longer active) a site is given the lowest score because it will be impossible to improve the site by modifying existing practices. The "remediation potential" criterion is an estimate of whether the site is amenable to intervention and whether waste minimization or prevention

TABLE 3: COMPARISON OF SEDIMENT[6] SCREENING LEVELS DEVELOPED BY NOAA AND THE STATE OF FLORIDA

SUBSTANCE	TEL	State of Florida[7] PEL	ERM[8]	NOAA ERL[9]	ERM[9]
Organics ug/kg					
Total PCBs	21.55	188.79	380	22.7	180
Acenaphthene	6.71	88.9	650	16	500
Acenaphthylene	5.87	127.89	44	640	
Anthracene	46.85	245	960	85.3	1100
Fluorene	21.17	144.35	640	19	540
2-methyl naphthalene	20.21	201.28	670	70	670
Naphthalene	34.57	390.64	2100	160	2100
Phenanthrene	86.68	543.53	1380	240	1500
Total LMW-PAHs	311.7	1442.0	552	3160	
Benz(a)anthracene	74.83	692.53	1600	261	1600
Benzo(a)pyrene	88.81	763.22	2500	430	1600
Chrysene	107.71	845.98	2800	384	2800
Dibenzo(a,h)anthracene	6.22	134.61	260	63.4	260
Fluoranthene	112.82	1493.54	3600	600	5100
Pyrene	152.66	1397.60	2200	665	2600
Total HMW-PAHs	655.34	6676.14	1700	9600	
Total PAHs	1684.06	16770.54	35000	4022	44792
Pesticides					
p, p'-DDE	2.07	374.17	15	2.2	27
Total DDT	3.89	51.70	350	1.58	46.1
p,p'-DDT	1.19	4.77			
Lindane	0.32	0.99			
Chlordane	2.26	4.79		0.5	6
Dieldrin	0.715	4.30		0.02	8
Endrin				0.02	45
Metals mg/kg					
Arsenic	7.24	41.6	85	8.2	70.0
Antimony				2	2.5
Cadmium	0.676	4.21	9	1.2	9.6
Chromium	52.3	160.4	145	81.0	370.0
Copper	18.7	108.2	390	34.0	270.0
Lead	30.24	112.18	110	46.7	218.
Mercury	0.130	0.696	1.3	0.15	0.71
Nickel	15.9	42.8	20.9	51.6	
Silver	0.733	1.77	2.5	1.0	3.7
Zinc	124	271.0	280	150.0	410.

[6]Values are for bulk sediment expressed on a dry weight basis
[7]MacDonald, 1996
[8]Long and Morgan, 1990
[9]Long et al., 1995

programs (implemented through permits) could be used to solve identified problems. Sites requiring sediment or other remediation or other expensive approaches receive a lower score.

4. Use a general ranking approach that groups toxic hot spots into categories. The criteria would be based on impact to aquatic life, human health and water quality objectives; and other factors required by law (Categorical Toxic Hot Spot Ranking Criteria).

The ranking system presented below has been designed to (1) provide a general criteria for ranking sites, (2) address specific requirements of the Water Code (Water Code Section 13393.5), and (3) establish a categorical ranking of toxic hot spots. The RWQCBs would be give discretion to rank sites based on the information available.

Categorical Ranking Criteria

A value for each criterion described below shall be developed provided appropriate information exists or estimates can be made. Any criterion for which no information exists shall be assigned a value of "No Action". The RWQCB shall create a matrix of the scores of the ranking criteria. The RWQCBs shall determine which sites are "High" priority based on the five general criteria (below) keeping in mind the value of the water body. The RWQCBs shall provide the justification or reason a rank was assigned if the value is an estimate based on best professional judgment.

Human Health Impacts

Human Health Advisory issued for consumption of non-migratory aquatic life from the site (assign a "High"); Tissue residues in aquatic organisms exceed FDA/DHS action level or U.S. EPA screening levels ("Moderate").

Aquatic Life Impacts

For aquatic life, site ranking shall be based on an analysis of the substantial information available. The measures that shall be considered are: sediment chemistry, sediment toxicity, biological field assessments (including benthic community analysis), water toxicity, toxicity identification evaluations (TIEs), and bioaccumulation.

Stations with hits in any two of the biological measures if associated with high chemistry, assign a "High" priority. A hit in one of the measures associated with high chemistry is assigned "moderate", and high sediment or water chemistry only shall be assigned "low". In analyzing the substantial information available, RWQCBs should take into consideration that impacts related to biological field assessments (including benthic community structure) are of more importance than other measures of impact.

Water Quality Objectives[10]

Any chemistry data used for ranking under this section shall be no more than 10 years old, and shall have been analyzed with appropriate analytical methods and quality assurance.

Water quality objective or water quality criterion: Exceeded regularly (assign a "High" priority), occasionally exceeded ("Moderate"), infrequently exceeded ("Low").

Areal Extent of Toxic Hot Spot

Select one of the following values: More than 10 acres, 1 to 10 acres, less than 1 acre.

Natural Remediation Potential

Select one of the following values: Site is unlikely to improve without intervention ("High"), site may or may not improve without intervention ("Moderate"), site is likely to improve without intervention ("Low").

Overall Ranking

The RWQCB shall list the overall ranking for the candidate toxic hot spot. Based on the interpretation and analysis of the five previous ranking criteria, ranks shall be established by the RWQCBs as "high", "moderate" or "low."

[10] Water quality objectives to be used are found in Regional Water Quality Control Board Basin Plans or the California Ocean Plan (depending on which plan applies to the water body being addressed). Where a Basin Plan contains a more stringent value than the statewide plan, the regional water quality objective will be used.

TABLE 4: NAS, FDA, AND U.S. EPA LIMITS RELEVANT TO THE BPTCP (NG/G WET WEIGHT)

Chemical	NAS Recommended Guideline[11] (whole fish)	FDA Action Level or Tolerance[12] (edible portion)	USEPA Screening Values[13] (edible portion)
Total PCB	500	2000**	10
Total DDT	50	5000	300
aldrin	*	300**,***	-
dieldrin	*	300**,***	7
endrin	*	300**,***	3000
heptachlor	*	300**,***	-
heptachlor epoxide	*	300**,***	10
lindane	50	-	80
chlordane	50	300	80
endosulfan	50	-	20,000
methoxychlor	50	-	-
mirex	50	-	2000
toxaphene	50	5000	100
hexachlorobenzene	50	-	70
any other chlorinated hydrocarbon pesticide	50	-	
dicofol	-	-	10,000
oxyfluorfen	-	-	800
dioxins/dibenzofurans	-	-	$7x10^{-4}$
terbufos	-	-	1000
ethion	-	-	5000
disulfoton	-	-	500
diazinon		-	-
900			
chlorpyrifos	-	-	30,000
carbophenothion	-	-	1000
cadmium	-	-	10,000
selenium	-	-	50,000
mercury	-	1000**(as methyl mercury)	600

*Limit is 5 ng/g wet weight. Singly or in combination with other substances noted by an asterisk.
**Fish and shellfish.
***Singly or in combination for shellfish

[11] National Academy of Sciences. 1973. Water Quality Criteria, 1972 (Blue Book). The recommendation applies to any sample consisting of a homogeneity of 25 or more fish of any species that is consumed by fish-eating birds and mammals, within the same size range as the fish consumed by any bird or mammal. No NAS recommended guidelines exist for marine shellfish.

[12] U.S. Food and Drug Administration. 1984. Shellfish Sanitation Interpretation: Action Levels for Chemical and Poisonous Substances. A tolerance, rather than an action level, has been established for PCB.

[13] U.S. Environmental Protection Agency. 1993. Guidance for assessing chemical contaminant data for use in fish advisories. Volume 1. EPA 823-R-93-002. Office of Water. Washington, D.C.

Rationale for the Categorical Ranking Criteria

This section describes the rationale for each of the six criteria listed above. One of the most important features of the categorical ranking criteria is that no criterion is given a numerical value. Each criterion is given a "High", "Moderate" and, sometimes, a "Low" value. This approach gives considerable flexibility to the RWQCBs in establishing the priority of a site.

Human Health Impacts

The human health impacts criterion has two parts: A "High" ranking is given if a human health advisory has been issued. These advisories are an indication that aquatic life used for consumption is severely contaminated (i.e., the beneficial use is severely impaired). If tissue levels exceed FDA/DHS action levels receive a "Moderate" ranking because these values do not take into consideration the site-specific factors of the risk assessments used for human health advisory issued for a site.

Aquatic Life Impacts

This criterion combines the various factors that should be considered in evaluating impacts on water quality, sediment quality, aquatic life and wildlife. In developing a ranking for the aquatic life criterion the RWQCB should consider all available information on a site. The decision to rank a site "High" under this criterion should take into consideration the substantial evidence (or the weight-of-evidence) (e.g., Fairey et al., 1996: Anderson et al., 1997; SPARC, 1997; Chapman et al., in press). If data from more than one type of effect are available that shows effects on organisms then the ranking is higher. If only high chemical concentrations are found at the site then the site is ranked "Low" because no information is available to show aquatic life beneficial uses are impacted.

The measurements to be considered for the weight-of-evidence include the individual measures of the sediment quality triad (SPARC, 1997), water toxicity tests (SWRCB, 1993), toxicity identification evaluations, and bioaccumulation (NAS, 1973). Measures of pollutant bioaccumulation in tissues should be compared to measures of effect on the organism not simply elevated data levels as used in the SMW. If information is available from biological field assessments (such as benthic community analysis) those data should be viewed by the RWQCBs as having more importance (if data are compared to proper reference conditions) because these types of studies are direct assessments of impacts on organisms in the environment. As with the other measurements, a good deal of RWQCB judgment is necessary to review and establish priorities using biological field data.

Under the ranking scheme the RWQCBs are given flexibility in choosing the critical chemical values for determining the significance of chemical measurements made.

Water Quality Objectives

The "water quality objective or water quality criterion" criterion results in a higher value when a water quality objective from the appropriate water quality control plan or promulgated EPA water quality criteria are exceeded regularly. If an objective is infrequently exceeded a lower score is given.

The California Enclosed Bays and Estuaries Plan and the Inland Surface Waters Plan were nullified by the California Superior Court in 1994. The objectives in these plans will, therefore, not be used for developing rankings of toxic hot spots. Also, Section 304(a) criteria for the priority pollutants should not be used unless they have been promulgated by EPA or approved as water quality objectives in a water quality control plan.

The definitions of "regularly", occasionally" and "infrequently" are not stated because of the site- and Region-specific interpretations that will be necessary to use this criterion.

Areal Extent of Toxic Hot Spot

The results for this criterion is to present an estimate of the areal extent of the toxic hot spot. No qualitative measure (e.g., "High" or "Moderate") is required. Interpretation of this criterion therefore is left to the discretion of the RWQCBs. RWQCBs may discount smaller sites in their ranking because these sites will be difficult or perhaps may not be practical to remediate or, in the RWQCB's view they may wish to place higher priority on larger sites or water bodies.

In practically every circumstance, this criterion is an estimate only. One of the first steps in planning for a cleanup of a known toxic hot spot should be a characterization of the size of the hot spot before any remedial activity occurs.

Natural Remediation Potential

This criterion involves judgments of the likely remediation potential. This criterion will be based on the experience and judgment of the RWQCB.

The " natural remediation potential" criterion is an estimate of whether the site is amenable to intervention and whether waste minimization or prevention programs (implemented through nonpoint source management, WDRs and permits) could be used to solve identified problems. Sites unlikely to improve without intervention receive a "High" ranking. Sites where remediation may be needed would rank as "Moderate". In these cases, ranking sites as "High" or "Moderate" is an acknowledgment that there will be costs to the State or dischargers for site cleanup or prevention of the toxic hot spot. If no remediation is warranted or sites will improve without intervention, the site would rank as "Low".

Overall Ranking

This section is the overall ranking a site received based on the RWQCB assessment of the five previously listed and described general ranking criteria. The RWQCBs should give their overall ranking as "high", "moderate" or "low".

Staff Recommendation: Adopt Alternative 4.

Issue 4: ***Mandatory Requirements for Regional Toxic Hot Spot Cleanup Plans and Issues to be Considered in the Consolidated Cleanup Plan***

Present Policy: None.

Issue Description: The SWRCB and RWQCBs are required by the Water Code (Section 13394) to address a variety of topics including the following information:

1. A priority ranking of all toxic hot spots, including recommendations for remedial actions;

2. A description of each toxic hot spot including a characterization of the pollutants present at the site;

3. An estimate of the total cost to implement the cleanup plan;

4. An assessment of the most likely sources of pollutants; (potential dischargers)

5. An estimate of recoverable costs from responsible parties;

6. Preliminary assessment of actions required to remedy or restore a THS to an unpolluted condition;

7. A two-year expenditure schedule identifying state funds to implement the plans;

8. A summary of actions that have been initiated by the regional boards to reduce the accumulation of pollutants at existing THSs and to prevent the creation of new THSs; and

9. Findings and recommendations concerning the need for a toxic hot spot cleanup program. (This factor is to be considered only by the SWRCB.)

These requirements are somewhat general and many of the topics require some definition and clarification if they are to be applied consistently Statewide. Also, there are several issues that should be considered by the SWRCB in developing the consolidated toxic hot spot cleanup plan. Several issues that should be considered in the consolidated cleanup plan were discussed at the public hearing on the draft FED.

Alternatives:

1. Do not adopt any additional guidance for development of toxic hot spot cleanup plans.

The only guidance required by the Water Code for implementation of the Bay Protection and Toxic Cleanup Program is for the Ranking Criteria (Section 13393.5). The SWRCB is not required to adopt any additional guidance for the Program or cleanup plans. An advantage of this approach is that the RWQCB has complete flexibility in interpretation of Water Code Section 13394. A disadvantage is that there is a great possibility of inconsistent implementation of the Program across the State.

2. Adopt guidance on each of the required sections of cleanup plans to require consistency of form and application of the various provisions.

The SWRCB could specify what is required to adequately and consistently develop the Regional and Statewide Cleanup Plans. This additional guidance should not limit the RWQCBs to the quantity of information presented but rather should establish the basic amount of information necessary to complete the requirements of the Water Code. Also, the Policy should contain an outline and template for the Regional Toxic Hot Spot Cleanup Plans in order to make the plans as consistent as possible.

3. Adopt Alternative 2 plus information on issues that could be considered in the consolidated toxic hot spot cleanup plan.

Several issues were raised at the May 5, 1998 and May 11, 1998 hearing and in the written comments on factors that should be considered as part of the consolidated plan. The SWRCB should consider incorporating the following information in the consolidated plan: (1) a process for delisting sites after they have been remediated, or if the problem no longer exists, at the site or water body; (2) guidance on reevaluation of WDRs; (3) findings and recommendations for funding the implementation of the plans (i.e., the need for a toxic hot spot cleanup program as described in the Water Code Section 13394(i)); and (4) approaches for compiling the regional toxic hot spot cleanup plans.

All the requirements for Alternative 2 would also be included in this alternative. The advantage of this alternative is that the public will have a better idea of the factors that will be considered by the SWRCB when the consolidated toxic hot spot cleanup plan is developed.

Staff Recommendation: Adopt Alternative 3.

Please refer to the proposed Policy (page "xiv" through "xix") for the mandatory requirements for the cleanup plans, issues to be considered by the SWRCB in the consolidated cleanup plan (page "l") , and the template (page "l" through "lii").

Issue 5: ***Remediation Actions and Costs***

Present Policy: None.

Issue Description: The RWQCBs are required to determine the type of remedial action and the cost for addressing the identified toxic hot spots. Remedial technologies should be identified and screened on the basis of effectiveness, cost effectiveness and implementability. Remedial technologies should attempt to satisfy the remedial objective; i.e., protect beneficial uses. The approach should include identifying the action, the technologies available, and the option that is technically practicable.

In the evaluation of cleanup options, one must consider a possible short-term or long-term increase in exposure, or the potential for providing new exposure pathways during the remediation process, as in dredging/disposal options. Choosing not to disturb the sediments may also be a viable option, and may mean leaving the material in place, and/or containing it. If wastewater treatment, stormwater or nonpoint sources of pollution are impacted by the designation of toxic hot spots, the RWQCBs should also consider remedial actions and costs necessary to address these actions as well.

In determining remediation actions, reasonable costs must also be factored into the selection of an appropriate alternative.

Alternatives:

1. <u>Treatment of the site sediments only.</u>

Remediation Methods for Sediment-related Toxic Hot Spots

Site treatment involves the physical or chemical alteration of material. The treatment must reduce or eliminate the toxicity, mobility, or volume of polluted material. Treatment may be either (a) *in situ*, or (b) *ex situ*. In situ treatment requires uniform treatment and confirmation of effectiveness; however, *in situ* methods generally have not been considered effective in marine sediments.

Ex situ treatment requires a treatment area, or a dedicated site to assure effectiveness.

Types of treatment include:

- *in situ* bioremediation (Table 5),
- soil washing and physical separation (Table 6),
- chemical separation and thermal desorption (Table 7),
- immobilization (Table 8),
- thermal and chemical destruction (Table 9), and
- *ex situ* bioremediation (Table 10).

The treatment choice should be pollutant specific. The choice depends upon the chemical characteristics of the pollutants, as well as physical and chemical characteristics of the sediments; for example, clay content, organic carbon content, salinity, and water content. Some treatment options produce by-products which require further handling. Although these technologies are currently being employed for soils, their effectiveness for use in marine sediments should be thoroughly evaluated. If the safety and effectiveness of treatment options are not well known, bench tests and pilot projects should be performed prior to authorization of the use of such treatment methods.

TABLE 5: IN-SITU BIOREMEDIATION

State of Practice (system maturity, known pilot studies, etc.)	Applicability	Advantages/Effectiveness	Limitations	Research Needs
(a) None documented for marine sediments; (b) examples from freshwater sediment are limited to special cases on pilot scale, e.g., chemical stimulation of dehalogenation (but no degradation) of PCBs in the Houseatonic River, Connecticut; (c) stimulation of degradation with addition of active microbes in Hudson River, New York.	(a) Pollutant is biologically available; (b) concentration of pollutant appropriate for bioactivity, e.g., sufficiently high to serve as substrate or not high enough to be toxic; (c) limited number or classes of pollutants that are biodegradable; less known for complex mixtures; (d) site is reasonably accessible for management and monitoring; (e) rapid solution is not required.	Based on experience from soil systems, it offers the potential for (a) complete degradation and elimination of organic pollutants; (b) reduced toxicity of sediment from partial biotransformation; (c) less materials handling, which can result in substantially lower costs; (d) no need for placement sites; (e) favorable public response and acceptability.	(a) Not a proven technology for sediments (freshwater or marine); (b) likely to require manipulation and disturbance of sediment; (c) can require containment which limits volume that is treatable; (d) can require long time periods, especially in temperate waters; (e) ineffective for low level pollution; (f) not applicable to areas of high turbulence or sheer; (g) not applicable for high molecular weight polyaromatic hydrocarbons.	(a) Fundamental understanding of biodegradation principles in marine environments; (b) bioavailability of sorbed pollutants and the effect of aging; (c) exploration of anaerobic degradation processes for the largely impacted near-shore anoxic sediments; (d) laboratory, pilot, and field demonstration of effectiveness for marine sediments; (e) interaction of physical, chemical, and microbiological processes on biodegradation, e.g., sediment composition, hydrodynamics; (f) analysis of cost-effectiveness; (g) exploration of combining in-situ bioremediation with capping.

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TABLE 6: SOIL WASHING AND PHYSICAL SEPARATION

State of Practice (system maturity, known pilot studies, etc.)	Applicability	Advantages/Effectiveness	Limitations	Research Needs
Well developed by mining industry and frequently used for sediments.	Where pollutant is predominantly associated with fine-grained material that is a small fraction of the total solids.	(a) Mature technology that can reduce volumes of polluted material requiring subsequent treatment; (b) soil washing can be used to recover Confined Disposal Facility space for later reuse.	Original sediments must have a significant proportion of sand for the process to be cost effective.	None identified.

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TABLE 7: CHEMICAL SEPARATION AND THERMAL DESORPTION

State of Practice (system maturity, known pilot studies, etc.)	Applicability	Advantages/Effectiveness	Limitations	Research Needs
(a) Pilot plant studies conducted on metal desorption by acid-leaching solutions and at least one full-scale implementation; (b) pilot and full-scale application of organics separation by liquid solvents and supercritical fluids; (c) organic chemical thermal desorption also has had full-scale demonstration; (d) thermal desorption used at Waukegan Harbor.	Suitable for weakly bound organics and metals.	Pollutant is removed and concentrated.	(a) Batch extraction during separation requires multiple cycles to achieve high removal; (b) fluid-solid separation is difficult for fine-grained materials; (c) a separate reactor is needed to remove the pollutant from the extracting fluid so that the extracting fluid can be reused; (d) thermal desorption requires temperatures that will vaporize water, and sediment particles must be eliminated from gaseous discharge; (e) pollutant removal from the gas phase following thermal desorption is another treatment process that is required.	Systems integration for complete pollutant isolation or destruction.

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TABLE 8: IMMOBILIZATION

State of Practice (system maturity, known pilot studies, etc.)	Applicability	Advantages/Effectiveness	Limitations	Research Needs
Extensive knowledge based on inorganic immobilization within solid wastes and dry soils.	Chemical fixation and immobilization of trace metals.	(a) Chemical isolation from biologically accessible environment; (b) process is simple and there is a history of use for sludge.	(a) Sediment should have moisture content of less than 50 percent, and solidified volumes can be 30 percent greater than starting material; (b) limited applicability to organic pollutants; (c) high organic pollutant levels may interfere with treatment for metals immobilization; (d) need for placement of solidified sediments.	(a)Studies of long-term effectiveness for pollutant isolation; (b) develop sediment placement options, especially for beneficial uses.

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TABLE 9: THERMAL AND CHEMICAL DESTRUCTION

State of Practice (system maturity, known pilot studies, etc.)	Applicability	Advantages/Effectiveness	Limitations	Research Needs
Thermal oxidation in flame and thermal reduction in nonflame reactors have been extensively tested and demonstrated.	Process destroys organic pollutants in sediment samples at efficiencies of greater than 99.99 percent but at very high costs.	Very effective.	(a) Very expensive; (b) metals mobilized into the gas phase require gas phase scrubbing; (c) water content of sediment increases energy costs.	(a) process control to prevent upsets and effluent gas treatment for metals containment; (b) facility design to control the destruction process.

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TABLE 10: EX SITU BIOREMEDIATION

State of Practice (system maturity, known pilot studies, etc.)	Applicability	Advantages/Effectiveness	Limitations	Research Needs
(a) Limited experience; (b) transfer of soil-based technologies to marine sediments is not proved and may not be directly applicable because of the different biogeochemistry of marine sediments; (c) but general trends should translate; (d) examples from freshwater sediment have been carried out at the pilot scale in the assessment and remediation of polluted sediments program, as well as in Europe; (e) PCBs were treated ex situ at a Sheboygan River site.	(a) Pollutant is biologically available; (b) concentration of pollutant appropriate for bioactivity (e.g., sufficiently high to serve as substrate, not high enough to be toxic); (c) limited number or classes of pollutants are biodegradable; less known for complex mixtures; (d) site is reasonable accessible for management and monitoring; (e) rapid solution is not required.	Based on experience from freshwater systems, it offers the potential for (a) degradation (as opposed to mass transfer) of some organic pollutants; (b) possible reduction of toxicity from biotransformation in those cases in which complete mineralization does not occur; (c) containment of polluted material allowing for an engineered system and enhanced rates, when compared to in situ biotransformations; (d) public acceptability.	(a) Far from a proven technology--all work with marine sediments is at the bench-scale; (b) requires handling of polluted sediment; (c) slow compared to chemical treatment; (d) ineffective for low levels of pollution, and does not remove 100 percent of pollutants; (e) not applicable for very complex organics, such as high-molecular-weight compounds; (f) susceptible to matrix effects on bioavailability.	(a) Fundamental understanding of biodegradation principles in engineered systems; (b) exploration of aerobic/anaerobic combinations or comparisons; (c) laboratory, pilot, and field demonstrations; (d) analysis of cost effectiveness; (e) exploration of bioremediation as part of more extensive treatment trains.

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2. Dredging: Sediment Removal and Disposal or Reuse

Dredging may be combined with containment or offsite disposal (Table 11). Selection of the method depends upon the amount of resuspension of sediments caused by the dredge at the removal site and at the disposal site. To reduce the transport of polluted sediment to other areas, silt curtains constructed of geotextile fabrics may be utilized to minimize migration of the resuspended sediments beyond the area of removal. Consideration must also be given to temporary loss of benthic organisms at the removal site and at the disposal site.

Selection of the dredging method should take into account the physical characteristics of the sediments, the sediment containment capability of the methods employed, the volume and thickness of sediments to be removed, the water depth, access to the site, currents, and waves. Consideration should also be given to placement site of the material once it is removed.

Typical dredging methods include mechanical or hydraulic dredging. Mechanical dredging often employs clamshell buckets and dislodges sediments by direct force. Sediments can be resuspended by the impact of the bucket, by the removal of the bucket, and by leakage of the bucket. Mechanical dredging generally produces sediments low in water content.

TABLE 11: CONFINED DISPOSAL FACILITY

State of Practice (system maturity, known pilot studies, etc.)	Applicability	Advantages/Effectiveness	Limitations	Research Needs
(a) The most commonly used placement alternative for polluted sediments; (b) hundreds of sites nationwide for navigation dredging projects; (c) often used for pretreatment prior to final placement or as final sediment placement site for remediation projects.	Applicable to a wide variety of sediment types and project conditions.	(a) Low cost compared to ex situ treatment; (b) compatible with a variety of dredging techniques, especially direct placement by hydraulic pipeline; (c) proper design results in high retention of suspended sediments and associated pollutants; (d) engineering for basic containment normally involves conventional technology; (e) controls for pollutant pathways usually can be incorporated into site design and management; (f) conventional monitoring approaches can be used; (g) site can be used for beneficial purposes following closure, with proper safeguards.	(a) Does not destroy or detoxify pollutants unless combined with treatment; (b) control of some pollutant loss pathways may be expensive.	(a) Design approaches, such as covers and liners, needed for low cost pollutant controls; (b) design criteria for treatment of releases or control strategies for high profile contaminates; (c) methods for site management to allow restoration of site capacity and potential use of treated materials.

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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 very high percentage of water at the end of the pipe.

Removal and consolidation often involves a diked structure which retains the dredged material (Tables 12 and 13). Considerations include:

A. construction of the dike or containment structure to assure that pollutants do not migrate,

B. the period of time for consolidation of the sediments,

C. disturbance or burying of benthic organisms,

D. Disposal to an offsite location, either upland (landfill), in-bay, or ocean. Considerations once the material has been dredged should 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.

3. <u>Containment of Polluted Sediments</u>

Containment can prevent human or ecological exposure, or prevent migration of pollutants. Containment can be either in-place capping, or removal and consolidation at a disposal structure (Tables 11, 13 and 14). Containment options such as capping clearly reduce the short-term exposure, but require long-term monitoring to track their effectiveness.

TABLE 12: CONTAINED AQUATIC DISPOSAL

State of Practice (system maturity, known pilot studies, etc.)	Applicability	Advantages/Effectiveness	Limitations	Research Needs
Limited application. Reviews exist concerning (a) necessary data, equipment, and procedures; (b) engineering considerations; (c) guidelines for cap armoring design; (d) predicting chemical containment effectiveness.	(a) Costs and environmental effects of relocation are factors; (b) suitable types and quantities of cap material are available; (c) hydrologic conditions will not compromise the cap; (d) cap can be supported by original bed; (e) appropriate for sites where excavation is problematic or removal efficiency is low; (f) cap material is compatible with existing aquatic environment.	(a) Eliminates need to remove polluted sediments; (b) cost effective for sites with large surface areas; (c) effective in containing pollutants by reducing bioaccessibility; (d) promotes in situ chemical or biological degradation; (e) maintains stable geochemical and geohydraulic conditions, minimizing pollutant release to surface water, groundwater, and air.	(a) Laboratory and field validation of capping procedures and tools; (b) analysis of data from existing and ongoing field demonstrations to support capping effectiveness; (c) test for chemical release during bed placement and consolidation; (d) tests to evaluate and simulate the effects of cap penetration by deep burrowing organisms; (e) simulate and evaluate consequences of mixing; (f) potential loss of pollutants to the water column may require controls during placement.	(a) Design criteria for treatment of releases or control strategies for high-profile pollutants; (b) improved methods for evaluation of potential pollutant release pathways; (c) develop reliable cost estimates.

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TABLE 13: LANDFILLS

State of Practice (system maturity, known pilot studies, etc.)	Applicability	Advantages/Effectiveness	Limitations	Research Needs
Used for several dredged material and Superfund projects involving polluted sediments.	(a) Small volumes; (b) where no other alternatives or sites are available.	(a) Does not require acquisition of permanent placement site; (b) may be most cost effective for small volumes; (c) effectiveness is inherent in the site license.	(a) Lack of landfill capacity in most regions of the country; (b) requires handling and transport to the landfill; (c) restriction on free liquids requires dewatering as a pretreatment step.	Improved methods for rehandling, dewatering, and transporting dredged sediments.

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The process for stabilization of sites using sub-aqueous capping to contain toxic waste at a site would be to follow the basic three-step approach and apply the criteria shown in U.S. EPA Report No. 893-B-93-001, Selection of Remediation Techniques for Contaminated Sediment. This federal remediation document provides a list of performance considerations to test whether clean sediments consisting of sands and silts can be used to effectively contain the waste, either at the present location or at some other location. The list includes, in part:

A. Capping provides adequate coverage of polluted sediments and capping materials can be easily placed.

B. The integrity of the cap must be assured to prevent burrowing organisms from mixing of polluted sediments (bioturbation).

C. The ability of the polluted sediment to support the cap, *i.e.,* causing settlement or loading.

D. The bottom topography causing sloping or slumping of the capped material during seismic events.

E. Cap erosion or disruption by currents, waves, bioturbation, propeller wash, or ship hulls.

F. Future use of capped area, *i.e.,* shipping channel.

Another consideration is presented in the U.S. EPA document concerning whether the no-action alternative would accomplish the same end as capping the site; however, this option should be considered as the last alternative.

TABLE 14: IN-PLACE CAPPING

State of Practice (system maturity, known pilot studies, etc.)	Applicability	Advantages/Effectiveness	Limitations	Research Needs
Less than 10 major in situ capping projects in North America have been competed (more than 20 worldwide). Reviews exist concerning (a) necessary data, equipment, and procedures; (b) engineering considerations; (c) guidelines for design of cap armor; and (d) predicting effectiveness of chemical containment.	(a) Pollutant sources have been substantially abated; (b) natural recovery is too slow; (c) costs and environmental effectiveness of relocation are too high; (d) suitable types and quantities of cap material are available; (e) hydrologic conditions will not compromise the cap; (f) cap can be supported by original bed; (g) appropriate for sites where excavation is problematic or removal efficiency is low.	(a) Eliminates need to remove polluted sediments; (b) effective in containing pollutants by reducing bioaccessibility; (c) promotes in situ chemical or biological degradation; (d) maintains stable geochemical and geohydraulic conditions, minimizing pollutant release to surface water, groundwater, and air; (e) relatively easy to implement; (f) eliminates bioturbation and resuspension; (g) reduces pollutant release to water column; (h) easily replaced or repaired; (i) in shallow water, creates wetlands, dry lands, or reduces water column depth.	(a) Cap incompatible with bottom material can alter benthic community; (b) subject to erosion by strong currents and wave action; (c) subject to penetration/destruction by deep burrowing organisms; (d) destroys/changes benthic communities/ecological niches; (e) requires ongoing monitoring for cap integrity; (f) dilutes pollutants in original bed if subsequent removal/remediation is required.	(a) Analysis of data from existing and ongoing field demonstrations to support capping effectiveness; (b) controls for chemical release during bed placement and consolidation; (c) test to simulate and evaluate consequences of episodic mixing, such as anchor penetration, propeller wash, and/or mechanical penetration.

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4. No Remediation (Natural Remediation or "No Action")

This alternative consists of two elements: (a) institutional or interim controls and (b) the no remediation/no action alternative. The first element, institutional controls could include, but is not limited to, posting of warning signs, or monitoring of water, sediments, or organisms. This element would be protective of human health by providing warning signs for fishing, etc., but not protective of aquatic life.

The second element is the no remediation alternative. If by no action, the toxic hot spot is to be left in place, because to move it, or to disturb it in any way would be detrimental, then "no action" should be considered. This would have to be proven beyond any doubt, and would not be "an easy way out" of dealing with a toxic hot spot.

The no-remediation/no-action alternative should be considered only after all other alternatives have been studied (Table 15). State Board Resolution 92-49 (as amended) requires that regional boards compel dischargers to clean up wastes to protect beneficial uses (III.G.). Resolution 92-49 also requires regional boards to consider "Minimizing the likelihood of imposing a burden on the people of the state with the expense of cleanup and abatement..." (IV.D.).

If the no-remediation/no-action alternative is to be implemented, the RWQCB should determine the following: (a) Point source discharges have been controlled, (b) The costs and environmental effects of moving and treating polluted sediment are too great, (c) Hydrologic conditions will not disturb the site, (d) The sediment will not be remobilized by human or natural activities, such as by shipping activity or bioturbation, (e) Notices to abandon the site have been issued to appropriate federal, state, and local agencies and to the public, (f) The exact location of the site and a list of chemicals causing the toxic hot spot and their quantities are noted on deeds, maps, and navigational charts, and (g) A monitoring program is established to measure changes in discharge rates from the site.

If a no-remediation alternative is considered, RWQCBs should provide an assessment of the geographic extent of the pollution, the depth of the pollution in the sediment, compelling evidence that no treatment technologies should be applied and that only the no-remediation alternative is feasible at the site, and a cleanup cost comparison of all other treatment technologies versus the no-remediation alternative.

If a no-remediation alternative is considered, the following information shall be provided in the proposed cleanup plan:

A. Sources of pollution which caused the toxic hot spot to exist.

B. A monitoring program description, specifying the duration of the monitoring, and all organizations which will carry it out.

C. Monitoring program which will show whether rates of pollutant release and the area of influence of the pollutants are not accelerating.

D. Detailed assessment containing proof that all of the following statements are true:

(1) Pollutant discharge has been controlled.

(2) Burial or dilution processes are rapid.

(3) Sediment will not be remobilized by human or natural activities.

(4) Environmental effects of cleanup are equal to or more damaging than leaving the sediment in place.

(5) Unpolluted sediments from the drainage basin will integrate with polluted sediments through a combination of dispersion, mixing, burial, and/or biological degradation.

(6) Polluted sediments at the site will not spread.

(7) The site will be noted on appropriate maps, charts, and deeds to document the exact location of the site.

For no-remediation alternatives, a map of the area should be required to be provided by potential discharger(s) to the US Army Corps of Engineers, US Coast Guard, National Oceanic and Atmospheric Administration, Coastal Commission, State Lands Commission, and harbor authorities to be included on official navigational charts and other maps to document the exact location of the site and the depth of the site and the pollutants encountered.

TABLE 15: NATURAL RECOVERY

State of Practice (system maturity, known pilot studies, etc.)	Applicability	advantages/Effectiveness	Limitations	Research Needs
Selected for James River, New York Kepone pollution and considered at Port of Tacoma, Washington site.	(a) Bed is stable or depositional; (b) chemical release rates are low; (c) interim controls can maintain safety to health and environment; (d) pollution level at active surface is low, but areal extent is large; (e) most of the pollution is below the bioturbed zone; (f) pollutants are underlain by low permeability strata; (g) site is not subject to dredging or other disturbance; (h) source of pollution has been abated.	(a) There may be less environmental risk to await natural capping than to attempt sediment removal; (b) removal may cause physical harm to bottom communities as well as suspend and disperse pollutants; (c) cleanup cost may be prohibitive because of large area and low level of pollution; (d) low cost.	(a) Effectiveness of in-bed processes that govern chemical containment and/or destruction is poorly known; (b) bed remains subject to resuspension by storms or anthropogenic processes; (c) should only rarely be used in beds of flowing streams; (d) not appropriate if dredging is required or bulk quantities of chemicals, such as non-aqueous liquids or solids, are present.	(a) Develop scientific principles to describe the process of natural recovery; (b) based on a literature survey, document the success, failure, effectiveness, *etc.*, of sites that have undergone natural recovery either by design or default; (c) develop accepted measuring protocols to determine in situ chemical flux from bed sediment to the overlying water column; (d) develop protocols for assessing the relative contribution of the five or more mechanisms for chemical release or movement from bed sediments.

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5. Remediation methods for wastewater treatment facilities.

Approaches for addressing toxic hot spots associated with wastewater treatment facilities should be designed to fit into the characteristics on the surrounding environment. Therefore, all the methods discussed below are examples for general planning purposes and are not intended to be used inconsistently with the Water Code (especially Section 13360).

Remediation Methods for Water-related Toxic Hot Spots

The three basic approaches which may be practiced independently or concurrently are pollution prevention, pretreatment and recycle and reuse. The RWQCBs should develop prevention activities tailored to local conditions and the tools available. The RWQCBs should also provide enough flexibility to dischargers so they can select the most cost-effective approaches for addressing wastewater-related problems.

A large number of technically feasible wastewater treatment methods are available. The treatment technologies that may possibly be applicable to situations in California coastal waters are presented in Table 16. The wastewater treatment methods are analyzed in a NRC report on managing wastewater in coastal urban areas (NRC, 1993). Predicted effluent quality from the various treatment trains are presented in Table 17.

Methods for addressing stormwater and nonpoint sources are emerging and RWQCBs should use their best judgment in suggesting best management practices (BMPs) and their costs.

Since the costs of implementing treatment technologies and BMPs are dependent on a huge variety of site-specific considerations, it is not recommended that the SWRCB adopt general cost estimates for treatment technologies and BMPs. In fact, realistic cost estimates for addressing the toxic hot spot will not be available until dischargers involved in the efforts weigh the differences in cost of addressing water quality problems by evaluating the costs of pretreatment, additional treatment, various BMPs, and recycle/reuse options. It is, therefore, necessary for the RWQCBs to involve dischargers in an effort to address the water quality impairment based on the scale of the problem (i.e., if the problem is localized or if the problem is water body-wide).

It is recommended that the RWQCBs develop watershed management efforts (scaled to the size of the water quality problem) to address the toxic hot spot. Specific cost estimates should only be developed as part of implementation of the toxic hot spot cleanup plan and should include an assessment of the cost effectiveness of modifying all sources of pollution (including, but not limited to, point sources, stormwater, and nonpoint sources). In the cleanup plans, the RWQCBs should present the costs of implementing the watershed management coordination effort.

TABLE 16: WASTEWATER TREATMENT SYSTEMS

System	Type of Treatment
1	Primary
2	Chemically enhanced primary
	a. Low-dose chemically -enhanced primary
	b. High-dose chemically-enhanced primary
3	Conventional primary plus biological treatment
4	Chemically-enhanced primary plus biological treatment
5	Primary or chemically enhanced primary plus nutrient removal
6	System 5 plus gravity filtration
7	System 5 plus high lime plus filtration
8	System 5 plus granular activated carbon plus filtration
9	System 5 plus high lime plus filtration plus granular activated carbon
10	System 9 plus reverse osmosis

Adapted from NRC. 1993. Managing wastewater in coastal urban areas. Committee on Wastewater Management for Coastal Urban Areas, Water Science and Technology Board, Commission on Engineering and Technical Systems, National Research Council. National Academy Press, Washington, D.C.

Table 17: Typical Effluent Concentrations of Organics and Metals for Selected Treatment Trains

Constituent	Influent	1	2	3	4	5	6	7	8	9	10
Chloroform	7-60	7-60	5.6-48	1.0-9.0	1.0-9.0	1.0-9.0	1.0-9.0	1.0-9.0	1.0-9.0	1.0-9.0	0.1-1.0
Bromodichloromethane	0.31-1.7	0.3-1.7	0.3-1.7	0.1-.05	0.1-0.5	0.1-0.5	0.1-0.5	0.1-0.5	0.04-0.2	0.04-0.2	0.02-0.1
Dibromochloromethane	1.0-6.0	1.0-6.0	1.0-6.0	0.1-0.7	0.1-0.7	0.1-0.7	0.1-0.7	0.1-0.7	0.03-0.2	0.03-0.2	0.01-0.08
Bromoform	0.3-1.2	0.2-1.0	0.2-1.0	0.1-0.4	0.1-0.4	0.1-0.4	0.1-0.4	0.1-0.4	0.02-0.08	0.02-0.08	0.01-0.03
Carbon Tetrachloride	1.0-8.0	1.0-8.0	1.0-8.0	0.2-2.0	0.2-2.0	0.2-2.0	0.2-2.0	0.2-2.0	0.1-1.6	0.1-1.6	0.01-0.16
1,2-Dichlorethane	5.0-15.0	5.0-15.0	3.9-11.7	0.8-2.4	0.8-2.4	0.8-2.4	0.8-2.4	0.8-2.4	0.2-0.6	0.2-0.6	0.02-0.06
1,1,1-Trichloroethane	7.5-12.5	7.5-12.5	7.5-12.5	3.0-5.0	3.0-5.0	3.0-5.0	3.0-5.0	3.0-5.0	0.1-1.2	0.1-1.2	0.01-0.1
Tetrachloroethylene	1.0-4.0	1.0-4.0	1.0-4.0	0.5-2.0	0.5-2.0	0.5-20	0.5-2.0	0.5-2.0	0.05-0.2	0.05-0.2	0.05-0.2
Trichlorothylene	1.0-2.0	1.0-2.0	1.0-2.0	0.5-1.0	0.5-1.0	0.5-1.0	0.5-1.0	0.5-1.0	0.35-0.7	0.35-0.7	0.35-0.7
Xylene	0.06-0.2	0.06-0.2	0.06-0.2	0.03-0.1	0.03-0.1	0.03-0.1	0.03-0.1	0.03-0.1	0.01-0.03	0.01-0.03	0.01-0.03
Chlorobenzene	1.0-25.0	0.8-20.0	0.7-18.0	0.1-2.5	0.1-2.5	0.1-2.5	0.1-2.5	0.1-2.5	0.01-0.02	0.01-0.02	0.01-0.02
1,2-Dichlorobenzene	1.0-8.0	0.8-6.4	0.7-5.6	0.1-0.8	0.1-0.8	0.1-0.8	0.1-0.8	0.07-0.6	0.03-0.3	0.03-03	0.02-0.2
1,3-Dichlorobenzene	1.0-8.0	0.8-6.4	0.7-5.6	0.1-0.8	0.1-0.8	0.1-0.8	0.1-0.8	0.05-0.4	0.05-0.4	0.02-0.2	0.01-0.1
1,4-Dichlorobenzene	15.0-25.0	12.0-20.0	10.0-17.5	1.5-2.5	1.5-2.5	1.5-2.5	1.5-2.5	0.9-1.5	0.4-0.7	0.4-0.7	0.3-0.6
1,2,4-Trichlorobenzene	1.0-5.0	0.8-4.0	0.7-3.5	0.1-05	0.1-0.5	0.1-0.5	0.1-0.5	0.03-0.15	0.01-0.05	0.01-0.05	0.01-0.05
Ethylbenzene	0.4-15.0	0.3-13.0	0.3-9.0	0.04-1.5	0.04-1.5	0.04-1.5	0.04-1.5	0.04-1.5	0.03-1.1	0.03-1.1	0.03-1.1
Naphthalene	1.0-20.0	0.2-17.4	0.2-15.4	0.03-0.6	0.03-0.6	0.03-0.6	0.03-0.6	0.02-0.5	0.01-0.02	0.01-0.02	0.01-0.02
1-Methylnaphthalene	0.33-30.0	0.29-26.1	0.25-23.1	0.01-0.9	0.01-0.9	0.01-0.9	0.01-0.9	0.01-0.9	0.01-0.9	0.01-0.9	0.004-0.36
2-Methylnaphthalene	0.33-30.0	0.29-26.1	0.25-23.1	0.01-0.9	0.01-0.9	0.01-0.9	0.01-0.9	0.01-0.9	0.01-0.9	0.01-0.9	0.004-0.36
Dimethylphthalate	33-106	21-67	5.0-16.0	5.0-16.0	3.2-10.4	3.2-10.4	3.2-10.4	3.2-10.4	1.1-3.7	1.1-3-7	0.46-1.5
Diisobutylphthalate	20-33	12-21	3.0-5.0	3.0-5.0	1.9-3.2	1.9-3.2	1.9-3.2	1.9-3.2	0.24-0.41	0.24-0.41	0.17-0.29
Bis-(2-ethylhexyl phthalate)	66-200	41-126	10.0-30.0	10.0-30.0	6.5-19.5	6.5-19.5	6.5-19.5	6.5-19.5	5.9-17.7	5.9-17.7	2.2-6.5
PCBs	5.0-33	3.1-20.7	0.55-3.6	0.5-3.3	0.3-2.6	0.3-2.6	0.3-2.6	0.3-2.6	0.1-0.3	0.1-0.3	0.1-03
Arsenic	9-22	9-22	9-22	8-20	5.6-14.0	5.6-14.0	5.0-12.6	1.4-3.6	5.0-12.6	1.4-3.6	<MDL
Barium	120-160	120-160	120-160	60-80	60-80	60-80	60-80	60-80	60-80	60-80	2.0-5.0
Boron	300-500	300-500	300-500	300-500	300-500	300-500	300-500	300-500	300-500	300-500	100-300
Cadmium	6.6-22.2	5.8-19.5	5.8-19.5	3.0-10.0	2.2-7.3	2.2-7.3	2.2-7.3	1.4-4.7	2.1-6.9	1.3-4.5	0.7-2.0
Chromium	160-320	149-297	137-275	40-80	12-24	12-24	9-18	8-16	5.4-10.8	4.8-9.6	0.2-2.0
Copper	167-267	134-214	94-150	50-30	31-50	31-50	31-50	15-24	15-25	7.0-12.0	1.0-10.0
Iron	600-1600	600-1600	300-800	300-800	150-400	150-400	120-320	30-80	84-224	21-56	20-30
Lead	100-150	70-105	50-80	40-60	32-48	32-48	27-41	18-27	16-25	11-16	1.0-3.0
Manganese	41-81	37-73	33-65	30-60	21-42	21-42	17-34	5.6-11.2	13.6-27.2	5.0-10.0	1.0-4.0
Mercury	0.25-2.5	0.2-2.0	0.2-2.0	0.1-1.0	0.08-0.8	0.08-0.8	0.08-0.8	0.07-0.7	0.06-0.6	0.05-0.5	<MDL
Nickel	93-147	88-140	79-126	70-110	60-95	60-95	60-95	49-77	50-79	41-64	4.0-10.0
Selenium	4.2-15.0	3.8-13.5	3.8-13.5	1.0-3.5	0.9-3.1	0.9-3.1	0.7-2.6	0.6-2.1	0.35-1.3	0.3-1.1	<MDL
Silver	0.4-6.7	0.4-6.7	0.4-6.7	0.2-3.0	0.2-3.0	0.2-3.0	0.2-3.0	0.12-1.8	0.2-3.0	0.12-1.8	0.1-1.2
Zinc	250-400	225-360	225-360	100-160	70-112	70-112	70-112	40-64	45-73	34-54	5.0-30.0

NOTE: Influent values attempt to be representative of concentrations entering POTWs. However, values can be quite variable depending on the nature of the service area. Adapted from NRC (1993).
MDL = minimum detection level

6. <u>Analyze all of the alternatives presented as alternatives 1 through 5, and determine which one or which combination of alternatives is best for the site in question.</u>

The RWQCBs should be given significant latitude in determining which alternative action to select for a site. While we believe that the list of alternatives is complete there will likely be a circumstance that was not taken into consideration. Therefore the RWQCBs should consider other alternatives and be allowed to identify other methods and associated costs to fit site-specific conditions. Since cost of remediation is site-specific, the RWQCBs should give a range of values in the cleanup plans.

The RWQCBs should also be required to plan for post-remediation monitoring to assess the effectiveness of the remediation.

Sediment Cleanup Costs

Total costs for various remedial technologies is dependent upon many factors, some of the most important being pollutant concentration, cleanup level, physical characteristics of the sediment, and the volume of material to be remediated. In addition, overall costs of remediation should also include monitoring to evaluate the effectiveness of cleanup. Due to the large number of variables associated with remedial actions and availability of disposal sites, the costs for any cleanup will be project specific.

Tables 18 and 19 provide a qualitative assessment of the various categories of technology. Table 20 contains estimates of the various costs associated with several cleanup methods from studies in the San Francisco Bay Region. The costs listed should not be considered as absolute for specific remediation methods.

RWQCBs should use either the estimates in Table 18 and Table 19 or obtain new, project-specific estimates of cleanup costs. The RWQCBs may obtain outside estimates of costs, if necessary (such as those presented in Table 20). Obtaining new estimates will allow a more realistic comparison of the cost-effectiveness benefit of the selected alternative.

Wastewater Remediation Costs

The costs for implementing the waste water treatment technologies and best management practices are discharge- and site-specific. In developing estimates the RWQCBs shall use the EPA Treatability Manual (EPA, 1983), applicable National Research Council reports (e.g., NRC, 1993), site-specific estimates for BMPs or treatment technologies, or delay the development of cost estimates if the toxic hot spot will be addressed as a part of a watershed management effort. Examples of general costs estimates for the wastewater treatment trains (from Table 15) are presented in Tables 21 and 22. The costs estimated in Tables 21 and 22 assume an 8 percent interest rate for a 20 MGD facility with a design period of 20 years and to not consider the cost of land or sludge disposal (NRC, 1993). These tables and estimates are provided only as examples of the types of information that should be produced in evaluating wastewater treatment.

If cost estimates are delayed the RWQCBs shall develop cost estimates for developing and coordinating the watershed planning effort.

Benefits of Remediation

In developing the regional toxic hot spot cleanup plans the RWQCBs should list the benefits that will be derived by remediating candidate toxic hot spots. Since the costs of remediating sites will be presented, it would assists the RWQCBs and the SWRCB in making their decision on the remediation if the potential benefits of the remediation are presented. It is acknowledged that the benefits to be developed by the RWQCBs are qualitative estimates. The list of possible qualitative benefits of remediation are presented in Table 23.

Staff Recommendation: Adopt Alternative 6.

TABLE 18: QUALITATIVE COMPARISON OF THE STATE OF THE ART IN REMEDIATION TECHNOLOGIES

Feature technology	State of Design Guidance	Number of Times Used	Scale of Application	Cost (per cubic yard)	Limitations
Natural recovery	Nonexistent	2	Full scale.	Low.	Source control Sedimentation Storms.
In place containment	Developing rapidly	<10	Full scale.	<$20.	Limited technical guidance. Legal/regulation uncertainty.
In place treatment	Nonexistent	~2	Pilot scale.	Unknown.	Technical problems Few proponents Need to treat entire volume.
Excavation and containment.	Substantial and well developed	Several hundred	Full scale.	$20 to $100.	Site availability Public assistance.
Excavation and treatment	Limited and extrapolated from soil	<10	Full scale.	$50 to $1,000.	High cost Inefficient for low concentration Residue toxic Need for treatment train.

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TABLE 19: COMPARATIVE ANALYSIS OF TECHNOLOGY CATEGORIES

Approach	Feasibility	Effective	Practicality	Cost
INTERIM CONTROL				
Administrative	0	4	2	4
Technological	1	3	1	3
LONG-TERM CONTROL				
In Situ				
Natural recovery	0	4	1	4
Capping	2	3	3	3
Treatment	1	1	2	2
Sediment Removal and Transport	2	4	3	2
Ex Situ Treatment				
Physical	1	4	4	1
Chemical	1	2	4	1
Thermal	4	4	3	0
Biological	0	1	4	1
Ex Situ Containment	2	4	2	2

SCORING	**Feasibility**	**Effective**	**Practicality**	**Cost**
0	<90%	Concept	Not acceptable, very uncertain	$1,000/yd
1	90%	Bench		$100/yd
2	99%	Pilot		$10/yd
3	99.9%	Field		$1/yd
4	99.99%	Commercial	Acceptable, certain	<$1/yd

TABLE 20: ESTIMATED COST RANGES FOR SEDIMENT REMEDIATION

			Alternatives	Volume	Cost/cy
I. Removal					
	A. mechanical				
		1.	dipper[4]	1 cy	$1 - 25
		2.	bucket ladder[4]	1 cy	$1 - 25
		3.	dragline[4]	1 cy	$1 - 25
		4.	clamshell[2]	1 cy	$10 labor
	B. hydraulic				
			silt screen[3]	10,000 sf	$30,000 mat/labor
		1.	plain suction[2,3]	1 cy	$7 - 10 labor
		2.	cutterhead[4]	1 cy	$7 - 10
		3.	dustpan		
		C.	pneumatic[4]	1 cy	>$10
II. Transport (may depend upon if hazardous waste, and will affected by dredge and treatment selection)					
		A.	pipeline	TBD*	TBD
		B.	barge[4]	TBD	TBD
		C.	rail[3]	1 Ton	$53 (includes 1500 miles of transportation and upland disposal of non-hazardous pollutants)
		D.	truck[2]	1 cy	$200

TBD = to be determined

Table 20
(Continued)
Estimated Cost Ranges for Sediment Remediation

		Alternatives	Volume	Cost
III.	Pre-Treatment			
		A. dewatering pumping[3]	1 cy	$0.05 labor
		1. air drying		
		a. construct upland drying area	(size dependent)[2]	$5,000 labor
		wick drains, subdrain blanket[3]	1 sf or lf	$1 materials
		b. condition dredged sediment[3]	1 cy	$4 - 7 mat/labor
		2. mechanical		
		a. filtration[5b]	1 cm	$6
		b. centrifuge[7]	1 cm	<$6
		c. gravity thickening[7]	1 cm	<$6
		B. particle classification: for #2, 3, 4, and 5 below[5b] (sorting and separating)	1 cy	$6 - 100
		1. impoundment basins	1 cy	$6 - 100
		2. hydraulic classifiers	1 cy	$6 - 100
		3. hydrocyclones	1 cy	$6 - 100
		4. grizzlies	1 cy	$6 - 100
		5. screens	1 cy	$6 - 100

Table 20
(Continued)
Estimated Cost Ranges for Sediment Remediation

Alternatives	Volume	Cost
C. slurry injections (may overlap with other treatment technologies)		
1. chemicals	TBD	TBD
2. nutrients	TBD	TBD
3. microorganisms	TBD	TBD
IV. Treatment (in some cases, costs associated with any particular treatment will be dependent upon pollutant concentration and cleanup levels required. Some of these technologies have been performed on sediments at the bench or pilot scale only, and are not proven for full scale.)		
A. biological		
1. biodegradation/bioremediation[5b]	1 ton	$25 - 100
B. physical		
1. solidification/stabilization[5]	1 cy	< $100
C. chemical		
1. chelation, chemical hydrolysis, detoxification[5a]	1 cy	$200-300
2. solvent extraction[5b]	1 ton	$50 -150
3. electrokinetic soil washing[5b]	1 cy	$100-300

Table 20
(Continued)
Estimated Cost Ranges for Sediment Remediation

	Alternatives	Volume	Cost
	D. thermal		
	1. rotary kiln incineration[1]	< 6,700 cy	$675 - 2,025
		6,750 - 20,250 cy	$405 - 1,215
		20,250 - 40,500 cy	$270 - 810
		> 40,500 cy	$135 - 540
	2. cyclone furnace vitrification[5b]	1 ton	$450 - 530
	3. fluid bed incineration[5b]	1 ton	$50 - 175
V. Disposal			
	A. onsite upland[6] (includes unspecified dredging method and disposal)	1 cy	$3 - 4
	B. offsite land		
	wetlands creation[6]	1 cy	$10 - 20
	class I disposal facility[5] (does not include hazardous waste generator fees)	1 ton	$200 - 300
	class II disposal facility[5]	1 ton	$55 - 65
	class III disposal facility[5]	1 cy	$30 - 40
	C. aquatic		
	1. confined	TBD	TBD

Table 20
(Continued)
Estimated Cost Ranges for Sediment Remediation

		Alternatives	Volume	Cost
	2.	unconfined		
		a. in-bay[6] (includes unspecified dredging method and disposal)	1 cy	$2 - 3
		b. in-bay[6] (includes clamshell dredging and disposal)	1 cy	$1 - 8
		c. ocean[6] (includes unspecified dredging method and disposal)	1 cy	$5 - 9
VI.	Effluent/Leachate Treatment			
	1.	set up carbon absorption system[2,3] (for organics)	1 system	$25,000 -30,000 mat/labor (does not include O&M)

Table 20
(Continued)
Estimated Cost Ranges for Sediment Remediation

References:

[1] US EPA Office of Research and Development, *Contaminated Sediments Seminar* CERI-91-19, May 1991

[2] *Feasibility Study for the United Heckathorn Site, Richmond, California,* prepared by Levine Fricke - Emeryville, California, January 11, 1991

[3] *Feasibility Study for the United Heckathorn Superfund Site, Richmond, California,* prepared by Batelle/Marine Sciences Laboratory, Sequim, Washington, July 1994

[4] US EPA Office of Water, *Selecting Remediation Techniques for Contaminated Sediment* EPA-823-B93-001, June 1993

[5] Draft Report - Long-Term Management Strategy, *Analysis of Remediation Technologies for Contaminated Dredged Material,* prepared by Gahagan & Bryant Associates, Inc., Novato California in association with ENTRIX, Inc. Walnut Creek, California, October 25, 1993 (includes review and analysis of other documents:

[a] Texas A & M *Proceedings of 25th Annual Dredging Seminar* ;

[b] *Sediment Treatment Technologies Database (SEDTEC),* 2nd edition; Site Remediation Division, Wastewater Technology Centre, operated by Rockcliffe Research Management, Inc.) - submitted by technology developers and vendors from around the world;

[6] Long-Term Management Strategy Dredging Costs Survey for San Francisco Bay, Tom Gandesbery, RWQCB Region 2, personal communication June 1994

[7] US EPA Office of Research and Development, Handbook/Remediation of Contaminated Sediments, EPA/625/6-91/028, April 1991.

TABLE 21: COSTS FOR SYSTEMS 1-4

	Primary (1)	Low-dose Chemical Primary (2a)	High-Dose Chemical Primary (2b)	Biological (3)	Low-Dose Chemical Primary + Biological (4)
Capital Cost ($/gpd)	0.9-1.1	1.1-1.4	1.2-1.8	2.4-2.6	2.6-2.9
Capital Cost ($/MG)	245-310	320-400	400	610-720	750-870
O & M Cost ($/MG)	205-240	230-280	250-350	320-410	350-450
Total Cost ($/MG)	450-550	550-680	650-750	930-1,130	1.050-1,150

Adapted from NRC. 1993. Managing wastewater in coastal urban areas. Committee on Wastewater Management for Coastal Urban Areas, Water Science and Technology Board, Commission on Engineering and Technical Systems, National Research Council. National Academy Press, Washington, D.C.

TABLE 22: COSTS FOR SYSTEMS 5-10

	Nutrient Removal (5)	Nutrient Removal + Filtration (6)	Nutrient Removal + High Lime + /filtration (7)	Nutrient Removal + Filtration + GAC (8)	Nutrient Removal + High Lime + Filtration + GAC (9)	Nutrient Removal + High lime + Filtration + GAC + Reverse Osmosis (10)
Capital Cost ($/gpd)	2.9-3.3	3.5-3.9	5.2-5.6	4.5-4.9	6.1-6.7	6.5-9.5
Capital Cost ($/MG)	750-870	890-1,140	1,300-1,700	1,150-1,450	1,500-1,800	7,000-2,500
O & M Cost ($/MG)	500-580	560-660	1,100-1,300	850-950	1,350-1,650	2,500-3,000
Total Cost ($/MG)	1,250-1,450	1,450-1,800	2,400-3,000	2,000-2,400	2,900-3,500	4,500-5,500

Adapted from NRC. 1993. Managing wastewater in coastal urban areas. Committee on Wastewater Management for Coastal Urban Areas, Water Science and Technology Board, Commission on Engineering and Technical Systems, National Research Council. National Academy Press, Washington, D.C.

TABLE 23. 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

*Memorandum from Walt Pettit to the RWQCB Executive Officers. 1993. Revised beneficial use definitions. SWRCB, Sacramento, CA.

Issue 6: Toxic Hot Spot Prevention Strategies

Present Policy: None.

Issue Description: Various factors influence the ability to implement prevention measures in identified toxic hot spots in bays and estuaries. The most important factors among others are: land use practices, type of pollutant affecting the site, areal extent of the site, and whether responsible party or parties are willing or able to implement the necessary control measures to prevent a THS or its recurrence.

There are three possible types of prevention tools that can be used in preventing and/or remediate toxic hot spots. These consist of (1) Voluntary tools which include actions that can be taken at the community level, (2) Interactive Cooperative Programs involving funds to entice private and public agencies to do prevention projects and activities, and (3) Regulatory Actions, taken in compliance with various existing regulatory programs currently in force throughout the State.

These implementation tools can be put to use in two ways: (1) The point source pollution control management strategy which achieves pollution control through the imposition of waste discharge permits, prohibitions and/or enforcement actions, and (2) Watershed Management Planning strategy which uses a multi-disciplinary, multi-regulatory integrated approach to achieve effective protection while allowing the flexibility to address specific problems within the context of a watershed. The question is to determine which process provides the possibility of achieving the best solutions to address point and nonpoint source of pollution in the receiving waters and sediment of bays and estuaries.

Alternatives:

1. <u>Point Source Pollution Control Strategy Only</u>

Historically, this is the way point source pollution control has been carried out, by applying a permitting process, imposing effluent limits on wastewater discharges, establishing prohibitions, and taking enforcement actions whenever it has been necessary. Other water quality protection strategies have been available through the State and RWQCB system and in other federal and state agencies but they tend to be applied in an independent fashion. Unfortunately, each potential prevention tool, has been conceived independently adopted through different legislation, forming distinct portions of different programs. Many potentially useful prevention Strategies reside in different agencies with different authorities. Each has been designed to address specific problems and/or sources of pollution, all are usually funded differently and therefore applied independently.

Toxic hot spot prevention requires not only control of point sources of pollution but even more importantly control over nonpoint sources as well. This requires a broader more coordinated approach. Proper prevention control requires the use of flexible and integrated strategies in order to effectively remediate and prevent the reoccurrence of polluted sites in bays and estuaries. The present way of implementing water quality controls confines activities to agencies, programs or geographical jurisdictions and does not promote the application of a coordinated water quality protection approach.

This option, in effect, does not require endorsement of any different approach. Toxic hot spot prevention is achieved through the application of existing control strategies.

2. Watershed Management Planning

Watershed management is a comprehensive strategy that can make possible the implementation of cost effective integrated control actions that can effectively achieve the protection necessary to maintain and restore beneficial uses of watershed as a whole.

For a given watershed, not only all hydrologic resources are considered (streams, lakes, groundwater basins, bays and estuaries) but also all land use practices being applied in the watershed as well. Interdisciplinary work groups that are able to cross over geographical and political boundaries to identify water quality problems prioritized them, and develop effective solutions. Solutions developed can be applied from the whole watershed perspective, that is, problem solutions are applied where they will do the most good from the watershed perspective.

This process also allows for dischargers, landowners, business owners, environmental groups, non-profit groups, and other members of an affected community to discuss the watershed issues and get involved in seeking practical, cost effective solutions to the watershed identified THSs. Such meetings help in the exchange of information, ideas, and expertise among different representations resulting in effective and more easily implementable management practices. Solutions developed could be unique to the watershed or they could be composed of a specific combination or modification of existing practices.

Effective prevention of sediment and water quality degradation in bays and estuaries requires a broad approach where all point and non-point sources of pollution from various land use activities are taken into consideration. A watershed management planning approach allows for the development of management practices that can address specific problems within a watershed area overcoming the barriers imposed by geography and different political jurisdictions. This promotes interaction and cooperation among all concerned parties which can result in a more comprehensive and effective solutions to solve water quality problems within a hydrologically defined watershed basin.

To address toxic hot spots, watershed management should involve implementation of voluntary, cooperative agreements and regulatory programs to address identified problems. Several existing State and Federal programs should be considered in developing prevention strategies as follows.

Voluntary Programs

Voluntary actions ideally represent the preferred approach for addressing toxic hot spots mitigation and prevention upon bays and estuary environments. Community based planning efforts, such as the Coordinated Resources Management Planning (CRMP) groups and Watershed Advisory Groups (WAGs), offer a forum through which information about a particular bay or estuary may be distributed and obtained.

Interactive Cooperative Programs

Interactive Cooperative Programs can be effective in developing comprehensive pollution prevention strategies among private and public agencies by providing ways that will encourage involvement, promote interagency cooperation and aid in the development of coordinated approaches to take pollution prevention steps. There are three types of Interactive Cooperative Programs. These can be categorized as follows; Interagency Agreements, Funding Programs and Federal Programs.

Interagency Agreements

Interagency Agreements, in the form of Management Agency Agreements (MAAs), and Memorandum of Understanding (MOUs) can provide effective cooperation and regulatory coordination among regulatory or planning agencies with different statutory jurisdiction. Such Interagency Agreements are useful in defining each agency's authority, responsibility and level of coordination in implementing mitigating and preventive water quality control measures.

Management Agency Agreement (MAA) with the Department of Pesticide Regulation (DPR) and the Pesticide Management Plan (PMP)

The SWRCB and DPR entered into a MAA in March 1997 to eliminate duplication of effort and inconsistency of action dealing with pesticide use and water quality. 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.

Funding Programs

There are several federal and state funding programs currently in place that can be useful in encouraging the development of pollution prevention actions. These include the following:

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 (see TMDL discussion, below).

Water Quality Planning (CWA §205(j))

Section 205(j) of the Clean Water Act (CWA) allows each state to provide funding for water quality management and planning projects. In addition, Congress has provided funding under Section 604(b), State Revolving Fund Set-Aside. Any regional or local public agency may apply directly to the State Board for 205(j) project funding. The State Board, Division of Water Quality, Water Quality Planning Unit and Regional Board Planning staff, administer this grant program.

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.

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.

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.

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.

Federal Programs

<u>Nonpoint Source Best Management Practices</u>

As defined in 40 CFR 103.2 (M), BMPs are; "Methods, measures or practices selected by an agency to meet its nonpoint source control needs. BMPs include, but are not limited to structural and nonstructural controls, and operation and maintenance procedures. BMPs can be applied before, during and after pollution producing activities to reduce or eliminate the introduction of pollutants into receiving waters."

BMPs fall into two general categories: Source Controls which prevent a discharge or threatened discharge. Recycling, fertilizer management, erosion control and physical barriers to prevent livestock impacts are considered source control measures. Treatment Controls measures remove pollutants from the nonpoint source before it reaches the waterbody of concern. Examples include, created wetlands, sedimentation basins and oil/water separators.

<u>Total Maximum Daily Loads (TMDLs)</u>

Section 303(d) of the Clean Water Act requires States to identify water bodies that do not meet water quality standards after technology based control has been implemented. These water bodies may be impacted by conventional or toxic pollutants from either point or nonpoint sources and are designated Water Quality Limited Segments. Once these water bodies are identified, states are required to develop Total Maximum Daily Loads

(TMDLs) and a Waste Load Allocation or Load Allocation as a strategy for reducing the contaminant load. The Waste Load Allocation and Load Allocation refer to the quantity of pollutant that can be added to waterbody and still maintain the beneficial use. The TMDL allocates a portion of the load to point sources (Waste Load Allocation), and to nonpoint sources and background (Load Allocation) with a margin of safety.

National Estuary Program

As specified in the Clean Water Act, Section 320, significant coastal estuaries and water bodies may be nominated by the Governor and accepted into the National Estuary Program by the Environmental Protection Agency. It must be demonstrated that the waterbody is of national significance from both an ecological and a public health standpoint.

The purpose of the program is to establish a mechanism for coastal protection. Acceptance into the National Estuary program provides a formal structure for developing water quality protection mechanisms, and may be an effective tool for initiating pollution prevention programs. Water bodies in the National Estuary Program are targeted for the development of comprehensive conservation and management plans that recommend priority corrective actions and compliance schedules addressing point and nonpoint source pollution. These plans must also propose methods to restore the chemical, physical and biological integrity of the estuary, as well as assure that beneficial uses are protected.

Regulatory

The following State and federal regulatory activities are carried out by the State and Regional Boards. These programs contain water quality protection enforcement provisions that must be complied with before operations are allowed to proceed. These programs, either require WDRs (or permits) containing specific provisions or require the strict adherence to specific operating procedures in order to provide appropriate water quality protection to a target receiving water. They have been identified and described on the basis of (1) information provided by each program that can be useful in the prevention of toxic hot spots and their recurrence, and (2) how these regulatory activities can be useful in providing component tools (mechanisms and process) to help prevent toxic hot spots.

Waste Discharge Requirements and the National Pollutant Discharge Elimination System (NPDES) Program

The Regional Water Boards issue waste discharge requirements orders which incorporate Federal Clean Water Act (CWA) provisions (NPDES Permits) and Porter-Cologne Act regulatory provisions to regulate point source discharges to navigable waters of the U.S. (streams, rivers, lakes, or coastal waters) and ground waters of the state. The permits are implemented in California through a cooperative program with the U.S. EPA and the state and RWQCBs. As a result, the issuance of waste discharge permits satisfies both State and Federal law. The regulatory provisions of the permits include the authority to issue the permits for a fixed term not to exceed five years. The regulation provides authority for inspection and monitoring. It also provides for a pretreatment program which authorizes the state to impose pretreatment standards on industrial users of POTWs.

During the issuance process, the RWQCB staff analyzes the discharge and prepares waste discharge requirements for Board adoption. The requirements must implement the water quality control plans and policies to protect beneficial uses of the receiving waters. Monitoring data provided by the permit program can provide information about possible toxic hot spots. Stricter effluent limits can help remediate and prevent recurrence of toxic hot spots in some cases. The imposition of appropriate effluent standards may help to prevent toxic hot spots.

Coastal Zone Act/Coastal Zone Act Reauthorization Amendments (CZARA)

In passing into law the CZARA, Congress identified nonpoint source pollution as a significant factor in coastal water degradation. This acknowledgment links coastal water quality with land use activities along the shore. Section 6217 now requires that states with approved coastal zone management programs develop a coastal nonpoint source pollution control program as well. The management measures are being evaluated and ultimately the program developed will: (1) identify those land uses that individually or cumulatively may cause or contribute significantly to a degradation of a coastal water, (2) identify critical geographical areas adjacent to coastal waters and (3) implement measures to achieve and maintain water quality standards.

Clean Water Act Section 404 and 401

Section 404 of the Clean Water Act prohibits the discharge of dredge or fill materials into navigable waters of the U.S. unless a permit is obtained from the U.S. Army Corps of Engineers. The U.S. EPA has oversight and veto authority over the Corps determination to issue the permit if it finds that the proposed project will have adverse effects on the receiving waters. Section 401 of the CWA requires that any federally permitted activity issued under CWA Section 404 complies with the States adopted water quality objectives and effluent limitations. Under this section the State, through the SWRCB must issue the water quality certification. The water quality certification declares that the proposed activity will be conducted using prescribed technology and that it will not result in any violation of any effluent limitations or water quality objectives. Until such a certification is issued, denied or waived by the SWRCB the proposed project can not proceed.

Storm Water Program

The 1987 amendments to the Clean water Act added Section 402(p) to the already existing NPDES program. The new section established a framework to regulate municipal and industrial storm water discharges to surface waters or through municipal separate storm sewers. The SWRCB and RWQCB currently issue individual and general permits to regulate most storm water discharges.

Owners or operators of industrial storm water discharge systems and some construction sites must obtain authorization for the use or continued use of storm water discharge systems by submitting a "Notice of Intent", which signifies that the discharger intends to comply with the provisions of a Statewide general permit. For example, the industrial storm water general permit authorizes the discharge of industrial storm water from industrial facilities, prohibits illicit connections and discharges containing hazardous substances in storm water in excess of reportable quantities prescribed by federal regulation.

The actual permit process could help prevent toxic hot spots from these permitted activities.

Staff Recommendation: Adopt Alternative 2.

Toxic Hot Spot Cleanup Plans should be written such that actions taken either to remediate or prevent toxic hot spots use an integrated and coordinated management protection approach. A watershed strategy should encompasses all waters surface, ground, inland and coastal and address point and nonpoint sources of pollution.

The Cleanup Plans should also be written to take into account and accommodate the water quality control priorities identified by already established local watershed plans. Wherever watershed plans are established, toxic hot spots cleanup plans should serve as a supplementary documents recommending different approaches to prevent toxic hot spots in the bays and estuaries of a particular watershed. In cases where a watershed plan is not in place the toxic hot spot cleanup plans should serve to provide guidance in implementing appropriate controls to prevent toxic hot spots.

Pesticide residues should not be considered under the Bay Protection and Toxic Cleanup Program if they are detected in the water column in a pattern of infrequent pulses moving by the sampling location. Such detections will be addressed using cooperative approaches such as the Management Agency Agreement between the SWRCB and the Department of Pesticide Regulation, the NPS Management Plan, and existing authorities including the Porter-Cologne Water Quality Control Act and Clean Water Act.

Please refer to Pages "xlvii" through "xlviii" of this document for the provisions related to toxic hot spot prevention.

ENVIRONMENTAL EFFECTS OF THE PROPOSED POLICY

This section provides an analysis of potential adverse environmental effects of SWRCB adoption of the Water Quality Control Policy on guidance for development of the BPTCP cleanup plans. The SWRCB and the RWQCBs will use a three phase process for adoption of the Regional and Statewide Toxic Hot Spot Cleanup Plans. The three phases are:

1. The SWRCB will adopt a policy outlining the toxic hot spot definition, ranking criteria and other factors needed for the consistent development of the BPTCP cleanup plans (as presented in this program FED).

2. The RWQCBs will adopt the regional toxic hot spot cleanup plans.

3. The SWRCB will compile and adopt the consolidated toxic hot spot cleanup plan. The SWRCB will develop a FED to facilitate CEQA and APA compliance. The SWRCB will use the same procedures used for adoption of the Policy in Phase 1 for adoption of the Statewide consolidated toxic hot spot cleanup plan. Any environmental impacts identified in the development of the Regional toxic hot spot cleanup plans will be evaluated when the consolidated toxic hot spot cleanup plan is considered by the SWRCB.

The analysis that follows identifies differences between existing RWQCB practices under current Water Code provisions and the proposed Policy, and the potential environmental effects of these differences. Also, this analysis examines whether adoption of the proposed Policy would change anything and, if so, does the change have the potential for significant adverse effects.

After evaluating the potential adverse effects of each of the issues in the proposed Policy, no issues were found to have the potential for significant adverse environmental effects.

Baseline

The baseline is the existing physical conditions under current RWQCB practices for addressing polluted water and sediments. The baseline is what is now occurring in the absence of the proposed Policy.

At present, the SWRCB and the RWQCBs have a variety of options for addressing polluted water and sediments in the absence of the BPTCP and the requirements for toxic hot spot cleanup plans. The various bases for regulation of toxic pollutants and their implementation procedures are discussed below.

The SWRCB and the RWQCBs implement State (Porter-Cologne Act) and Federal law (Clean Water Act) for the protection of water quality. The RWQCBs regulate point discharges through Waste Discharge Requirements (WDRs) and National Pollutant Discharge Elimination System (NPDES) permits. Because the SWRCB and the RWQCBs operate the NPDES permit program in California, one permit is usually issued to point dischargers to comply with State and Federal statute. For nonpoint dischargers, the RWQCBs can issue WDRs to protect beneficial uses. The current functions of the SWRCB and the RWQCBs are described below.

Planning

The RWQCBs have Water Quality Control Plans for their Regions (Basin Plans). The plans contain inventories of beneficial uses of the waters in the regions and water quality objectives to ensure reasonable protection of the beneficial uses. The plans also contain an implementation program to achieve the water quality objectives. This program can include the actions necessary to achieve water quality objectives, a time schedule for the actions, and descriptions of the monitoring necessary to determine compliance with objectives.

The SWRCB can adopt State policies for water quality control or statewide water quality control plans. Policies contain water quality principles and guidelines for long range resource planning, including surface water management. Policies may also contain water quality objectives. RWQCB basin plans must conform to all SWRCB Policies.

Plans and Policies are implemented through the issuance of WDRs, NPDES permits, cleanup and abatement orders, and other enforcement actions.

WDRs and NPDES Permits

All dischargers of waste to the waters of the State must apply for and receive from a RWQCB a WDR. This document lists what can and can not be discharged to the waters of the State. WDRs implement water quality control plans and are intended to protect the beneficial uses of receiving water. WDRs are adopted by RWQCBs after interested parties and the discharger has had an opportunity to comment on the provisions of the WDR.

The issuance of WDRs satisfies the requirements of both State and Federal law. Consequently, for a point discharger WDRs are considered to be a NPDES permit. Under the Water Code (Chapter 5.5) the RWQCBs have the authority to issue NPDES permits for a fixed term not to exceed five years. Other authorities include inspection and monitoring, notice to the public, notice to the U.S. EPA, notice to any other affected state, protection of navigation, enforcement, a pretreatment program, and necessary enforcement authorities.

The RWQCBs regulate nonpoint source discharges of pollutants to surface waters primarily through application of the SWRCB's Nonpoint Source Management Plan (NPS Plan). The NPS Plan provides a policy for addressing all types of nonpoint source discharges (such as agricultural return flows). The NPS Plan gives the RWQCBs the discretion to determine which of three options, individually or in combination, should be used to address a nonpoint source pollution problem. The options are: (1) voluntary implementation by dischargers of best management practices (BMPs); (2) regulatory actions by RWQCBs to encourage dischargers to implement BMPs; and (3) RWQCB issuance of effluent limitations in WDRs.

Enforcement

RWQCBs have a variety of enforcement actions that they can use to ensure that WDRs and NPDES permits are met. The actions can be administrative (actions taken by the

RWQCB) or judicial (considered in the courts after referral to the State Attorney General). The enforcement actions listed below are at the discretion of each RWQCB, and, as a result, there may not be strict uniformity as to method or level of enforcement from Region to Region.

Administrative Civil Liability

The process of imposing administrative civil liability orders begins when the RWQCB staff issues a complaint to 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.

Cease and Desist Orders

These orders are based on the violation of a WDR, a NPDES permit, or a prohibition in a water quality control plan. The violation can be actual or threatened. The order itself must be adopted by the RWQCB.

Cleanup and Abatement Orders

This type of order directs a discharger to do or not do something. The cleanup and abatement order can be based upon a violation of existing regional board orders (e.g., WDRs) or where someone has discharged waste or threatens to discharge waste. The effect of the order is to cleanup the waste discharged or abate the effects of the waste, or in the case of threatened pollution or nuisance, to take other remedial action.

Potentially Significant Adverse Environmental Effects

The proposed Policy was evaluated in terms of the baseline described above. The analysis of each issue is formatted consistently as described below.

1. Existing RWQCB Practices.

   This section provides a brief description of how RWQCBs currently address this issue.

2. Proposed Policy.

   This section provides a brief description of how the Policy addresses the issue and a brief description of why the Policy was developed this way.

3. Differences Between the Policy and Existing Practices.

   Differences between (1) and (2).

4. Potential Adverse Environmental Effects.

   What are the potential effects of the differences between the proposed Policy and the existing RWQCB practices?

5. Potentially Significant Adverse Environmental Effects.

   Are any anticipated potential adverse environmental effects in (4) significant?

Issue 1: Authority and Reference for Guidance on Developing Toxic Hot Spot Cleanup Plans

1. Existing RWQCB Practices.

   Currently, the Water Code requires the RWQCBs to develop Regional toxic hot spot cleanup plans. The plans are required to contain the following information: (1) ranked list of all toxic hot spots, (2) estimate of areal extent of each toxic hot spot, (3) estimate of likely sources of pollution at the toxic hot spot, (4) summary of actions initiated by the RWQCB at the site, (5) preliminary list of actions to remedy the toxic hot spot, (6) estimate of costs to implement actions, (7) estimate of costs recoverable from dischargers, and (8) expenditure schedule. The provisions of the Water Code are not very specific with respect to these factors.

2. Proposed Policy.

   The proposed Policy would limit flexibility in interpretation of the Water Code and would ensure consistent development of the toxic hot spot cleanup plans on a Statewide basis. The proposed Policy allows for site-specific variances similar to the exception processes in Statewide Plans and regulations. Variance provisions are needed in site-specific circumstances where the Policy cannot be implemented by the RWQCBs.

This approach was selected because it provided Statewide consistency in the development of the regional toxic hot spot cleanup plans and will facilitate the development of the consolidated cleanup plan.

3. Differences Between the Policy and Existing Practices.

The proposed Policy establishes mandatory requirements for the contents of cleanup plans and requires the use of specific ranking criteria and THS definition. The RWQCBs will have less discretion in defining and ranking toxic hot spots. The RWQCBs will also be required to include information in the cleanup plan that they might not have included otherwise (e.g., ranking based on weight-of-evidence or natural remediation potential).

4. Potential Adverse Environmental Effects.

The development of a Water Quality Control Policy will have no significant effect on the environment. The proposed Policy will ensure the consistent development of regional toxic hot spot cleanup plans. Standardizing the cleanup plans and establishing a consistent toxic hot spot definition and ranking criteria will increase the likelihood of the consolidated plan being completed by the June 30, 1999 deadline.

5. Potentially Significant Adverse Environmental Effects.

None.

Issue 2: **Toxic Hot Spot Definition**

1. Existing RWQCB Practices.

   The Water Code establishes a general definition. The statutory definition of a toxic hot spot gives the RWQCBs significant latitude in considering which locations in the State are considered toxic hot spots.

   It is very unclear how many toxic hot spots would be identified using the statutory definition. Conceivably, every water body that has been previously sampled could be designated as a toxic hot spot.

2. Proposed Policy.

   The proposed Policy would establish a specific definition of a toxic hot spot. The specific definition of a toxic hot spot combines consideration of the statutory definition of a toxic hot spot, sediment quality assessment criteria from the SWRCB 1991 workshop, several programmatic and regulatory criteria, SPARC review, and tools currently available to identify toxic hot spots.

   The specific definition is separated into two parts: candidate and known, based on whether the RWQCBs and SWRCB have adopted cleanup plans identifying the site as a known toxic hot spot. Under the proposed definition, a site shall be considered a candidate toxic hot spot if it exhibits significant toxicity, high levels of bioaccumulation, impairment of resident organisms, degradation of biological resources, or if water or sediment quality objectives are exceeded. Once the consolidated cleanup plan is adopted by the SWRCB then candidate sites will become known toxic hot spots. Dischargers cannot be considered to be toxic hot spots.

   Sites that are not well characterized (i.e., insufficient data to designate as a candidate toxic hot spot) shall be characterized as areas of concern. Any site designated as an area of concern will be considered for further monitoring to confirm preliminary indications of the site impairments.

This alternative was selected because it provided the RWQCBs and the SWRCB a specific definition of a toxic hot spot that would allow the worst sites to be distinguished consistently from other sites.

3. <u>Differences Between the Policy and Existing Practices.</u>

Existing RWQCB practice is to broadly interpret the Water Code definition for use in planning for the cleanup or remediation of toxic hot spots. This approach is problematic because it would be difficult to focus efforts where regulatory response is needed most. Using the statutory definition would give the same "toxic hot spot" designation to sites with little information available as sites that are well studied. The RWQCBs would then be required to develop a cleanup plan that planned for the remediation or further prevention of toxic pollutants at these sites.

The statutory definition of a toxic hot spot is quite general, and could be subject to an interpretation that would allow large portions (if not all) of California's coastline, including enclosed bays and estuaries, to be designated as a toxic hot spot. Once they are identified the parties responsible for the sites could be liable for the cleanup of the site or further prevention of the discharges or activities that caused the toxic hot spot.

The proposed Policy establishes a specific definition that limits the discretion of the RWQCBs but allows them to include Region-specific factors (e.g., use of appropriate species for monitoring, interpretation of toxicity data). The specific definition also requires that a site should be considered a candidate toxic hot spot until the SWRCB has formally adopted the consolidated cleanup plan. After this plan is adopted the site will become a known toxic hot spot. This is necessary because the RWQCBs are required to initiate review of WDRs upon listing of toxic hot spots. Delaying the designation until the consolidated cleanup plan is completed allows the SWRCB to complete the CEQA analysis before any plan implementation.

4. Potential Adverse Environmental Effects.

   The specific definition of a toxic hot spot in the proposed Policy is not expected to result in adverse impacts to the environment. The specific definition will allow for a more clear identification of toxic hot spots throughout the State. The definition will clearly identify the worst sites. This would allow the RWQCBs to better focus on these problem areas. Sites with little or contradictory information will not be identified as toxic hot spots. Sites that are of concern to the RWQCBs but do not meet the criteria of the definition are to be listed separately in the Regional cleanup plan. As these sites are better characterized they may become candidate toxic hot spots.

   The RWQCBs recently completed proposed toxic hot spot cleanup plans using the specific definition presented in this FED. For all Regions, a total of 37 sites were identified as candidate toxic hot spots and 63 sites identified as areas of concern (RWQCB, 1997a; 1997b; 1997c; 1997d; 1997e; 1997f; 1997g).

5. Potentially Significant Adverse Environmental Effects.

   None.

Issue 3: Criteria to Rank Toxic Hot Spots in Enclosed Bays and Estuaries of California

1. Existing RWQCB Practices.

   The RWQCBs currently use the SWRCB's Watershed Management Initiative to establish priorities for funding and addressing problems.

   The California Water Code, Section 13393.5, requires the State Water Board to develop and adopt criteria for the priority ranking of toxic hot spots in enclosed bays and estuaries. The criteria are to "take into account pertinent factors relating to public health and environmental quality, including but not limited to potential hazards to public health, toxic hazards to fish, shellfish, and wildlife, and 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."

Each RWQCB is free to rank sites depending on their Regional priorities and needs.

2. Proposed Policy.

The ranking system presented in the proposed Policy has been designed to (1) provide a general criteria for ranking sites, (2) address specific requirements of the Water Code (Water Code Section 13393.5), and (3) establish a categorical ranking of toxic hot spots. The RWQCBs would be given discretion to rank sites based on the information available.

The ranking criteria provides the RWQCBs with five general criteria (plus a summary criterion) that can be used by each Region consistently but still allow for Region-specific interpretation and assessment of the final ranked order of sites.

This alternative was selected because it provides the best combination of Statewide consistency with RWQCB flexibility for ranking sites. The ranking criteria allow for Regional differences in the data used to rank sites, allows RWQCB discretion in establishing the final site ranks and is not so specific to require numerical ranking.

3. Differences Between the Policy and Existing Practices.

The major differences between existing practices and the proposed policy is that the ranking criteria address the mandated requirements of the Water Code, is more specific and applies to enclosed bays, estuaries and the ocean. The proposed Policy sets out a consistent method for ranking sites. Existing practices are region-specific.

4. Potential Adverse Environmental Effects.

The ranking criteria will have no significant impact on the environment. The role of the ranking criteria is to provide a priority list of sites based on the severity of the identified problem. The Water Code calls for waste discharge requirements to be reevaluated in the ranked order. Water Code Section 13395 states, in part, that the RWQCBs shall "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 initiated within 120 days from, and the last shall be initiated within one year from, the ranking of toxic hot spots."

The priority ranking for each site is to be included in a Regional toxic hot spot 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 list of ranked hot spots will be consolidated into a statewide prioritized list of toxic hot spots, and included in the consolidated toxic hot spot cleanup plan.

Within specified periods of time, waste discharge requirements for each source identified as contributing to a toxic hot spot are to be reviewed and revised (with certain exceptions) to prevent further pollution of existing toxic hot spots or the formation of new hot spots. The reevaluation of permits is to be conducted in the order established by the priority ranking of hot spots.

The focus on point and nonpoint sources of pollution at highly ranked sites will most likely improve water and sediment quality.

Using the categorical ranking criteria, the RWQCBs identified 17 sites Statewide as "high" priority (RWQCB, 1997a; 1997b; 1997c; 1997d; 1997e; 1997f; 1997g).

5. Potentially Significant Adverse Environmental Effects.

None.

Issue 4: Mandatory Requirements for Regional and Statewide Toxic Hot Spot Cleanup Plans

1. Existing RWQCB Practices.

The SWRCB and RWQCBs are required by the Water Code (Section 13394) to address a variety of topics including the following information:

A. A priority ranking of all THS, including recommendations for remedial actions;

B. A description of each THS including a characterization of the pollutants present at the site;

C. An estimate of the total cost to implement the cleanup plan;

D. An assessment of the most likely sources of pollutants; (potential dischargers)

E. An estimate of recoverable costs from responsible parties;

F. Preliminary Assessment of Actions required to remedy or restore a THS;

G. A two-year expenditure schedule identifying state funds to implement the plans;

H. A summary of actions that have been initiated by the regional boards to reduce the accumulation of pollutants at existing THSs and to prevent the creation of new THSs

I. Findings and recommendations concerning the need for a toxic hot spot cleanup program.

No Specific guidance is given on what information should be included in each of these sections.

2. Proposed Policy.

The proposed Policy would establish specific requirements for what is required to adequately and consistently develop the Regional and Statewide Cleanup Plans. This additional guidance does not limit the RWQCBs to the quantity of information presented but rather should establish the basic amount of information necessary to complete the requirements of the Water Code. This alternative was selected because it will facilitate completion of the Statewide toxic hot spot cleanup plan. A section was also added that lists issues that will be considered in the Statewide consolidated plan.

3. Differences Between the Policy and Existing Practices.

Existing policy provides the SWRCB and the RWQCBs a great deal of flexibility is determining the contents of the cleanup plans. Beyond basic guidance of the topics to be covered there is no specific guidance on the contents of the plans. The proposed Policy differs for the existing practices by requiring the RWQCBs to provide a minimum amount of information in the regional toxic hot spot cleanup plans. The SWRCB will address issues raised by commenters on the draft FED (e.g., delisting sites, guidance on revision of WDRs, etc.).

4. Potential Adverse Environmental Effects.

The mandatory requirements for the contents of the toxic hot spot cleanup plans will have no significant effect on the environment. The proposed Policy will result in more consistently developed regional toxic hot spot cleanup plans. In most cases, the mandatory requirements will make the RWQCB cleanup plans more specific than would have otherwise been required. Therefore, the proposed Policy will better protect California enclosed bays and estuaries.

5. Potentially Significant Adverse Environmental Effects.

None.

Issue 5: **Remediation Actions and Costs**

1. Existing RWQCB Practices.

   The RWQCBs develop responses to cleanup actions on a case-by-case basis. Typically, the process the RWQCBs go through is (1) identify the potential problem, (2) identify any potentially responsible parties, and then (3) the existing enforcement authority to address the problem. RWQCBs cannot specify what means a discharger must use to solve the identified problem (Water Code Section 13360).

2. Proposed Policy.

   The proposed Policy presents guidance on a variety of remediation technologies and approaches that are available. The guidance requires the RWQCBs to consider a variety of remediation methods and requires the RWQCBs to estimate the costs of the cleanup, if possible. When cost estimates are not available to address a toxic hot spot the RWQCBs will develop a watershed management effort that brings together dischargers so that realistic, problem-specific cost estimates can be made. This alternative was chosen because it provides the RWQCBs with consistent guidance on estimating the actions necessary to address a sediment pollution problem and the costs associated with the alternatives and because it provides a mechanism to address the problem when cost estimates cannot be made. The proposed Policy does not require that the estimates be used when the discharger voluntarily or through an enforcement action addresses the toxic hot spot.

3. Differences Between the Policy and Existing Practices.

   Existing practices are to allow each RWQCB to develop cleanup actions based on the experience of individual staff and the identified dischargers. The proposed Policy requires the RWQCBs to consider a variety of alternatives and to plan actions necessary to address polluted sites before any enforcement or other actions are implemented. This alternative was selected because it will require the RWQCBs to complete preliminary plans for addressing toxic hot spots before enforcement or other actions are begun.

4. Potential Adverse Environmental Effects.

The remediation and costs guidance will have no significant effect on the environment. The proposed Policy will result in more consistently developed regional toxic hot spot cleanup plans and will result in the RWQCBs completing preliminary planning for addressing the identified toxic hot spot. The proposed Policy will better protect bays, estuaries and the ocean because the RWQCBs will complete much of the planning necessary to address the toxic hot spot. In addition, since these approaches do not limit the RWQCBs once the cleanup plans are implemented (using existing authorities), the effect on dischargers for specifying the methods should be minimal.

5. Potentially Significant Adverse Environmental Effects.

None.

Issue 6: Toxic Hot Spot Prevention Strategies and Costs

1. Existing RWQCB Practices.

The RWQCBs develop responses to address toxic hot spots that can include modifying and issuing WDRs or implementing the NPS Management Plan. In fact, the Water Code requires that the RWQCBs initiate an evaluation of WDRs that may influence a listed toxic hot spot. Typically, the process the RWQCBs go through is (1) identify the potential problem, (2) identify any potentially responsible parties, and then (3) the existing enforcement authority to address the problem. There are a variety of programs that can be used to address toxic hot spots identified in the cleanup plans (Please refer to Issue 6 in the Issue Analysis section above). Depending on the experience of RWQCB staff reviewing the WDRs, some or all of these programs will be considered in revising WDRs to prevent or cleanup a toxic hot spot.

2. Proposed Policy.

The proposed Policy presents guidance on a variety of prevention programs available to the RWQCBs. The proposed Policy requires the RWQCBs to integrate efforts to address polluted sites by addressing pollution prevention of point and nonpoint sources in a watershed management approach. The guidance restates the NPS Plan requirements for addressing NPS problems and encourages the RWQCBs to involve all interested parties in the development of prevention strategies. The proposed Policy also provides guidance on what approaches the RWQCBs should use for pesticide residues. The proposed Policy specifies that the RWQCBs work within existing watershed management efforts to protect water quality. The proposed Policy recommends several types of analyses that should be considered as part of these efforts.

3. Differences Between the Policy and Existing Practices.

The proposed Policy does not represent a substantive change from existing practices but is designed to provide greater Statewide consistency.

4. Potential Adverse Environmental Effects.

The proposed Policy, as well as the various existing RWQCB practices, protects water quality by providing additional guidance to the RWQCBs on using a watershed management approach when evaluating point and nonpoint sources of pollution. The proposed Policy does not represent a significant change from existing practices, and, therefore, would not have significant effects on water quality, human health, or aquatic life, or place significant additional requirements on dischargers.

5. Potentially Significant Adverse Environmental Effects.

None.

Growth-Inducing Impacts

CEQA defines the expected discussion of growth-inducing impacts and indirect impacts associated with growth in Section 15126(g) of the CEQA guidelines. That section states:

> "...Discuss the ways in which the proposed project could foster economic or population growth, or the construction of additional housing, either directly or indirectly, in the surrounding environment. Included in this are projects which would remove obstacles to population growth (a major expansion of a waste water treatment plant might, for example, allow for more construction in service areas). Increase in the population may further tax existing community service facilities so consideration must be given to this impact. Also discuss the characteristics of some projects which may encourage and facilitate other activities that could significantly affect the environment, either individually or cumulatively. It must not be assumed that growth in any area is necessarily beneficial, detrimental, or of little significance to the environment."

The proposed Policy provides consistent Statewide guidance on the development of Regional cleanup plans and the consolidated toxic hot spot cleanup plans as required by the Water Code (Section 13390 et seq.). The analysis of environmental impacts concludes that each part of the proposed Policy will not have a significant effect on the environment. The proposed Policy is not expected to foster or inhibit economic or human population growth, or the construction of additional housing.

Cumulative and Long-Term Impacts

CEQA guidelines Section 15355 provides the following description of cumulative impacts:

> "'Cumulative impacts' refer to two or more individual effects which, when considered together, are considerable or which compound or increase other environmental impacts.
> (a) The individual effects may be changes resulting from a single project or a number of separate projects.

(b) The cumulative impact from several projects is the change in the environment which results from the incremental impact of the project when added to other closely related past, present, and reasonably foreseeable probable future projects. Cumulative impacts can result from individually minor but collectively significant projects taking place over a period of time."

One means of complying with CEQA's requirement to consider cumulative impacts is to provide a list of past, present and reasonably foreseeable future projects which are related to the proposed action. There is one project which meets this definition: the development of the consolidated Statewide toxic hot spot cleanup plan.

The development of the consolidated toxic hot spot cleanup plan will involve compiling the Regional toxic hot spot cleanup plans and incorporating them into the consolidated cleanup plan. When the SWRCB considers the consolidated plan, it will consider any unaddressed potential effects of the actions identified in the Regional toxic hot spot cleanup plans. However, we do not know now what actions will be necessary because the Regional cleanup plans have yet to be completed in final form or adopted. Once the Regional toxic hot spot cleanup plans are adopted and incorporated into a proposed consolidated plan, the SWRCB will conduct a CEQA review and consider unaddressed potential environmental impacts (both direct and indirect) of adoption of the proposed consolidated plan.

When the program FED is prepared for the Statewide toxic hot spot cleanup plan, the SWRCB will provide the opportunity for public review. The analysis that will take place in the program FED for the Statewide toxic hot spot cleanup plan will focus on specific issues identified at specific toxic hot spots (i.e., the analysis will most likely be tiered as described in CEQA Guidelines Section 15385).

ENVIRONMENTAL CHECKLIST

A. Background

1. Name of Proponent: State Water Resources Control Board

2. Address and Phone Number of Proponent: Division of Water Quality
P.O. Box 944213, Sacramento, CA 94244-2130 (916) 657-0671

3. Date Checklist Submitted: March 5, 1998

4. Agency Requiring Checklist: Resources Agency

5. Name of Proposal, if Applicable: Water Quality Control Policy For Guidance on the Development of Regional Toxic Hot Spot Cleanup Plans

B. Environmental Impacts
(Explanations are included on attached sheets).

		Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
I.	LAND USE AND PLANNING.				
	Would the proposal:				
a.	Conflict with general plan designation or zoning?	[ ]	[ ]	[ ]	[X]
b.	Conflict with applicable environmental plans or policies adopted by agencies with jurisdiction over the project?	[ ]	[ ]	[ ]	[X]
c.	Be incompatible with existing land use in the vicinity?	[ ]	[ ]	[ ]	[X]
d.	Affect agriculture resources or operations (e.g. impacts to soils or farmlands or impacts from incompatible land uses)?	[ ]	[ ]	[ ]	[X]
e.	Disrupt or divide the physical arrangement of an established community (including a low-income or minority community)?	[ ]	[ ]	[ ]	[X]
II.	POPULATION AND HOUSING.				
	Would the proposal:				
a.	Cumulatively exceed official regional or local population projections?	[ ]	[ ]	[ ]	[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)?	[ ]	[ ]	[ ]	[X]
c.	Displace existing housing especially affordable housing?	[ ]	[ ]	[ ]	[X]

	III. GEOLOGIC PROBLEMS	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
	Would the proposal result in or expose people to potential impacts involving:	[ ]	[ ]	[ ]	[X]
a.	Fault rupture?				
b.	Seismic ground shaking?	[ ]	[ ]	[ ]	[X]
c.	Seismic ground failure, including liquefaction?	[ ]	[ ]	[ ]	[X]
d.	Seiche, tsunami, or volcanic hazard?	[ ]	[ ]	[ ]	[X]
e.	Landslides or mudflows?	[ ]	[ ]	[ ]	[X]
f.	Erosion, changes in topography or unstable soil conditions from excavation, grading or fill?	[ ]	[ ]	[ ]	[X]
g.	Subsidence of the land?	[ ]	[ ]	[ ]	[X]
h.	Expansive soils?	[ ]	[ ]	[ ]	[X]
i.	Unique geologic or physical features?	[ ]	[ ]	[ ]	[X]

IV. WATER

Would the proposal result in:

a.	Changes in absorption rates, drainage patterns, or the rate and amount of surface runoff?	[ ]	[ ]	[ ]	[X]
b.	Exposure of people or property to water related hazards such as flooding?	[ ]	[ ]	[ ]	[X]
c.	Discharge into surface water or other alteration of surface water quality (e.g. temperature, dissolved oxygen or turbidity)?	[ ]	[ ]	[ ]	[X]
d.	Changes in the amount of surface water in any water body?	[ ]	[ ]	[ ]	[X]
e.	Changes in currents or the course or direction of surface water movements?	[ ]	[ ]	[ ]	[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?	[ ]	[ ]	[ ]	[X]
g.	Altered direction or rate of flow of ground water?	[ ]	[ ]	[ ]	[X]
h.	Impacts to ground water quality?	[ ]	[ ]	[ ]	[X]
i.	Substantial reduction in the amount of ground water otherwise available for public water supplies?	[ ]	[ ]	[ ]	[X]

		Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
V.	AIR QUALITY				
	Would the proposal:				
a.	Violate any air quality standard or contribute to an existing or projected air quality violation?	[ ]	[ ]	[ ]	[X]
b.	Expose sensitive receptors to pollutants?	[ ]	[ ]	[ ]	[X]
c.	Alter air movement, moisture, or temperature, or cause any change in climate?	[ ]	[ ]	[ ]	[X]
d.	Create objectionable odors?	[ ]	[ ]	[ ]	[X]
VI.	TRANSPORTATION/CIRCULATION				
	Would the proposal result in:				
a.	Increased vehicle trips or traffic congestion?	[ ]	[ ]	[ ]	[X]
b.	Hazards to safety from design features (e.g. farm equipment)?	[ ]	[ ]	[ ]	[X]
c.	Inadequate emergency access or access to nearby uses?	[ ]	[ ]	[ ]	[X]
d.	Insufficient parking capacity on- site or off-site?	[ ]	[ ]	[ ]	[X]
e.	Hazards or barriers for pedestrians or bicyclists?	[ ]	[ ]	[ ]	[X]
f.	Rail, waterborne or air traffic impacts?	[ ]	[ ]	[ ]	[X]
g.	Conflicts with adopted policies supporting transportation (e.g., bus turnouts, bicyclists racks)?	[ ]	[ ]	[ ]	[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)?	[ ]	[ ]	[ ]	[X]
b.	Locally designated species?	[ ]	[ ]	[ ]	[X]
c.	Locally designated natural communities (e.g. oak forest, coastal habitat, etc.)?	[ ]	[ ]	[ ]	[X]
d.	Wetland habitat (e.g. marsh, riparian and vernal pool)?	[ ]	[ ]	[ ]	[X]
e.	Wildlife dispersal or migration corridors?	[ ]	[ ]	[ ]	[X]
VIII.	ENERGY AND MINERAL RESOURCES				
	Would the proposal:				
a.	Conflict with adopted energy conservation plans?	[ ]	[ ]	[ ]	[X]

		Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
b.	Use non- renewable resources in a wasteful and inefficient manner?	[ ]	[ ]	[ ]	[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?	[ ]	[ ]	[ ]	[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)?	[ ]	[ ]	[ ]	[X]
b.	Possible interference with an emergency response plan or emergency evacuation plan?	[ ]	[ ]	[ ]	[X]
c.	The creation of any health hazard or potential health hazard?	[ ]	[ ]	[ ]	[X]
d.	Exposure of people to existing sources of potential health hazards?	[ ]	[ ]	[ ]	[X]
e.	Increased fire hazard in areas with flammable brush, grass, or trees?	[ ]	[ ]	[ ]	[X]
X.	NOISE				
	Would the proposal result in:				
a.	Increases in existing noise levels?	[ ]	[ ]	[ ]	[X]
b.	Exposure of people to severe noise levels?	[ ]	[ ]	[ ]	[X]
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?	[ ]	[ ]	[ ]	[X]
b.	Police protection?	[ ]	[ ]	[ ]	[X]
c.	Schools?	[ ]	[ ]	[ ]	[X]
d.	Maintenance of public facilities, including roads?	[ ]	[ ]	[ ]	[X]
e.	Other governmental services?	[ ]	[ ]	[ ]	[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?	[ ]	[ ]	[ ]	[X]
b.	Communications systems?	[ ]	[ ]	[ ]	[X]

		Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
c.	Local or regional water treatment or distribution facilities?	[ ]	[ ]	[ ]	[X]
d.	Sewer or septic tanks?	[ ]	[ ]	[ ]	[X]
e.	Storm water drainage?	[ ]	[ ]	[ ]	[X]
f.	Solid waste disposal?	[ ]	[ ]	[ ]	[X]
g.	Local or regional water supplies?	[ ]	[ ]	[ ]	[X]
XIII.	AESTHETICS				
	Would the proposal:				
a.	Affect a scenic vista or scenic highway?	[ ]	[ ]	[ ]	[X]
b.	Have a demonstrable negative aesthetic effect?	[ ]	[ ]	[ ]	[X]
c.	Create light or glare?	[ ]	[ ]	[ ]	[X]
XIV.	CULTURAL RESOURCES				
	Would the proposal:				
a.	Disturb paleontological resources?	[ ]	[ ]	[ ]	[X]
b.	Disturb archaeological resources?	[ ]	[ ]	[ ]	[X]
c.	Affect historical resources?	[ ]	[ ]	[ ]	[X]
d.	Have the potential to cause a physical change which would affect unique ethnic cultural values?	[ ]	[ ]	[ ]	[X]
e.	Restrict existing religious or sacred uses within the potential impact area?	[ ]	[ ]	[ ]	[X]
XV.	RECREATION				
	Would the proposal:				
a.	Increase the demand for neighborhood or regional parks or other recreational facilities?	[ ]	[ ]	[ ]	[X]
b.	Affect existing recreational opportunities?	[ ]	[ ]	[ ]	[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?	[ ]	[ ]	[ ]	[X]

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
b. Does the project have the potential to achieve short- term, to the disadvantage or long- term, environmental goals?	[ ]	[ ]	[ ]	[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).	[ ]	[ ]	[ ]	[X]
d. Does the project have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly?	[ ]	[ ]	[ ]	[X]

C. DETERMINATION

Based on the evaluation in FED (Environmental Effects Section), I find that the proposed Policy which provides guidance for the development of toxic hot spot cleanup plans will not have a significant adverse effect on the environment.

March 2, 1998
Date

Jesse M. Diaz, Chief
Division of Water Quality
State Water Resources Control Board

ENVIRONMENTAL CHECKLIST -- Phase 1 (Policy)

I.a.,b.,c.,e. Land use and planning (e.g., 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 Policy that requires property to be used in any way or prohibits property uses.

I.d. The regulation of nonpoint source toxic substances to address identified toxic hot spots that may be caused by pesticides could impact farming operations. However, the SWRCB is not changing its approach to nonpoint source regulation, outlined in its Nonpoint Source Management Plan (NPS Plan). The SWRCB and RWQCBs will continue to work with nonpoint source dischargers under the existing NPS Plan.

II.a.,b.,c.;XV.a. See the Growth-Inducing Impacts Section of the FED.

III.a.,b.,d. These geologic actions are not caused by water pollution. However, people could potentially be exposed to such impacts during the construction or operation of new facilities to treat water pollution to address identified toxic hot spots. If such actions are necessary to address toxic hot spots, the potential environmental effects will be addressed in the program FED on the consolidated toxic hot spot cleanup plan.

III.c. Liquefaction occurs in the subsurface when the mechanical behavior of a granular material is transformed from a solid state to a liquid state due to loss of grain-to-grain contact during earthquake shaking. It occurs most often in areas underlain by saturated, unconsolidated sediments. Seismic ground failure is not caused or affected by water pollution.

III.a.,b.,d.,e.,f.,g.,i.;V.d.;VI.a.,b.,c.,d.,e.,f.,g.;VIII.a.,b.,IX.a.,b.,e.;X.a.,b.;XI.a.,b.,c.,d.,e.;XII.a.,b.,f.; XIII.a.,b.,c.;XIV.a.,b.,c.,d.,e. Exposure of people to geologic actions, landslides, erosion, impacts to transportation systems, energy impacts, odors, impacts to public services and utilities, impacts to wildlife areas, and impacts to aesthetics or cultural resources could occur during the construction or operation of new facilities to treat water pollution. If such actions are necessary to address toxic hot spots, the potential environmental effects will be addressed in the program FED on the consolidated toxic hot spot cleanup plan.

III.h. Expansion of soils is influenced by amount of moisture change and the type of soil (the amount of clay in the soil, and the type of minerals in the clay). Shrink-swell is measured by the volume change in the soil. Water pollutants do not significantly affect the shrink-swell capacity of soils.

IV.a.,b.,d.,e.,f.,g.,i. Levels of toxic substances do not affect absorption rates, drainage patterns, surface runoff, flooding, quantity of surface or ground water, surface water currents, or ground water flow or supply.

IV.c. The proposed Policy is expected to provide procedures that would enable the RWQCBs to better regulate water and sediment quality and to generally improve water and sediment quality.

IV.h.;V.a.,b. The proposed Policy is not expected to adversely affect ground water or air quality.

V.c. There is no evidence that toxic water or sediment pollutants significantly affect temperature, humidity, precipitation, winds, cloudiness, or other atmospheric conditions.

VII.a.,b.,c.,d.,e.;XVI.a. The proposed Policy is not expected to cause any significant adverse effects to plants and animals, including rare, threatened, or endangered species. The provisions of the proposed Policy are expected to encourage better regulation of polluted sediments and water. Therefore, the proposed Policy will encourage development of and protect rare and endangered species as well as fish and wildlife habitats generally. If there are potential impacts to these resources identified in the development of the Regional toxic hot spot cleanup plans then the potential environmental effects will be addressed in the program FED on the consolidated toxic hot spot cleanup plan.

VIII.c. The proposed Policy does not involve or affect the mining of mineral resources.

IX.c.,d.;XVI.d. The proposed Policy is not expected to cause adverse effects to human health.

XII.c.,d.,e.,g. Effects on wastewater or water utility and service systems could potentially occur if the proposed Policy would cause dischargers to have to take compliance actions that involved construction or substantial alterations to treatment facilities. However, the Policy is not expected to require dischargers to take such compliance actions. If there are potential impacts to these resources identified in the development of the Regional toxic hot spot cleanup plans then the potential environmental effects will be addressed in the program FED on the consolidated toxic hot spot cleanup plan.

XV.b. Toxic pollutants in water and sediment can affect recreational opportunities such as swimming if water quality criteria/objectives are not achieved in a water body.

XVI.a.,c. See the section of the FED regarding cumulative and long-term impacts.

COMMENTS AND RESPONSES

On March 5, 1998, a public notice for the two public hearings was circulated to the public and a draft FED (DWQ/SWRCB, 1998a) was made available for public review. The hearing notice was also published in several newspapers with circulation in coastal areas. The list of persons who submitted written comments or oral testimony are listed below. A key for reading the comment and response table follows the list of commenters. Finally, a table is presented with a summary of all comments submitted and the SWRCB response to each comment.

List of Commenters

Individuals or organizations who submitted written comments on the proposed Water Quality Control Policy before the close of the hearing record (May 15, 1998) or who gave testimony at the May 5 and May 11, 1998 hearings or the June 18, 1998 SWRCB Workshop are listed below. Each of the commenters are referred to by number when referenced in the various issues. All comments presented at the hearing and workshop were addressed.

Dr. James Hunt (Commenter 21) and Dr. Alex Horne (Commenter 45) peer reviewed the draft FED pursuant to Section 57004 of the Health and Safety Code.

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47. Bob Kanter
    The Port of Long Beach

48. Pete Michael
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    Regional Water Quality Control Board

49. Ruth Kolb
    Port of San Diego

50. Nicole Capretz
    Environmental Health Coalition

Presenters at the May 11, 1998 Public Hearing

51. Ellen Johnck
    Bay Planning Coalition

52. Darlene Ruiz
    Hunter/Ruiz

53. M'K Veloz
    Northern California Marine Association

54. Marshall Lee
    California Department of Pesticide Regulation

55. Brian Stuart
    Dow AgroSciences

56. Eric Newman
    Western States Petroleum Association

57. Keith Nakatani
    Save San Francisco Bay Association

58. Melissa Thorme
    Tri-TAC

59. Sharon Green
    County Sanitation Districts of Los Angeles County

60. Patti Tenbrook
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61. Alvin Greenberg
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62. G. Fred Lee
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105. William Thomas
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107. Marshall Lee
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108. Karen Taberski
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109. Melissa Thorme
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110. Keith Nakatani
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111. Chris Foe
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