FINAL

# Functional Equivalent Document

## Water Quality Control Policy for Developing California's Clean Water Act Section 303(d) List

JULY 2004

DIVISION OF WATER QUALITY
STATE WATER RESOURCES CONTROL BOARD

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**STATE WATER RESOURCES CONTROL BOARD**
*P.O. 100*
*Sacramento, CA 95812-0100*

*To request copies of the draft Final FED and proposed Policy please call (916) 341-5566.*

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STATE WATER RESOURCES CONTROL BOARD
DIVISION OF WATER QUALITY

# FINAL FUNCTIONAL EQUIVALENT DOCUMENT

# WATER QUALITY CONTROL POLICY FOR DEVELOPING CALIFORNIA'S CLEAN WATER ACT SECTION 303(d) LIST

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JULY 2004

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# PREFACE

Section 303(d) of the federal Clean Water Act (CWA) and accompanying federal regulations require states to regularly identify water bodies that cannot achieve applicable water quality standards after technology-based controls have been implemented. In complying, California has developed successive lists of "impaired" water bodies biennially since 1976. After 1996, public attention increasingly focused on an important consequence of "section 303(d) listing" – the development and implementation of Total Maximum Daily Loads (TMDLs). Simultaneously, public demand for regional consistency and transparency in the section 303(d) listing process intensified.

In response, the California Water Code (CWC) was modified to require the State Water Resources Control Board (SWRCB) to prepare guidelines for listing or delisting water bodies on the section 303(d) list (CWC section 13191.3(a)). SWRCB regulations (Title 23 of the California Code of Regulations [CCR] section 3777(a)) independently require that an environmental review, equivalent to a CEQA document, accompany a Policy proposed for SWRCB adoption. Such a "functionally equivalent document" (FED) must contain (a) a brief description of, (b) reasonable alternatives to, and (c) mitigation measures for the proposed activity.

This document is the final FED supporting a Policy for development of and revisions to a list of water quality limited segments, otherwise known as a section 303(d) list of water quality limited segments. This final FED explores various alternatives, provides options and recommendations, and evaluates the environmental impacts of these guidelines.

The proposed "Water Quality Control Policy for Developing California's CWA Section 303(d) List" (Policy) is intended to provide SWRCB and RWQCB staff with recommended procedures for evaluating information solicited in support of listing or delisting candidate water bodies for the section 303(d) list. The Policy does <u>not</u> develop new or revise existing water quality standards (i.e., beneficial uses, water quality objectives, or the State's Non-degradation Policy). The Policy does address scheduling of listed water bodies for eventual development and implementation of TMDLs.

The SWRCB held public hearings on January 28, 2004 and February 5, 2004 to hear public comment on the draft FED and Policy. SWRCB received testimony and written comments from 126 individuals or organizations. SWRCB staff responded to all comments received and the draft FED and Policy have been revised in response.

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| | |
|---|---|
| AB | Assembly Bill |
| AGR | Agriculture water supply beneficial use category |
| $\alpha$ | Type I error rate (alpha) |
| APA | Administrative Procedure Act |
| ASTM | American Society of Testing Materials |
| $\beta$ | Type II error rate (beta) |
| BCF | bioconcentration factor |
| BMI | benthic macroinvertebrates index |
| BMP | best management practice |
| BOD | biological oxygen demand |
| BPJ | best professional judgement |
| BPTCP | Bay Protection and Toxic Cleanup Program |
| BWQW | Beach Water Quality Workgroup |
| °C | degrees Celsius |
| °F | degrees Fahrenheit |
| CalEPA | California Environmental Protection Agency |
| CALM | Consolidated Assessment and Listing Methodology |
| CAMLnet | California Aquatic Bioassessment Laboratory Network |
| CCR | California Code of Regulations |
| CEQA | California Environmental Quality Act |
| CFR | Code of Federal Regulations |
| COD | chemical oxygen demand |
| COMM | Commercial and recreational fisheries beneficial use category |
| CSBP | California Stream Bioassessment Procedures |
| CTR | California Toxic Rule |
| CWA | Clean Water Act |
| CWC | California Water Code |
| DDT | dichlorodiphenyltrichloroethane |
| DEP | Department of Environmental Protection |
| DEQ | Department of Environmental Quality |
| DFG | California Department of Fish and Game |
| DHS | California Department of Health Services |
| DO | dissolved oxygen |
| DOC | dissolved organic carbon |
| dw | dry weight |
| EDL | Elevated Data Level |
| EIR | Environmental Impact Report |
| EMAP | Environmental Monitoring and Assessment Program |
| EqP | equilibrium partitioning |
| ERL | Effects Range-Low |
| ERM | Effects Range-Median |
| FED | Functional Equivalent Document |
| GIS | Geographic Information System |
| $H_a$ | alternate hypothesis |

| | |
|---|---|
| $H_o$ | null hypothesis |
| I | Incomplete beta function |
| IBI | index of biological integrity |
| IND | Industrial process supply beneficial use category |
| IRIS | Integrated Risk Information System |
| k | number of exceedances in a sample |
| *kdelist* | maximum number of exceedances to remove a water body/pollutant combination from the list |
| *klist* | minimum number of exceedances to list |
| MCL | maximum contaminant level |
| mg/kg | milligrams per kilogram (parts per million) |
| mg/L | milligrams per liter (parts per million) |
| mm | millimeter |
| MSD | minimum significant difference |
| MTRL | Maximum Tissue Residue Level |
| MUN | Municipal beneficial use category |
| MWAT | maximum weekly average temperature |
| N | sample size |
| NAS | National Academy of Sciences |
| NAV | Navigational beneficial use category |
| NAWQA | National Water Quality Assessment Program |
| ng/kg | nanograms per kilogram |
| NMFS | National Marine Fishery Service |
| NOAA | National Oceanic and Atmospheric Administration |
| NPDES | National Pollutant Discharge Elimination System |
| NPS | nonpoint source |
| NSSP | National Shellfish Sanitation Program |
| NTU | nephelometric turbidity unit |
| oc | organic carbon |
| OC | operating characteristics curve |
| OEHHA | Office of Environmental Health Hazard Assessment |
| ONRW | outstanding national resource water |
| P | Probability |
| p | Estimate of the true proportion of samples |
| PAG | Public Advisory Group |
| PAH | Polynuclear Aromatic Hydrocarbon |
| PCB | polychlorinated biphenyl |
| PEC | Probable Effects Concentration |
| PEL | Probable Effects Level |
| pH | Hydrogen ion concentration |
| PHG | Public Health Goal |
| POW | Hydropower generation beneficial use category |
| PP | Precautionary Principle |
| QA | quality assurance |
| QC | quality control |
| QAPP | quality assurance project plan |
| QL | quantitation limit |

| | |
|---|---|
| *r* | exceedance rate |
| REC | Recreational beneficial use category |
| REMAP | Regional Environmental Monitoring and Assessment Program |
| RIVPACS | River Invertebrate Prediction and Classification Scheme |
| RMP | regional monitoring program |
| RTAG | Regional Technical Advisory Group |
| RWQCB | Regional Water Quality Control Board |
| SB | Senate Bill |
| SCCWRP | Southern California Coastal Water Research Project |
| SFEI | San Francisco Estuary Institute |
| SMWP | State Mussel Watch Program |
| SNARL | Sierra Nevada Aquatic Research Laboratory |
| SNARLs | suggested no-adverse-response levels |
| SQG | sediment quality guideline |
| STRTAG | State Regional Technical Advisory Group |
| SWAMP | Surface Water Ambient Monitoring Program |
| SWMP | Storm Water Management Plan |
| SWRCB | State Water Resources Control Board |
| TDS | Total Dissolved Solids |
| TEL | Threshold Effects Level |
| TIE | Toxicity Identification Evaluation |
| TKP | Total Kjeldahl phosphorus |
| TMDL | Total Maximum Daily Load |
| TOC | Total Organic Carbon |
| TSD | Technical Support Document |
| TSS | Total Suspended Solids |
| µg/L | micrograms per liter (parts per billion) |
| USC | United States Code |
| USEPA | U.S. Environmental Protection Agency |
| USFDA | U.S. Food and Drug Administration |
| USFS | U.S. Forest Service |
| USGS | U.S. Geological Survey |
| V* | sediment evaluation tool |
| WDR | waste discharge requirement |
| WQ | water quality |
| WQC | Water Quality Criteria |
| WQO | Water Quality Objective |
| ww | wet weight |

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*FINAL FUNCTIONAL EQUIVALENT DOCUMENT:*

# *WATER QUALITY CONTROL POLICY FOR DEVELOPING CALIFORNIA'S CLEAN WATER ACT SECTION 303(d) LIST*

## INTRODUCTION

Section 303(d)(1) of the federal Clean Water Act (CWA) requires states to identify waters that do not meet applicable water quality standards with technology-based controls alone and prioritize such waters for the purposes of developing Total Maximum Daily Loads (TMDLs) (40 Code of Federal Regulations (CFR) 130.7(b)). Water quality limited segments are defined as "any segment [of a water body] where it is known that water quality does not meet applicable water quality standards, and/or is not expected to meet applicable water quality standards, even after application of technology-based effluent limitations required by [CWA] sections 301(b) or 306..." (40 CFR 130.2(j)). The states are required to assemble and evaluate all existing and readily available water quality-related data and information to develop the list (40 CFR 130.7(b)(5)) and to provide documentation to list or not to list a state's waters (40 CFR 130.7(b)(6)).

Section 13191.3(a) of the California Water Code (CWC) requires the State Water Resources Control Board (SWRCB), on or before July 1, 2003, to prepare guidelines to be used by the SWRCB and the RWQCBs (Regional Water Quality Control Boards) in listing, delisting, developing, and implementing TMDLs pursuant to section 303(d) of the federal CWA (33 United States Code [USC] section 1313(d)). In addition, the 2001 Budget Act Supplemental Report required the use of a "weight of evidence" approach in developing the Policy for listing and delisting waters and to include criteria that ensure the data and information used are accurate and verifiable.

CWC section 13191.3(b) also requires the SWRCB to consider the consensus recommendations on the guidelines adopted by the Public Advisory Group (PAG). California Assembly Bill (AB) 982 PAG was established in 2000 to assist in the evaluation of the SWRCB's water quality programs structure and effectiveness as it relates to the implementation of section 303(d) of the CWA (33 USC section 1313 (d)) and applicable federal regulation. The PAG has of twelve members from the regulated community and twelve members from the environmental community. Each member has an alternate representative.

## 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 RWQCBs in the development of the CWA section 303 (d) list. The FED also assesses the potential adverse environmental impacts of the recommended Policy.

## CEQA Compliance

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

As part of a certified regulatory program, the proposed Policy is exempt from Chapter 3 of CEQA 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, 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 (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.

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, therefore, prepare the FED following CEQA guidelines. The environmental impacts that may occur as a result of the Policy are summarized in an Environmental Checklist and analyzed in the Environmental Effects section of the FED.

## Background

The listing of water bodies pursuant to CWA section 303(d) has evolved over time. The first section 303(d) list was assembled in 1976. This initial list identified less than 20 water bodies in the section 305(b) report as "Water Quality Limited Segments". The "Water Quality Limited Segments" list remained virtually the same until 1988, when the number of water quality limited segments increased to 75 water bodies. In 1990, the list grew to approximately 250 water quality limited segments due in part to an increase in water quality assessment activity resulting from amendment of the CWA. CWA section 304 required lists of impaired waters and sources to be submitted to U.S. Environmental Protection Agency (USEPA) as a "one time" effort. The list included waters (1) not achieving numeric water quality standards for priority pollutants after implementation of technology-based controls, (2) not meeting the fishable/swimmable goals of the Act, and (3) not meeting applicable standards after technology-based controls were met due primarily to point source discharge of toxic pollutants.

In 1997, the SWRCB and RWQCB staff prepared informal guidance for the water quality assessment update. That guidance outlined procedures for the RWQCBs assessment process. The assessment methodology recommended: (1) reevaluation of the listed water bodies on the 1996 section 303(d) list, (2) reviewing new monitoring information, (3) consistent procedures for the information soliciting process, and (4) measures to increase public participation. The RWQCBs staff used these guidelines to establish public noticing procedures, list or delist water bodies, and prioritize and schedule TMDLs.

In 1998, 509 water bodies were listed with 1,471 water body/pollutant combinations. This 1998 section 303(d) list served as the basis for the 2002 list. The State and USEPA-approved 2002 section 303(d) list has a total of 685 water quality limited segments and 1,883 segment-pollutant combinations (SWRCB, 2003a; USEPA, 2003d).

During the development of the section 303(d) list in 2002, the RWQCBs assembled and evaluated all new available water quality data and information and provided recommendations for each water body-pollutant combination. The RWQCBs prepared staff reports, fact sheets, and summaries of the additions, deletions and changes to the 1998 section 303(d) list in order to create the 2002 list. The SWRCB staff reviewed the RWQCBs staff recommendations and either concurred or identified the reasons for not concurring with the RWQCB recommendations.

In preparing the 2002 section 303(d) list, the SWRCB set *Priorities and Schedules for Completing TMDLs* as required by federal law for listed

water bodies to help guide TMDL planning (40 CFR 130.7(b)(4)). Federal regulations also require the state to identify waters targeted for TMDL development in the next two years.

In addition to the section 303(d) list the following related lists were compiled in 2002:

***TMDL Completed List.*** This list included water bodies where a number of TMDLs have been completed to show progress in developing TMDLs. The TMDLs Completed List contained those water quality limited segments that already had TMDLs with approved implementation plans.

***Enforceable Programs List.*** This list included water bodies where an alternate regulatory program was already in place to address the water quality problem. Regulatory programs included the Consolidated Toxic Hot Spots Cleanup Plan and enforcement of existing permits or other legally required authorities. The programs and requirements were specifically applicable to the identified water quality problem.

***Monitoring List.*** Many water bodies identified had minimal, contradictory, or anecdotal information that suggested standards were not met but the available data or information was inadequate to draw a conclusion. In many cases, the data or information were not of adequate quality and/or quantity to support a listing. In these cases, a finding was made that more information must be collected to resolve whether water quality objectives and beneficial uses were attained. Waters on this list were considered high priority for monitoring before the completion of the next section 303(d) list.

The TMDLs Completed List, the Enforceable Programs List, and the Monitoring List were not considered part of the section 303(d) list. However, these lists including the section 303(d) list were submitted to the USEPA.

***Developing the Scope of the Policy***

CWC section 13191.3(b) requires SWRCB to consider the consensus recommendations of the PAG. In developing the proposed Policy, SWRCB staff consulted with the PAG and other groups several times. Six scoping meetings were held between December 2001 and January 2002 with members from the environmental and regulated caucuses. Based on the feedback received at these meetings, SWRCB staff developed a concept paper discussing important policy issues. This concept paper was discussed at the PAG's February 2002, April 2002, July 2002, and October 2002 meetings (AB 982 PAG, 2002). A pre-draft version of the Policy was reviewed by the PAG during its July 2003 meeting (AB 982 PAG, 2003). At each step in this review the PAG caucuses provided

verbal and written comments (e.g., Johns, 2002, 2003; Sheehan, 2002, 2003), but only in February 2002 did the PAG provided consensus recommendations.

***Consensus Recommendations of the PAG***

In February 2002, the AB 982 PAG developed the following consensus recommendations:

- The listing process should be transparent.
- The public participation process should be transparent; in addition it should be (a) specific and (b) well advertised with active outreach to diverse geographic areas and those with environmental justice concerns.
- To the greatest extent possible, there should be a consistent standardized set of tools and principles used across the Regions to evaluate data. Additionally, site specific information should be taken into consideration.

## Scope of FED

The FED has been developed with consideration of existing state statute, regulations, and policies; the current approaches of the SWRCB and the RWQCBs; approaches used by other states; USEPA guidance; and the consensus recommendations of the PAG.

The FED contains six major sections: Introduction, Environmental Setting, Issue Analysis, Environmental Effects of the Proposed Policy, Environmental Checklist, and References. The Proposed Policy in included in Appendix A and the responses to all comments received before the close of the hearing record on February 18, 2004 are included in Appendix B.

## Statement of Goals

The SWRCB's goals for this Policy are to provide:

- consistent and transparent approaches for the identification of water quality limited segments using a standardized set of tools and principles to be used by the RWQCBs to evaluate data;
- scientifically defensible approaches to address the identification and listing of water bodies on the section 303(d) list; and
- a transparent public participation process.

## Proposed Action

The proposed action is SWRCB adoption of the proposed Policy outlined above and as presented in Appendix A.

# ENVIRONMENTAL SETTING

California encompasses a variety of environmental conditions ranging from the Sierra Nevada to deserts (with a huge variation in between these two extremes) to the Pacific Ocean.

For water quality management, section 13200 of the Porter-Cologne Water Quality Control Act (Porter-Cologne) divides the State into nine different hydrologic regions. Brief descriptions of the Regions and the water bodies, including water bodies on the 2002 section 303(d) list (Table 1) are presented below. The information descriptive of the Regions provided in this section comes from the Basin Plans.

## *North Coast Region (Region 1)*

The North Coast Region comprises all regional basins, including Lower Klamath Lake and Lost River Basins, draining into the Pacific Ocean from the California-Oregon state line southern boundary and includes the watershed of the Estero de San Antonio and Stemple Creek in Marin and Sonoma Counties (Figure 1). Two natural drainage basins, the Klamath River Basin and the North Coastal Basin divide the Region. The 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. It encompasses a total area of approximately 19,390 square miles, including 340 miles of coastline and remote wilderness areas, as well as urbanized and agricultural areas.

Beginning at the Smith River in northern Del Norte County and heading 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.

Listings on the 2002 section 303(d) list for the North Coast Region included seven water bodies affecting an estimated 49,374 acres (bays, estuaries, lakes, and wetlands) and 48 water bodies affecting 20,493 miles of rivers and shoreline. The major pollutants affecting these water bodies included nutrients, metals, pathogens, sediment, and temperature among others (SWRCB, 2003a).

TABLE 1: TOTAL WATER BODIES BY REGION, WATER BODY TYPE AND ESTIMATED SIZE AFFECTED ON THE 2002 SECTION 303(D) LIST

| Region | Water Body Type | Pollutant Category | Pollutant Category Totals* | Total Estimated Size Affected |
|---|---|---|---|---|
| 1 | Bays and Harbors | Other Organics | 1 | 16,075 Acres |
| 1 | Estuaries | Nutrients | 1 | 199 Acres |
| 1 | Estuaries | Sediment | 2 | 247 Acres |
| 1 | Lakes/Reservoirs | Metals/Metalloids | 3 | 6,054 Acres |
| 1 | Lakes/Reservoirs | Miscellaneous** | 1 | 26,998 Acres |
| 1 | Rivers/Streams | Miscellaneous** | 36 | 17,148 Miles |
| 1 | Rivers/Streams | Nutrients | 12 | 5,849 Miles |
| 1 | Rivers/Streams | Pathogens | 2 | 282 Miles |
| 1 | Rivers/Streams | Sediment | 37 | 14,647 Miles |
| 2 | Bays and Harbors | Metals/Metalloids | 11 | 279,415.73 Acres |
| 2 | Bays and Harbors | Miscellaneous** | 10 | 270,870.73 Acres |
| 2 | Bays and Harbors | Nutrients | 1 | 8,545 Acres |
| 2 | Bays and Harbors | Other Organics | 10 | 270,870.73 Acres |
| 2 | Bays and Harbors | Pathogens | 2 | 10,984 Acres |
| 2 | Bays and Harbors | Pesticides | 10 | 270,870.73 Acres |
| 2 | Bays and Harbors | Sediment | 1 | 8,545 Acres |
| 2 | Coastal Shoreline | Pathogens | 5 | 3.1 Miles |
| 2 | Estuaries | Metals/Metalloids | 4 | 47,472.5 Acres |
| 2 | Estuaries | Miscellaneous** | 2 | 47,393 Acres |
| 2 | Estuaries | Nutrients | 2 | 54.5 Acres |
| 2 | Estuaries | Other Inorganics | 2 | 54.5 Acres |
| 2 | Estuaries | Other Organics | 5 | 47,518.5 Acres |
| 2 | Estuaries | Pathogens | 1 | 169 Acres |
| 2 | Estuaries | Pesticides | 6 | 48,642.5 Acres |
| 2 | Lakes/Reservoirs | Metals/Metalloids | 4 | 1,289 Acres |
| 2 | Lakes/Reservoirs | Miscellaneous** | 1 | 299 Acres |
| 2 | Lakes/Reservoirs | Nutrients | 2 | 441 Acres |
| 2 | Lakes/Reservoirs | Trash | 1 | 142 Acres |
| 2 | Rivers/Streams | Metals/Metalloids | 5 | 50.3 Miles |
| 2 | Rivers/Streams | Nutrients | 6 | 151.1 Miles |
| 2 | Rivers/Streams | Pathogens | 9 | 159.4 Miles |
| 2 | Rivers/Streams | Pesticides | 37 | 523.3 Miles |
| 2 | Rivers/Streams | Sediment | 9 | 202.6 Miles |
| 2 | Wetlands, Tidal | Metals/Metalloids | 1 | 66,339 Acres |
| 2 | Wetlands, Tidal | Nutrients | 1 | 66,339 Acres |

| Region | Water Body Type | Pollutant Category | Pollutant Category Totals* | Total Estimated Size Affected |
|---|---|---|---|---|
| 2 | Wetlands, Tidal | Salinity | 1 | 66,339 Acres |
| 3 | Bays and Harbors | Metals/Metalloids | 2 | 1,998 Acres |
| 3 | Bays and Harbors | Pathogens | 2 | 2,001 Acres |
| 3 | Bays and Harbors | Pesticides | 1 | 79 Acres |
| 3 | Bays and Harbors | Sediment | 2 | 2,001 Acres |
| 3 | Bays and Harbors | Toxicity | 1 | 76 Acres |
| 3 | Coastal Shoreline | Metals/Metalloids | 1 | 12 Miles |
| 3 | Coastal Shoreline | Pathogens | 11 | 7.23 Miles |
| 3 | Coastal Shoreline | Pesticides | 1 | 12 Miles |
| 3 | Estuaries | Metals/Metalloids | 1 | 196 Acres |
| 3 | Estuaries | Nutrients | 6 | 552.2 Acres |
| 3 | Estuaries | Other Organics | 2 | 384 Acres |
| 3 | Estuaries | Pathogens | 5 | 2,371.2 Acres |
| 3 | Estuaries | Pesticides | 5 | 2,397 Acres |
| 3 | Estuaries | Salinity | 1 | 30 Acres |
| 3 | Estuaries | Sediment | 6 | 2,678.2 Acres |
| 3 | Lakes/Reservoirs | Metals/Metalloids | 2 | 6,362 Acres |
| 3 | Lakes/Reservoirs | Nutrients | 2 | 79 Acres |
| 3 | Lakes/Reservoirs | Pathogens | 1 | 23 Acres |
| 3 | Rivers/Streams | Metals/Metalloids | 8 | 102.9 Miles |
| 3 | Rivers/Streams | Miscellaneous** | 1 | 16 Miles |
| 3 | Rivers/Streams | Nutrients | 24 | 311 Miles |
| 3 | Rivers/Streams | Other Organics | 3 | 17 Miles |
| 3 | Rivers/Streams | Pathogens | 40 | 520.82 Miles |
| 3 | Rivers/Streams | Pesticides | 7 | 136.6 Miles |
| 3 | Rivers/Streams | Salinity | 5 | 215 Miles |
| 3 | Rivers/Streams | Sediment | 27 | 438.6 Miles |
| 3 | Rivers/Streams | Toxicity | 1 | 8.6 Miles |
| 4 | Bays and Harbors | Metals/Metalloids | 5 | 6,673 Acres |
| 4 | Bays and Harbors | Miscellaneous** | 4 | 148,148 Acres |
| 4 | Bays and Harbors | Other Organics | 10 | 154,421 Acres |
| 4 | Bays and Harbors | Pathogens | 3 | 849 Acres |
| 4 | Bays and Harbors | Pesticides | 10 | 154,421 Acres |
| 4 | Bays and Harbors | Toxicity | 7 | 154,248 Acres |
| 4 | Bays and Harbors | Trash | 1 | 146,645 Acres |
| 4 | Coastal Shoreline | Other Organics | 31 | 32.77 Miles |
| 4 | Coastal Shoreline | Pathogens | 56 | 62.83 Miles |
| 4 | Coastal Shoreline | Pesticides | 33 | 33.78 Miles |
| 4 | Estuaries | Metals/Metalloids | 2 | 605 Acres |

| Region | Water Body Type | Pollutant Category | Pollutant Category Totals* | Total Estimated Size Affected |
|---|---|---|---|---|
| 4 | Estuaries | Miscellaneous** | 1 | 15 Acres |
| 4 | Estuaries | Nutrients | 2 | 359 Acres |
| 4 | Estuaries | Other Organics | 2 | 605 Acres |
| 4 | Estuaries | Pathogens | 2 | 64 Acres |
| 4 | Estuaries | Pesticides | 3 | 654 Acres |
| 4 | Estuaries | Sediment | 1 | 344 Acres |
| 4 | Estuaries | Toxicity | 1 | 344 Acres |
| 4 | Lakes/Reservoirs | Hydromodification | 1 | 121 Acres |
| 4 | Lakes/Reservoirs | Metals/Metalloids | 9 | 696.8 Acres |
| 4 | Lakes/Reservoirs | Miscellaneous** | 7 | 255 Acres |
| 4 | Lakes/Reservoirs | Nuisance | 8 | 243.8 Acres |
| 4 | Lakes/Reservoirs | Nutrients | 16 | 949.1 Acres |
| 4 | Lakes/Reservoirs | Other Organics | 4 | 321 Acres |
| 4 | Lakes/Reservoirs | Pathogens | 1 | 20 Acres |
| 4 | Lakes/Reservoirs | Pesticides | 5 | 429 Acres |
| 4 | Lakes/Reservoirs | Salinity | 1 | 15 Acres |
| 4 | Lakes/Reservoirs | Toxicity | 1 | 20 Acres |
| 4 | Lakes/Reservoirs | Trash | 6 | 235.6 Acres |
| 4 | Rivers/Streams | Hydromodification | 5 | 48.43 Miles |
| 4 | Rivers/Streams | Metals/Metalloids | 35 | 236.09 Miles |
| 4 | Rivers/Streams | Miscellaneous** | 12 | 194.4 Miles |
| 4 | Rivers/Streams | Nuisance | 11 | 99.9 Miles |
| 4 | Rivers/Streams | Nutrients | 53 | 393.19 Miles |
| 4 | Rivers/Streams | Other Inorganics | 14 | 124.2 Miles |
| 4 | Rivers/Streams | Other Organics | 11 | 58.2 Miles |
| 4 | Rivers/Streams | Pathogens | 51 | 350.69 Miles |
| 4 | Rivers/Streams | Pesticides | 17 | 124.6 Miles |
| 4 | Rivers/Streams | Salinity | 19 | 236.3 Miles |
| 4 | Rivers/Streams | Sediment | 14 | 101 Miles |
| 4 | Rivers/Streams | Toxicity | 17 | 122.3 Miles |
| 4 | Rivers/Streams | Trash | 17 | 104.7 Miles |
| 4 | Wetlands, Tidal | Hydromodification | 1 | 289 Acres |
| 4 | Wetlands, Tidal | Metals/Metalloids | 2 | 44 Acres |
| 4 | Wetlands, Tidal | Miscellaneous** | 1 | 289 Acres |
| 4 | Wetlands, Tidal | Nutrients | 1 | 31 Acres |
| 4 | Wetlands, Tidal | Other Organics | 1 | 13 Acres |
| 4 | Wetlands, Tidal | Pathogens | 1 | 31 Acres |
| 4 | Wetlands, Tidal | Pesticides | 2 | 44 Acres |
| 4 | Wetlands, Tidal | Toxicity | 1 | 13 Acres |
| 4 | Wetlands, Tidal | Trash | 1 | 289 Acres |

| Region | Water Body Type | Pollutant Category | Pollutant Category Totals* | Total Estimated Size Affected |
|---|---|---|---|---|
| 5 | Estuaries | Metals/Metalloids | 3 | 43,991 Acres |
| 5 | Estuaries | Nutrients | 1 | 952 Acres |
| 5 | Estuaries | Pesticides | 3 | 43,991 Acres |
| 5 | Estuaries | Salinity | 1 | 22,904 Acres |
| 5 | Estuaries | Toxicity | 3 | 43,991 Acres |
| 5 | Lakes/Reservoirs | Metals/Metalloids | 14 | 87,196 Acres |
| 5 | Lakes/Reservoirs | Nutrients | 1 | 40,070 Acres |
| 5 | Lakes/Reservoirs | Pathogens | 1 | 98 Acres |
| 5 | Rivers/Streams | Metals/Metalloids | 38 | 636.75 Miles |
| 5 | Rivers/Streams | Miscellaneous** | 2 | 127.3 Miles |
| 5 | Rivers/Streams | Nutrients | 12 | 199.43 Miles |
| 5 | Rivers/Streams | Other Organics | 3 | 18.8 Miles |
| 5 | Rivers/Streams | Pathogens | 15 | 81.93 Miles |
| 5 | Rivers/Streams | Pesticides | 35 | 647.3 Miles |
| 5 | Rivers/Streams | Salinity | 9 | 218 Miles |
| 5 | Rivers/Streams | Sediment | 3 | 28.8 Miles |
| 5 | Rivers/Streams | Toxicity | 18 | 630 Miles |
| 5 | Wetlands, Freshwater | Metals/Metalloids | 1 | 3,045 Acres |
| 5 | Wetlands, Freshwater | Salinity | 1 | 7,962 Acres |
| 6 | Lakes/Reservoirs | Metals/Metalloids | 2 | 2,687 Acres |
| 6 | Lakes/Reservoirs | Nutrients | 7 | 113,832 Acres |
| 6 | Lakes/Reservoirs | Other Organics | 1 | 819 Acres |
| 6 | Lakes/Reservoirs | Sediment | 4 | 88,937 Acres |
| 6 | Rivers/Streams | Hydromodification | 4 | 30.8 Miles |
| 6 | Rivers/Streams | Metals/Metalloids | 13 | 83.31 Miles |
| 6 | Rivers/Streams | Miscellaneous** | 9 | 218.1 Miles |
| 6 | Rivers/Streams | Nutrients | 12 | 92.58 Miles |
| 6 | Rivers/Streams | Other Inorganics | 1 | 4 Miles |
| 6 | Rivers/Streams | Other Organics | 1 | 3.8 Miles |
| 6 | Rivers/Streams | Pathogens | 14 | 104.98 Miles |
| 6 | Rivers/Streams | Salinity | 5 | 29 Miles |
| 6 | Rivers/Streams | Sediment | 16 | 220 Miles |
| 6 | Rivers/Streams | Toxicity | 1 | 58 Miles |
| 6 | Saline Lakes | Hydromodification | 1 | 665 Acres |
| 6 | Saline Lakes | Metals/Metalloids | 2 | 58,421 Acres |
| 6 | Saline Lakes | Salinity | 2 | 58,421 Acres |
| 6 | Wetlands, Freshwater | Metals/Metalloids | 1 | 62,590 Acres |
| 6 | Wetlands, Freshwater | Nutrients | 1 | 1 Acre |
| 6 | Wetlands, Freshwater | Salinity | 1 | 1 Acre |

| Region | Water Body Type | Pollutant Category | Pollutant Category Totals* | Total Estimated Size Affected |
|---|---|---|---|---|
| 7 | Rivers/Streams | Metals/Metalloids | 2 | 1,279 Miles |
| 7 | Rivers/Streams | Nutrients | 1 | 66 Miles |
| 7 | Rivers/Streams | Other Organics | 1 | 66 Miles |
| 7 | Rivers/Streams | Pathogens | 2 | 76.4 Miles |
| 7 | Rivers/Streams | Pesticides | 3 | 1,345 Miles |
| 7 | Rivers/Streams | Sediment | 2 | 1,288 Miles |
| 7 | Rivers/Streams | Trash | 1 | 66 Miles |
| 7 | Saline Lakes | Metals/Metalloids | 1 | 233,340 Acres |
| 7 | Saline Lakes | Nutrients | 1 | 233,340 Acres |
| 7 | Saline Lakes | Salinity | 1 | 233,340 Acres |
| 8 | Bays and Harbors | Metals/Metalloids | 3 | 1,390 Acres |
| 8 | Bays and Harbors | Other Organics | 3 | 1,390 Acres |
| 8 | Bays and Harbors | Pathogens | 1 | 221 Acres |
| 8 | Bays and Harbors | Pesticides | 3 | 1,390 Acres |
| 8 | Coastal Shoreline | Metals/Metalloids | 1 | 2.6 Miles |
| 8 | Coastal Shoreline | Pathogens | 2 | 6.33 Miles |
| 8 | Estuaries | Metals/Metalloids | 1 | 653 Acres |
| 8 | Estuaries | Pesticides | 1 | 653 Acres |
| 8 | Lakes/Reservoirs | Metals/Metalloids | 1 | 2,865 Acres |
| 8 | Lakes/Reservoirs | Miscellaneous** | 1 | 2,865 Acres |
| 8 | Lakes/Reservoirs | Nutrients | 4 | 5,839 Acres |
| 8 | Lakes/Reservoirs | Pathogens | 3 | 547.2 Acres |
| 8 | Lakes/Reservoirs | Sediment | 2 | 5,296 Acres |
| 8 | Lakes/Reservoirs | Toxicity | 1 | 2,431 Acres |
| 8 | Rivers/Streams | Metals/Metalloids | 3 | 11.8 Miles |
| 8 | Rivers/Streams | Nutrients | 5 | 19.1 Miles |
| 8 | Rivers/Streams | Pathogens | 16 | 156.59 Miles |
| 8 | Rivers/Streams | Pesticides | 1 | 7.8 Miles |
| 8 | Rivers/Streams | Salinity | 2 | 20.8 Miles |
| 8 | Rivers/Streams | Sediment | 2 | 6.3 Miles |
| 8 | Rivers/Streams | Toxicity | 1 | 6.3 Miles |
| 9 | Bays and Harbors | Metals/Metalloids | 3 | 2240 Acres |
| 9 | Bays and Harbors | Miscellaneous** | 8 | 206.8 Acres |
| 9 | Bays and Harbors | Nutrients | 1 | 2032 Acres |
| 9 | Bays and Harbors | Other Organics | 2 | 60.5 Acres |
| 9 | Bays and Harbors | Pathogens | 3 | 2,160.9 Acres |
| 9 | Bays and Harbors | Pesticides | 1 | 5.5 Acres |
| 9 | Bays and Harbors | Toxicity | 8 | 206.8 Acres |
| 9 | Coastal Shoreline | Pathogens | 20 | 23.86 Miles |

| Region | Water Body Type | Pollutant Category | Pollutant Category Totals* | Total Estimated Size Affected |
|---|---|---|---|---|
| 9 | Estuaries | Metals/Metalloids | 1 | 1319 Acres |
| 9 | Estuaries | Nutrients | 6 | 2,155.2 Acres |
| 9 | Estuaries | Pathogens | 7 | 2,108.59 Acres |
| 9 | Estuaries | Pesticides | 1 | 1,319 Acres |
| 9 | Estuaries | Sediment | 4 | 1,243.8 Acres |
| 9 | Estuaries | Trash | 1 | 1,319 Acres |
| 9 | Lakes/Reservoirs | Nuisance | 2 | 1,665 Acres |
| 9 | Lakes/Reservoirs | Nutrients | 2 | 1,137 Acres |
| 9 | Lakes/Reservoirs | Salinity | 1 | 1,104 Acres |
| 9 | Rivers/Streams | Metals/Metalloids | 3 | 13.6 Miles |
| 9 | Rivers/Streams | Miscellaneous** | 1 | 6.4 Miles |
| 9 | Rivers/Streams | Nutrients | 9 | 75.12 Miles |
| 9 | Rivers/Streams | Other Inorganics | 1 | 1.2 Miles |
| 9 | Rivers/Streams | Other Organics | 1 | 5.8 Miles |
| 9 | Rivers/Streams | Pathogens | 8 | 54.9 Miles |
| 9 | Rivers/Streams | Pesticides | 2 | 7 Miles |
| 9 | Rivers/Streams | Salinity | 8 | 49.01 Miles |
| 9 | Rivers/Streams | Sediment | 2 | 2.12 Miles |
| 9 | Rivers/Streams | Toxicity | 2 | 25.6 Miles |
| 9 | Rivers/Streams | Trash | 1 | 5.8 Miles |

* The pollutant category totals are derived from counting the number of pollutant-water segment combinations for the pollutant category. For a more detailed listing of water body/pollutant combinations, please refer to SWRCB (2003a).

** Miscellaneous pollutants include abnormal fish histology, pH, pH(high), temperature, habitat alterations, noxious aquatic plants, exotic species, exotic vegetation, fish consumption advisory, shellfish harvesting advisory, benthic community effects, and fish kills (SWRCB, 2003a).

Distinct temperature zones characterize the North Coast Region. Along the coast, the climate is moderate and foggy with limited temperature variation. Inland, however, seasonal temperature ranges in excess of 100°F (Fahrenheit) have been recorded. Precipitation 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 1955, December 1964, and February 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, fur bearers, 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 cold water and warm water fish.

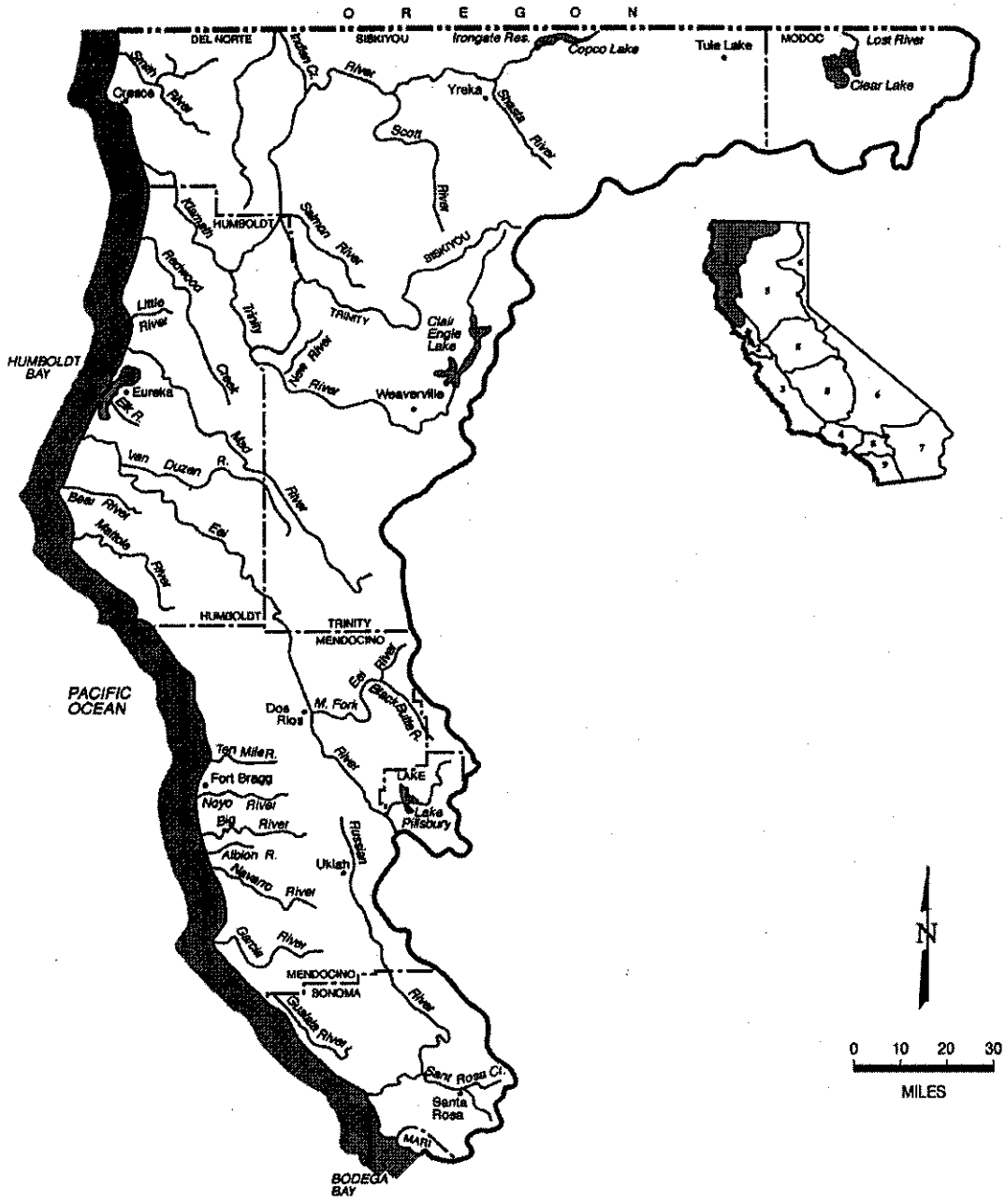
Tidelands and marshes are extremely important to many species of waterfowl and shore birds, both for feeding and nesting. Cultivated land and pasturelands also provide supplemental food for many birds, including small pheasant populations. Tideland areas along the north coast provide important habitat 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 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 California's total population resides in the North Coast Region. The largest urban centers are Eureka in Humboldt County, and Santa Rosa in Sonoma County.

## North Coast Region (1)

**NORTH COAST HYDROLOGIC BASIN PLANNING AREA (NC)**




Base map prepared by the Division of Water Rights, Graphics Services Unit

FIGURE 1: NORTH COAST REGION HYDROLOGIC BASIN

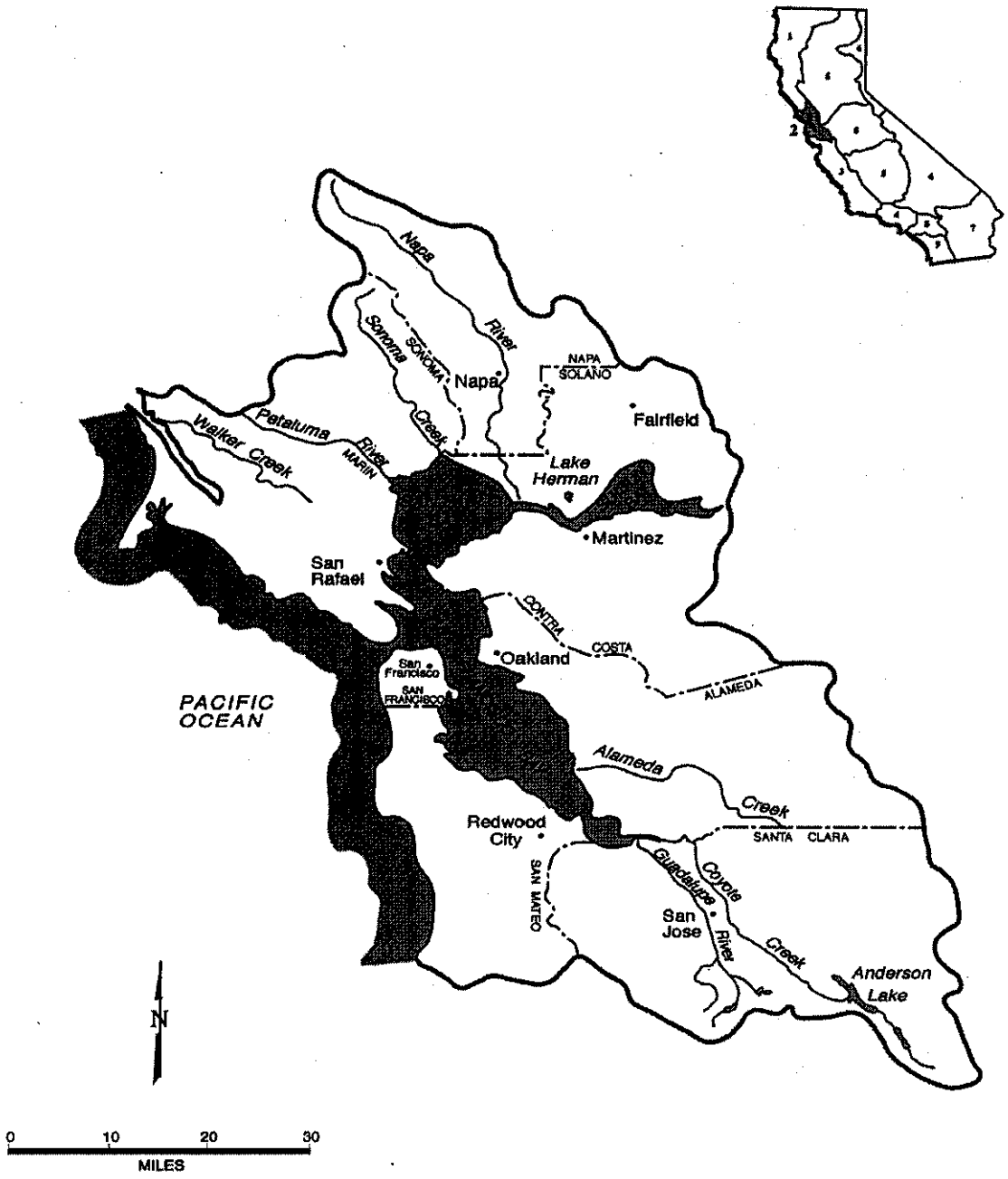
## *San Francisco Region (Region 2)*

The San Francisco Bay Region comprises San Francisco Bay, Suisun Bay beginning at the Sacramento River, and San Joaquin River westerly, from a line which passes between Collinsville and Montezuma Island (Figure 2). The Region's boundary follows the borders common to Sacramento and Solano counties and Sacramento and Contra Costa counties west of the Markely Canyon watershed in Contra Costa County. All basins west of the boundary, described above, and all basins draining into the Pacific Ocean between the southern boundary of the North Coast Region and the southern boundary of the watershed of Pescadero Creek in San Mateo and Santa Cruz counties are included in the Region.

The Region comprises most of the San Francisco Estuary to the mouth of the Sacramento-San Joaquin Delta. The San Francisco Estuary conveys the waters of the Sacramento and San Joaquin Rivers to 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). The San Francisco Estuary sustains a highly dynamic and complex environment. Within each section of the Bay system lie deepwater areas that are adjacent to large expanses of very shallow water. Salinity levels range from hypersaline to fresh water and water temperature varies widely. The Bay system's deepwater channels, tidelands, marshlands, fresh water streams and rivers provide a wide variety of habitats within the Region. 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 enter the Bay system through the Delta at the eastern end of Suisun Bay and contribute almost all of the fresh water inflow into the Bay. Many smaller rivers and streams also convey fresh water to the Bay system. The rate and timing of these fresh water 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.




Base map prepared by the Division of Water Rights, Graphics Services Unit

FIGURE 2: SAN FRANCISCO BAY REGION HYDROLOGIC BASIN

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 2002 section 303(d) list for the San Francisco Region included 25 water bodies affecting an estimated 396,296 acres (bays, estuaries, lakes, and wetlands) and 54 water bodies affecting 724 miles of rivers and shoreline. The major pollutants affecting these water bodies included nutrients, metals, pathogens, pesticides, and sediment among others (SWRCB, 2003a).

## *Central Coast Region (Region 3)*

The Central Coast Region comprises all basins (including Carrizo Plain in San Luis Obispo and Kern Counties) draining into the Pacific Ocean from the southern boundary of the Pescadero Creek watershed in San Mateo and Santa Cruz Counties; to the southeastern boundary of the Rincon Creek watershed, located in western Ventura County (Figure 3). The Region extends 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 such as the Salinas, Santa Maria, and Lompoc Valleys; National Forest lands; extremely wet areas such as the Santa Cruz mountains; and arid areas such as the Carrizo Plain.

Water bodies in the Central Coast Region 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. Several small estuaries also characterize the Region, including the Santa Maria River Estuary, San Lorenzo River Estuary, Big Sur River Estuary, and many others. Major rivers, streams, and lakes include San Lorenzo River, Santa Cruz River, San Benito River, Pajaro River, Salinas River, Santa Maria River, Cuyama River, Estrella

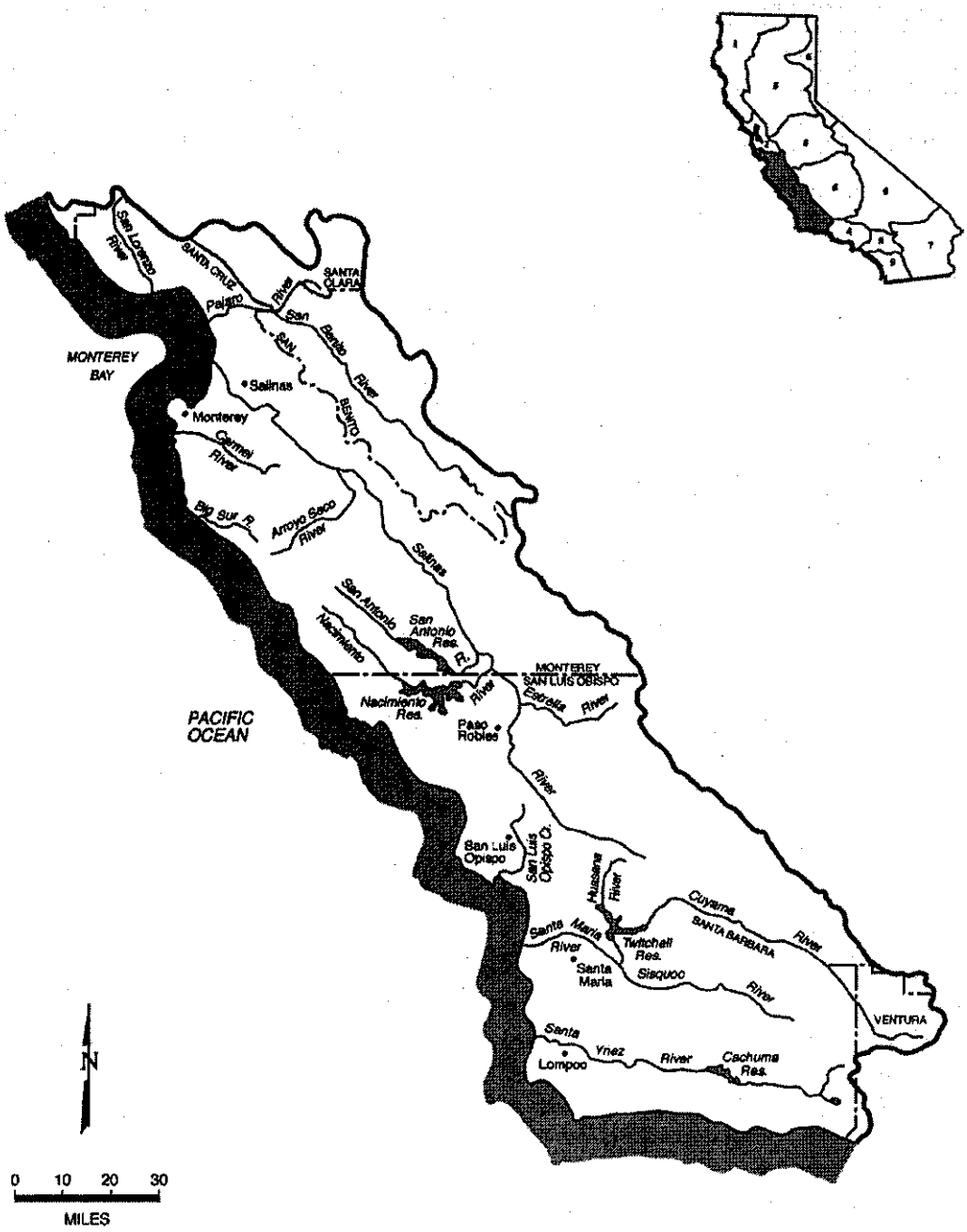
River and Santa Ynez River, San Antonio Reservoir, Nacimiento Reservoir, Twitchel Reservoir, and Cuchuma Reservoir.

The economic and cultural activities in the basin have been primarily agrarian. Livestock grazing persists, but has been combined with hay cultivation in the valleys. Irrigation, with pumped local groundwater, 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; while offshore oil exploration and production have heavily influenced the southern part. Total population of the Region is estimated at 1.22 million people.

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

Listings on the 2002 section 303(d) list for the Central Coast Region included 16 water bodies affecting an estimated 11,366 acres (bays, estuaries, lakes, and wetlands) and 77 water bodies affecting 842 miles of rivers and shoreline. The major pollutants affecting these water bodies included nutrients, metals, pathogens, pesticides, and sediment among others (SWRCB, 2003a).




Base map prepared by the Division of Water Rights, Graphics Services Unit

FIGURE 3: CENTRAL COAST REGION HYDROLOGIC BASIN

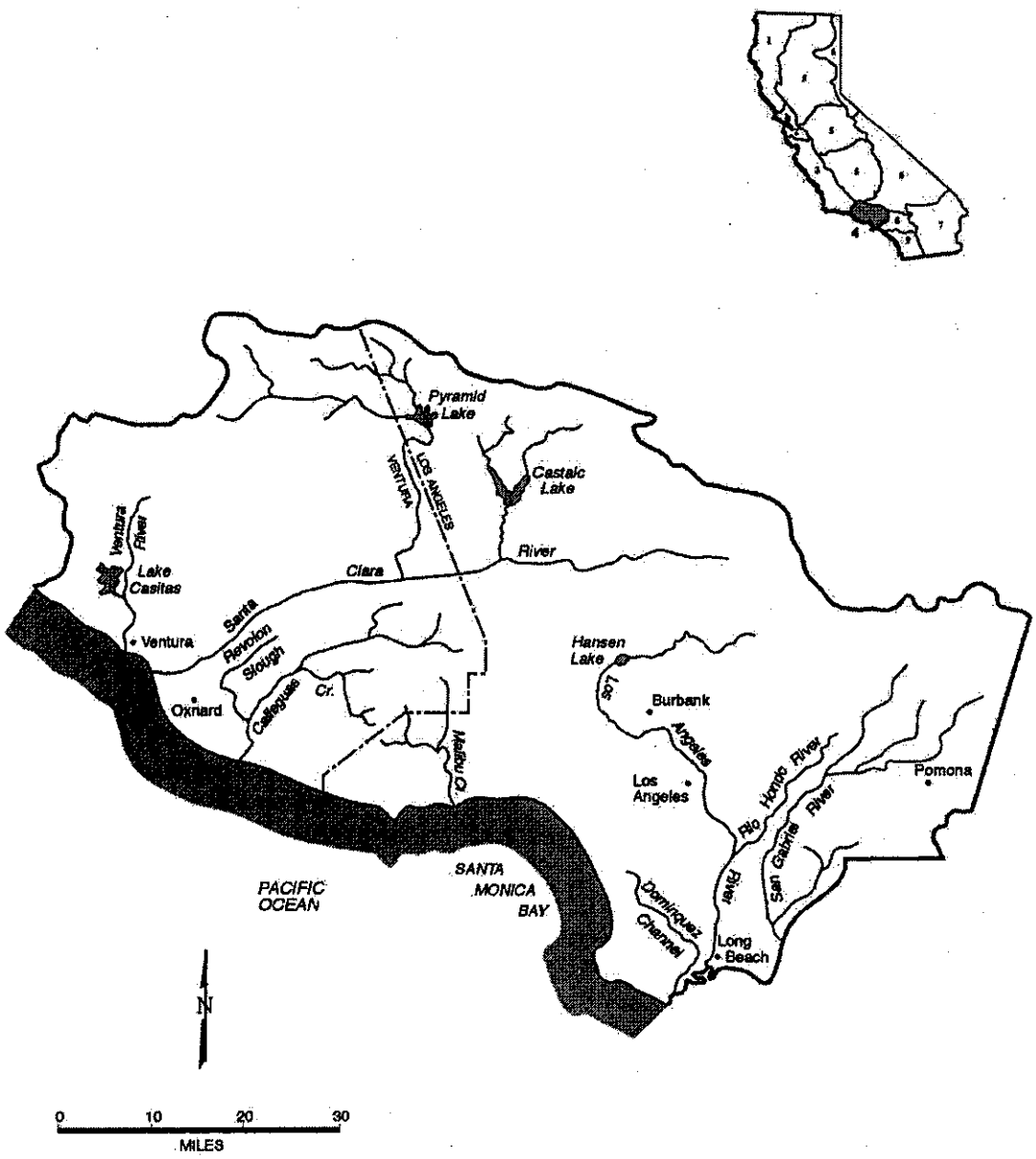
## *Los Angeles Region (Region 4)*

The Los Angeles Region comprises all basins draining into the Pacific Ocean between the southeastern boundary of the watershed of Rincon Creek, located in western Ventura County, and a line which coincides with the southeastern boundary of Los Angeles County, from the Pacific Ocean to San Antonio Peak, and follows the divide, between the San Gabriel River and Lytle Creek drainages to the divide between Sheep Creek and San Gabriel River drainages (Figure 4).

The Region encompasses all coastal drainages flowing into 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 Two large deepwater harbors (Los Angeles and Long Beach Harbors) and one smaller deepwater harbor (Port Hueneme) are contained in the Region. 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 exist along the coast (Marina del Rey, King Harbor, Ventura Harbor); these contain boatyards, other small businesses and dense residential development.

Several large, primarily concrete-lined rivers (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 works discharging tertiary-treated effluent. Lagoons are located at the mouths of other rivers draining relatively undeveloped areas (Mugu Lagoon, Malibu Lagoon, Ventura River Estuary, and 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, dominates a large portion of the open coastal water bodies in the Region. The Region's coastal water bodies also include the areas along the shoreline of Ventura County and the waters surrounding the five offshore islands in the region.




Base map prepared by the Division of Water Rights, Graphics Services Unit

FIGURE 4: LOS ANGELES REGION HYDROLOGIC BASIN

Waters on the 2002 section 303(d) list for the Los Angeles Region included 38 water bodies affecting an estimated 156,921 acres (bays, estuaries, lakes, and wetlands) and 142 water bodies affecting 802 miles of rivers and shoreline. The major pollutants affecting these water bodies included nutrients, metals, pathogens, pesticides, and sediment among others (SWRCB, 2003a).

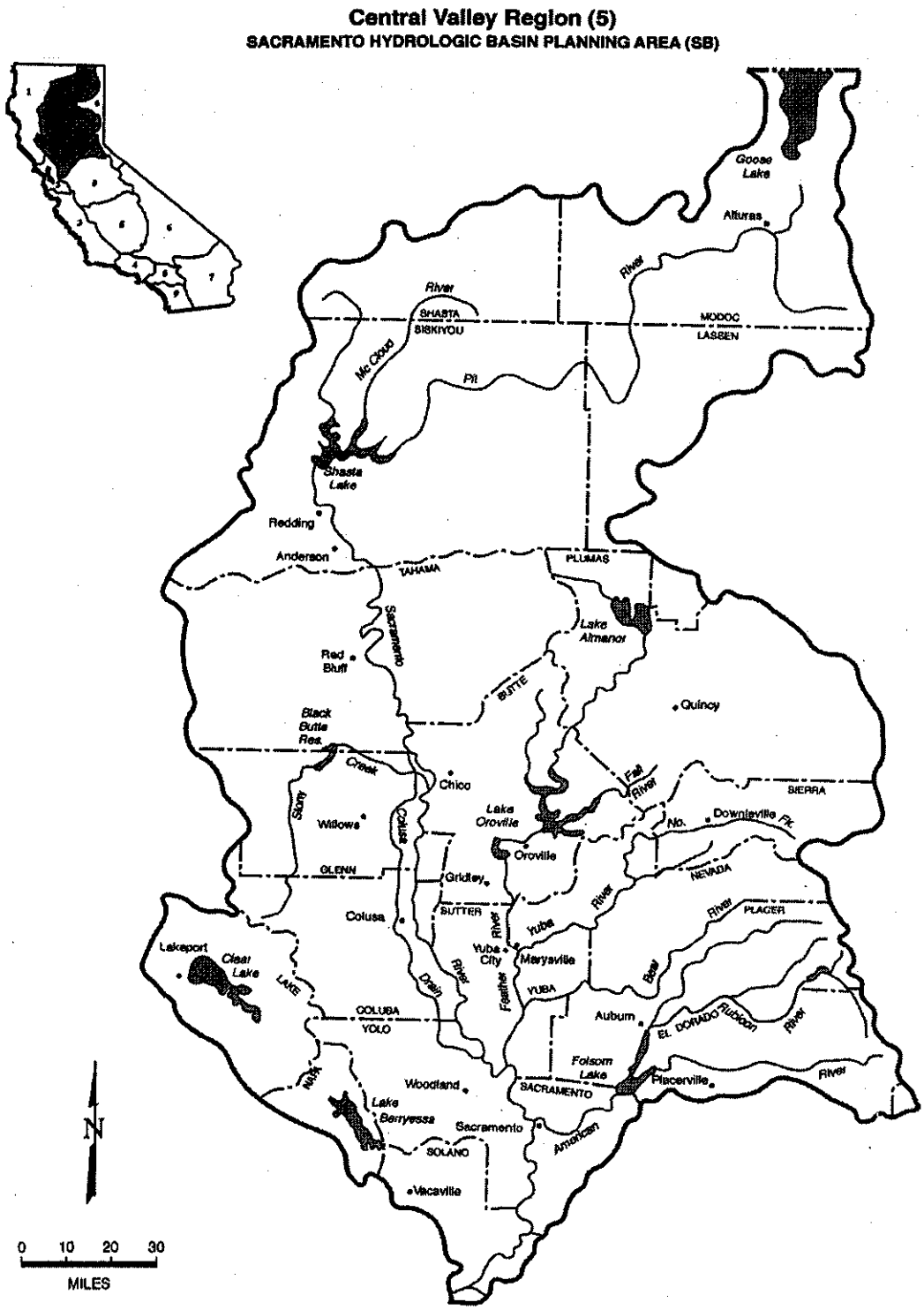
## *Central Valley Region (Region 5)*

The Central Valley Region includes approximately 40 percent of the land in California stretching from the Oregon border to the Kern County/ Los Angeles county line. The Region is divided into three basins. For planning purposes, the Sacramento River Basin and the San Joaquin River basin are covered under one Basin Plan and the Tulare Lake Basin is covered under a separate distinct one.

The Sacramento River Basin covers 27,210 square miles and includes the entire area drained by the Sacramento River (Figure 5). The principal streams are the Sacramento River and its larger tributaries: the Pitt, Feather, Yuba, Bear, and American Rivers to the East; and Cottonwood, Stony, Cache, and Putah Creek to the west. Major reservoirs and lakes include Shasta, Oroville, Folsom, Clear Lake, and Lake Berryessa.

The San Joaquin River Basin covers 15,880 square miles and includes the entire area drained by the San Joaquin River (Figure 6). Principal streams in the basin are the San Joaquin River and its larger tributaries: the Consumnes, Mokelumne, Calaveras, Stanislaus, Tuolumne, Merced, Chowchilla, and Fresno Rivers. Major reservoirs and lakes include Pardee, New Hogan, Millerton, McClure, Don Pedro, and New Melones.

The Tulare Lake Basin covers approximately 16,406 square miles and comprises the drainage area of the San Joaquin Valley south of the San Joaquin River (Figure 7). The planning boundary between the San Joaquin River Basin and the Tulare Lake Basin is defined by the northern boundary of Little Pinoche Creek basin eastward along the channel of the San Joaquin River to Millerton Lake in the Sierra Nevada foothills, and then along the southern boundary of the San Joaquin River drainage basin. Main rivers within the basin include the King, Kaweah, Tule, and Kern Rivers, which drains the west face of the Sierra Nevada Mountains. Imported surface water supplies enter the basin through the San Luis Drain- California Aqueduct System, Friant- Kern Channel and the Delta Mendota Canal.




Base map prepared by the Division of Water Rights, Graphics Services Unit

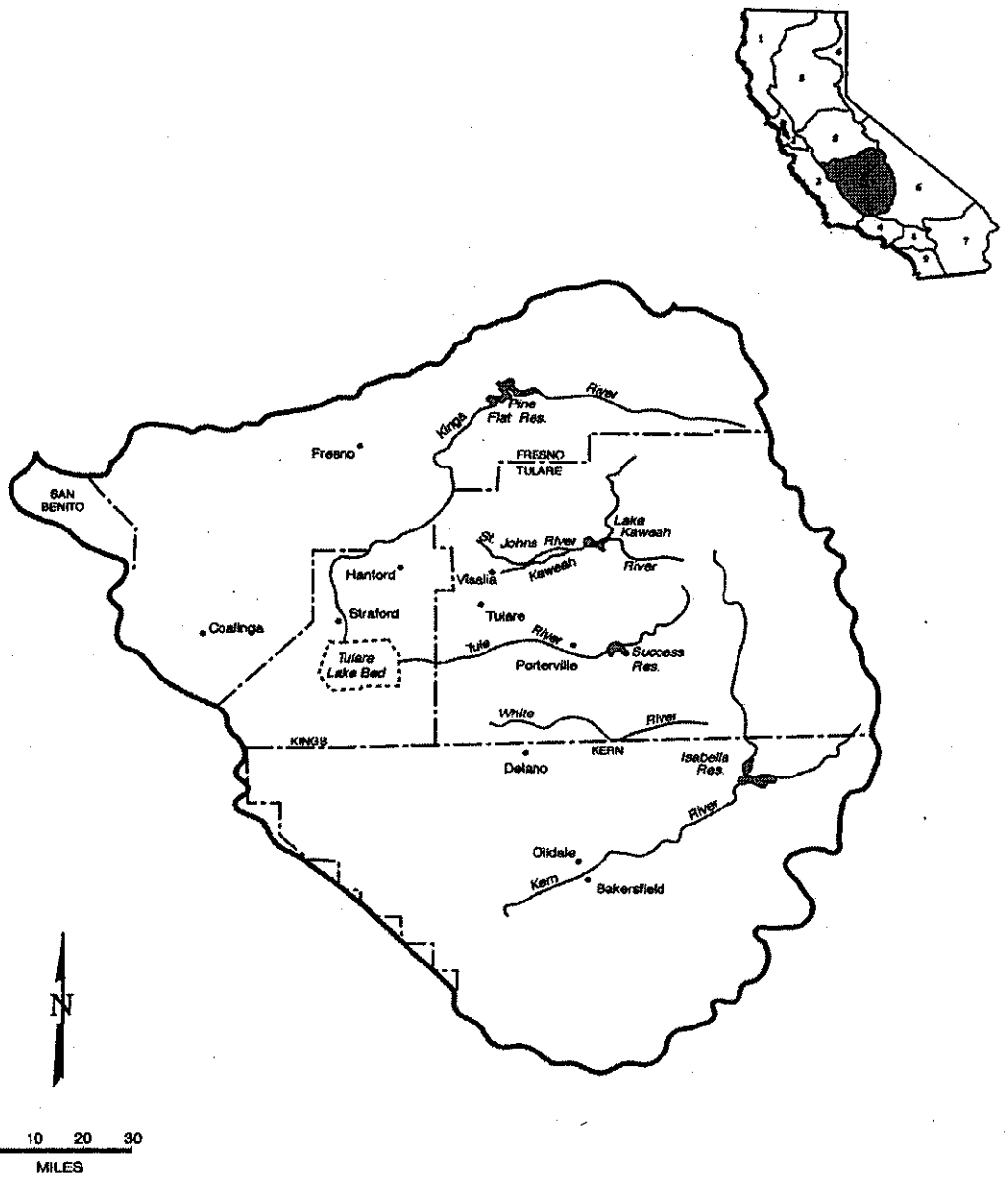
FIGURE 5: CENTRAL VALLEY REGION, SACRAMENTO REGION HYDROLOGIC BASIN

**Central Valley Region (5)**
**SAN JOAQUIN HYDROLOGIC BASIN PLANNING AREA (SJ)**


Base map prepared by the Division of Water Rights, Graphics Services Unit

FIGURE 6: CENTRAL VALLEY REGION, SAN JOAQUIN HYDROLOGIC BASIN

**Central Valley Region (5)**
**TULARE LAKE HYDROLOGIC BASIN PLANNING AREA (TL)**




Base map prepared by the Division of Water Rights, Graphics Services Unit

FIGURE 7: CENTRAL VALLEY REGION, TULARE LAKE HYDROLOGIC BASIN

The two northern most 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 meet and form the Delta, which ultimately drains into the San Francisco Bay.

The Delta is a maze of river channels and diked islands covering roughly 1,150 square miles, including 78 square miles of water area. 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 CWC section 12220.

The 2002 section 303(d) list for the Central Valley Region included 20 water bodies affecting an estimated 142,292 acres (bays, estuaries, lakes, and wetlands) and 83 water bodies affecting 1344 miles of rivers. The major pollutants affecting these water bodies included nutrients, metals, pathogens, and pesticides among others (SWRCB, 2003a).

## *Lahontan Region (Region 6)*

The Lahontan Region has historically been divided into North and South Lahontan Basins at the boundary between the Mono Lake and East Walker River watersheds (Figure 8 and 9). It is about 570 miles long and has a total area of 33,131 square miles. The Lahontan Region includes the highest (Mount Whitney) and lowest (Death Valley) points in the contiguous United States. The topography of the remainder of the Region is diverse. The Region includes the eastern slopes of the Warner, Sierra Nevada, San Bernardino, Tehachapi and San Gabriel Mountains, and all or part of other ranges including the White, Providence, and Granite Mountains. Topographic depressions include the Madeline Plains, Surprise, Honey Lake, Bridgeport, Owens, Antelope, and Victor Valleys.

The Region is generally in a rain shadow; however, annual precipitation amounts can be high (up to 70 inches) at higher elevations. Most precipitation in the mountainous areas falls as snow. Desert areas receive relatively little annual precipitation (less than 2 inches in some locations) but this can be concentrated and lead to flash flooding. Temperature extremes recorded in the Lahontan Region range from –45°F at Boca (Truckee River watershed) to 134 °F in Death Valley. The varied topography, soils, and microclimates of the Lahontan Region support a

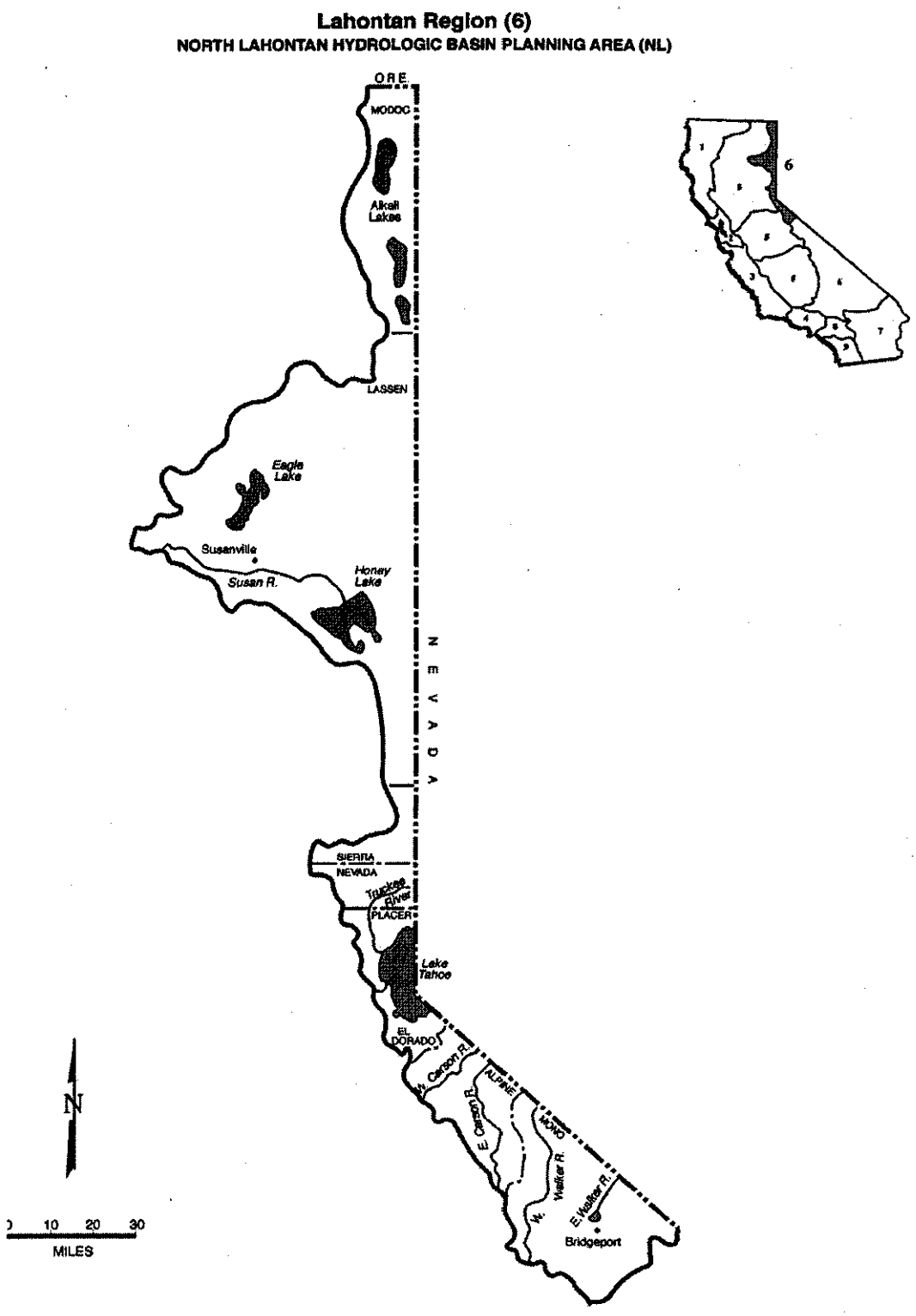



FIGURE 8: LAHONTAN REGION, NORTH LAHONTAN HYDROLOGIC BASIN

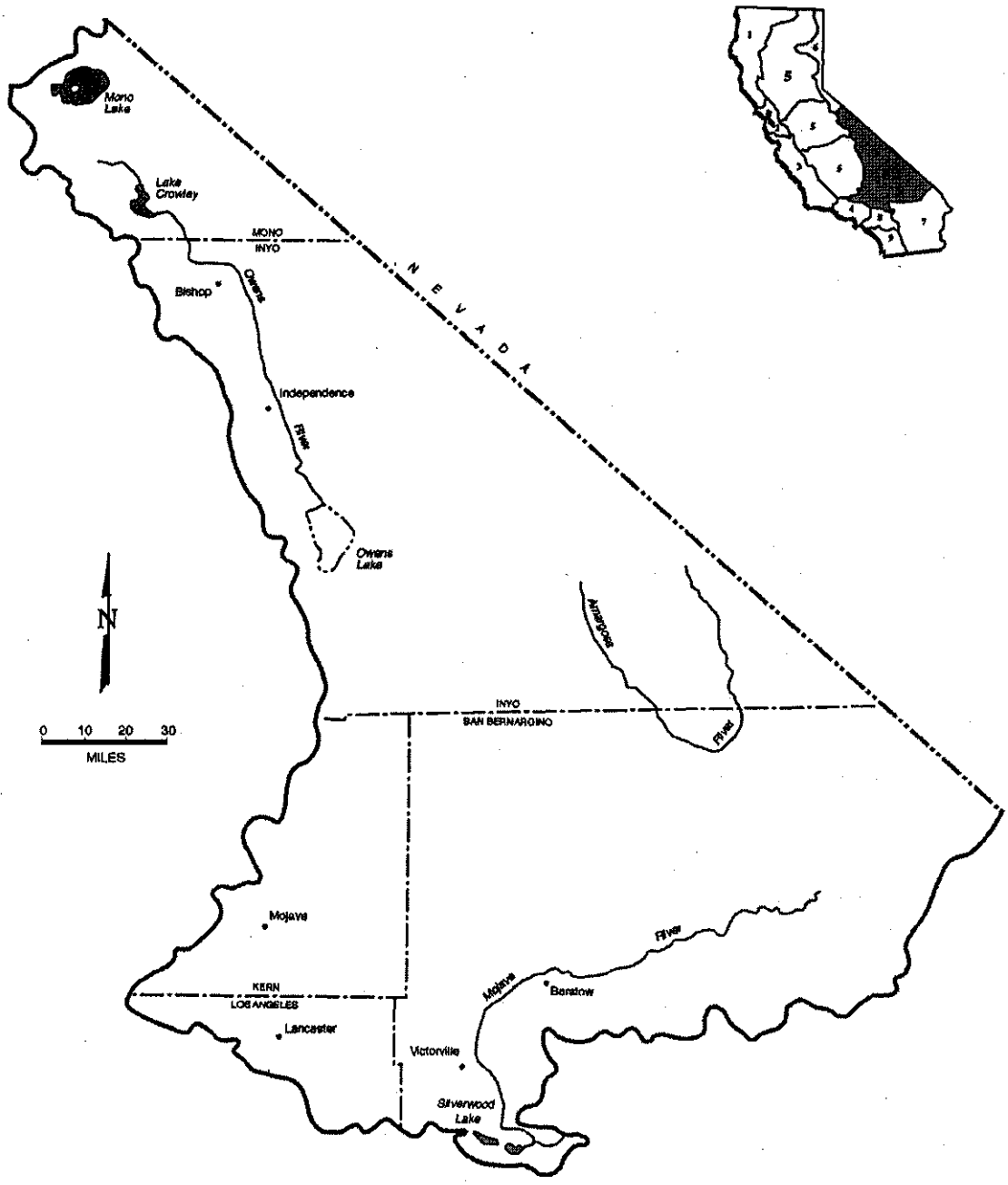



FIGURE 9: LAHONTAN REGION, SOUTH LAHONTAN HYDROLOGIC BASIN

corresponding variety of plant and animal communities. Vegetation ranges from sagebrush and creosote bush scrub in the desert areas to pinyon-juniper and mixed conifer forest at higher elevations. Subalpine and alpine communities occur on the highest peaks. Wetland and riparian plant communities, including marshes, meadows, "sphagnum" bogs, riparian deciduous forest, and desert washes, are particularly important for wildlife, given the general scarcity of water in the Region.

The Lahontan Region is rich in cultural resources (archaeological and historic sites), ranging from remnants of Native American irrigation systems to Comstock mining era ghost towns, such as Bodie, and 1920s resort homes at Lake Tahoe and Death Valley (Scotty's Castle).

Much of the Lahontan Region is in public ownership, with land use controlled by agencies, such as the U.S. Forest Service (USFS), National Park Service, Bureau of Land Management, various branches of the military, the California State Department of Parks and Recreation, and the City of Los Angeles Department of Water and Power. While the permanent resident population (about 500,000 in 1990) of the Region is low, most of it is concentrated in high density communities in the South Lahontan Basin. In addition, millions of visitors use the Lahontan Region for recreation each year. Rapid population growth has occurred in the Victor and Antelope Valleys and within commuting distance of Reno, Nevada. Principal communities of the North Lahontan Basin include Susanville, Truckee, Tahoe City, South Lake Tahoe, Markleeville, and Bridgeport. The South Lahontan Basin includes the communities of Mammoth Lakes, Bishop, Ridgecrest, Mojave, Adelanto, Palmdale, Lancaster, Victorville, and Barstow. Recreational and scenic attractions of the Lahontan Region include Eagle Lake, Lake Tahoe, Mono Lake, Mammoth Lakes, Death Valley, and portions of many wilderness areas. Segments of the East Fork Carson and West Walker Rivers are included in the State Wild and Scenic River system. Both developed (e.g., camping, skiing, day use) and undeveloped (e.g., hiking, fishing) recreation are important components of the Region's economy. In addition to tourism, other major sectors of the economy are resource extraction (mining, energy production, and silviculture), agriculture (mostly livestock grazing), and defense-related activities. There is relatively little manufacturing industry in the Region, in comparison to major urban areas of the state. Economically valuable minerals, including gold, silver, copper, sulfur, tungsten, borax, and rare earth metals have been or are being mined at various locations within the Lahontan Region.

The Lahontan Region includes over 700 lakes, 3,170 miles of streams and 1,581 square miles of groundwater basins. There are twelve major watersheds (called "hydrologic units" under the Department of Water

Resources' mapping system) in the North Lahontan Basin. Among these are the Eagle Lake, Susan River/Honey Lake, Truckee, Carson, and Walker River watersheds. The South Lahontan Basin includes three major surface water systems (the Mono Lake, Owens River, and Mojave River watersheds) and a number of separate closed groundwater basins. Water quality problems in the Lahontan Region are largely related to nonpoint sources (including erosion from construction, timber harvesting, and livestock grazing), storm water, acid drainage from inactive mines, and individual wastewater disposal systems.

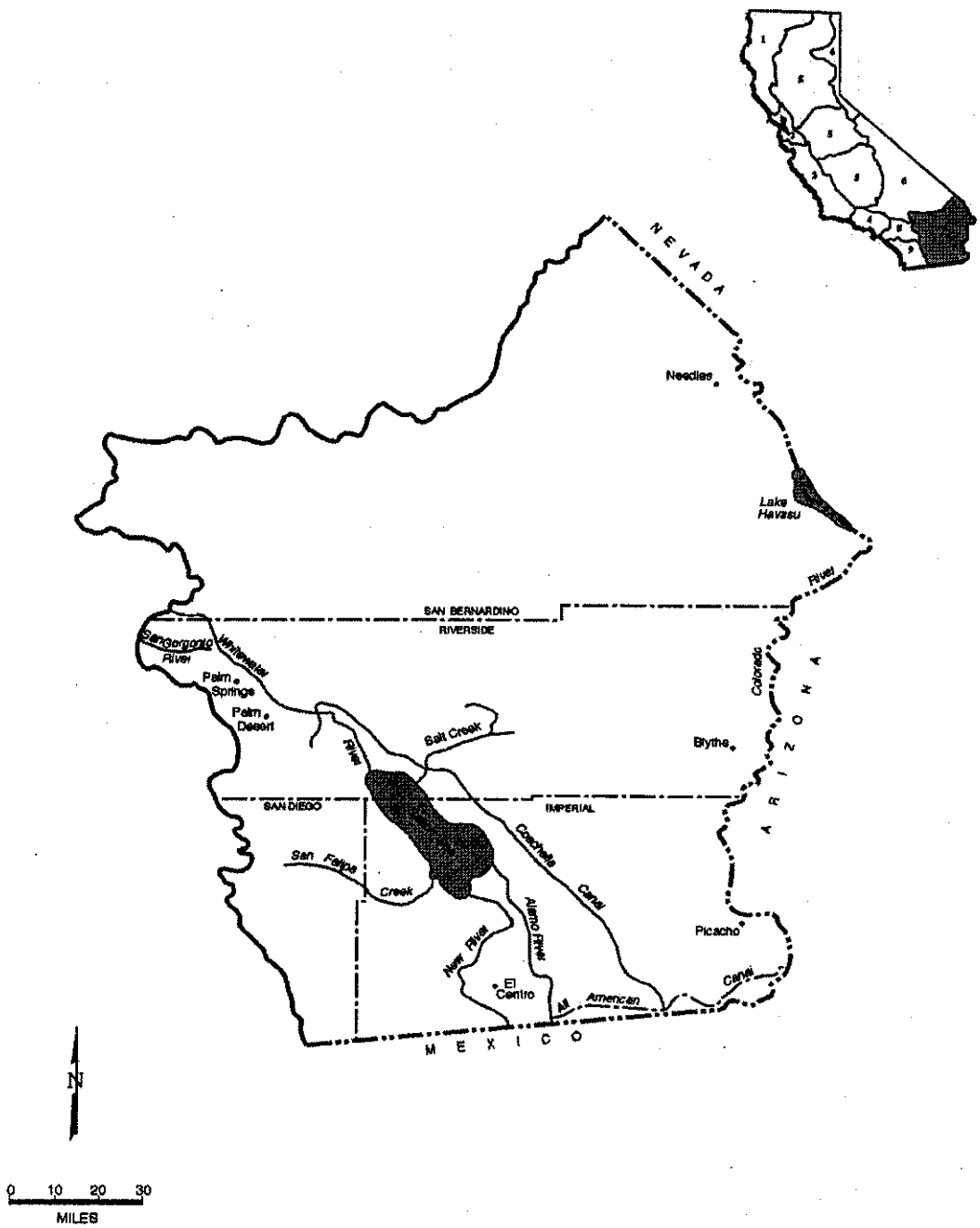
Listings on the 2002 section 303(d) list for the Lahontan Region included 16 water bodies affecting an estimated 239,309 acres (lakes and wetlands) and 54 water bodies affecting 699 miles of rivers and shoreline. The major pollutants affecting these water bodies included nutrients, metals, pathogens, and pesticides among others (SWRCB, 2003a).

## *Colorado River Basin Region (Region 7)*

The Colorado River Basin Region covers approximately 13 million acres (20,000 square miles) in the southeastern portion of California (Figure 10).

It includes all of Imperial County and portions of San Bernardino, Riverside, and San Diego Counties. It shares a boundary for 40 miles on the northeast with the State of Nevada, on the north by the New York, Providence, Granite, Old Dad, Bristol, Rodman, and Ord Mountain ranges, on the west by the San Bernardino, San Jacinto, and Laguna Mountain ranges, on the south by the Republic of Mexico, and on the east by the Colorado River and State of Arizona. Geographically the Region represents only a small portion of the total Colorado River drainage area which includes portions of Arizona, Nevada, Utah, Wyoming, Colorado, New Mexico, and Mexico. A significant geographical feature of the Region is the Salton Trough, which contains the Salton Sea and the Coachella and Imperial Valleys. The two valleys are separated by the Salton Sea, which covers the lowest area of the depression. The trough is a geologic structural extension of the Gulf of California.

Much of the agricultural economy and industry of the Region is located in the Salton Trough. There are also industries associated with agriculture, such as sugar refining as well as increasing development of geothermal industries. In the future, agriculture is expected to experience little growth in the Salton Trough, but there will likely be increased development of other industries (such as construction, manufacturing, and services). The present Salton Sea, located on the site of a prehistoric lake, was formed between 1905 and 1907 by overflow of the Colorado River. The Salton Sea serves as a drainage reservoir for irrigation return water and storm




Base map prepared by the Division of Water Rights, Graphics Services Unit

FIGURE 10: COLORADO RIVER REGION HYDROLOGIC BASIN

water from the Coachella Valley, Imperial Valley, and Borrego Valley, and also receives drainage water from the Mexicali Valley in Mexico. The Salton Sea is California's largest inland body of water and provides a very important wildlife habitat and sportfishery. Development along California's 230 mile reach of the Colorado River, which flows along the eastern boundary of the Region, include agricultural areas in Palo Verde Valley and Bard Valley, urban centers at Needles, Blythe, and Winterhaven, several transcontinental gas compressor stations, and numerous small recreational communities. Some mining operations are located in the surrounding mountains. Also the Fort Mojave, Chemehuevi, Colorado River, and Yuma Indian Reservations are located along the River.

Waters on the 2002 section 303(d) list for the Colorado River Basin Region included one water body affecting an estimated 233,340 acres (lakes and wetlands) and five water bodies affecting 1,421 miles of rivers. The major pollutants affecting these water bodies included nutrients, metals, pathogens, pesticides, and sediments among others (SWRCB, 2003a).

The Region has the driest climate in California. The winters are mild and summers are hot. Temperatures range from below freezing to over 120°F. In the Colorado River valleys and the Salton Trough, frost is a rare occurrence and crops are grown year round. Snow falls in the Region's higher elevations, with mean seasonal precipitation ranging from 30 to 40 inches in the upper San Jacinto and San Bernardino Mountains. The lower elevations receive relatively little rainfall. An average four inches of precipitation occurs along the Colorado River, with much of this coming from late summer thunderstorms moving north from Mexico. Typical mean seasonal precipitation in the desert valleys is 3.6 inches at Indio and 3.2 inches at El Centro. Precipitation over the entire area occurs mostly from November through April, and August through September, but its distribution and intensity are often sporadic. Local thunderstorms may contribute all the average seasonal precipitation at one time, or only a trace of precipitation may be recorded at any locale for the entire season.

The Region provides habitat for a variety of native and introduced species of wildlife. Increased human population and its associated development have adversely affected the habitat for some species, while enhancing it for others. Large areas within the Region are inhabited by animals tolerant of arid conditions, including small rodents, coyotes, foxes, birds, and a variety of reptiles. Along the Colorado River and in the higher elevations of the San Bernardino and San Jacinto Mountains where water is more abundant, deer, bighorn sheep, and a diversity of small animals exist.

Practically all of the fishes inhabiting the Region are introduced species. The most abundant species in the Colorado River and irrigation canals include largemouth bass, smallmouth bass, flathead and channel catfish, yellow bullhead, bluegill, redear sunfish, black crappie, carp, striped bass, threadfin shad, red shiner, and, in the colder water above Lake Havasu, rainbow trout. Grass carp have been introduced into sections of the All American Canal system for aquatic weed control. Fish inhabiting agricultural drains in the Region generally include mosquito fish, mollies, red shiners, carp, and tilapia, although locally significant populations of catfish, bass, and sunfish occur in some drains. A considerable sportfishery exists in the Salton Sea, with orangemouth corvina, gulf croaker, sargo, and tilapia predominating. The Salton Sea National Wildlife Refuge and state waterfowl management areas are located in or near the Salton Sea. The refuge supports large numbers of waterfowl in addition to other types of birds. Located along the Colorado River are the Havasu, Cibola and Imperial National Wildlife Refuges. The Region provides habitat for certain endangered/threatened species of wildlife including desert pupfish, razorback sucker, Yuma clapper rail, black rail, least Bell's vireo, yellow billed cuckoo, desert tortoise, and peninsular bighorn sheep.

## *Santa Ana Region (Region 8)*

The Santa Ana Region comprises all basins draining into the Pacific Ocean between the southern boundary of the Los Angeles Region and the drainage divide between Muddy and Moro Canyons, from the ocean to the summit of San Joaquin Hills; along the divide between lands draining into Newport Bay and Laguna Canyon to Niguel Road; along Niguel Road and Los Aliso Avenue to the divide between Newport Bay and Aliso Creek drainages; and along the divide and the southeastern boundary of the Santa Ana River drainage to the divide between Baldwin Lake and Mojave Desert drainages; to the divide between the Pacific Ocean and Mojave Desert drainages (Figure 11). The Santa Ana Region is the smallest of the nine regions in the state (2,800 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. Principal Rivers include Santa Ana, San Jacinto and San Diego. Lakes and reservoirs include Big Bear, Hemet, Mathews, Canyon Lake, Lake Elsinore, Santiago Reservoir, and Perris Reservoir.

The section 2002 303(d) list for the Santa Ana Region included nine water bodies affecting an estimated 7,886 acres (bays, estuaries, lakes, and wetlands) and 24 water bodies affecting 191 miles of rivers and shoreline. The major pollutants affecting these water bodies included nutrients, metals, pathogens, pesticides, and sediments among others (SWRCB 2003a).

## *San Diego Region (Region 9)*

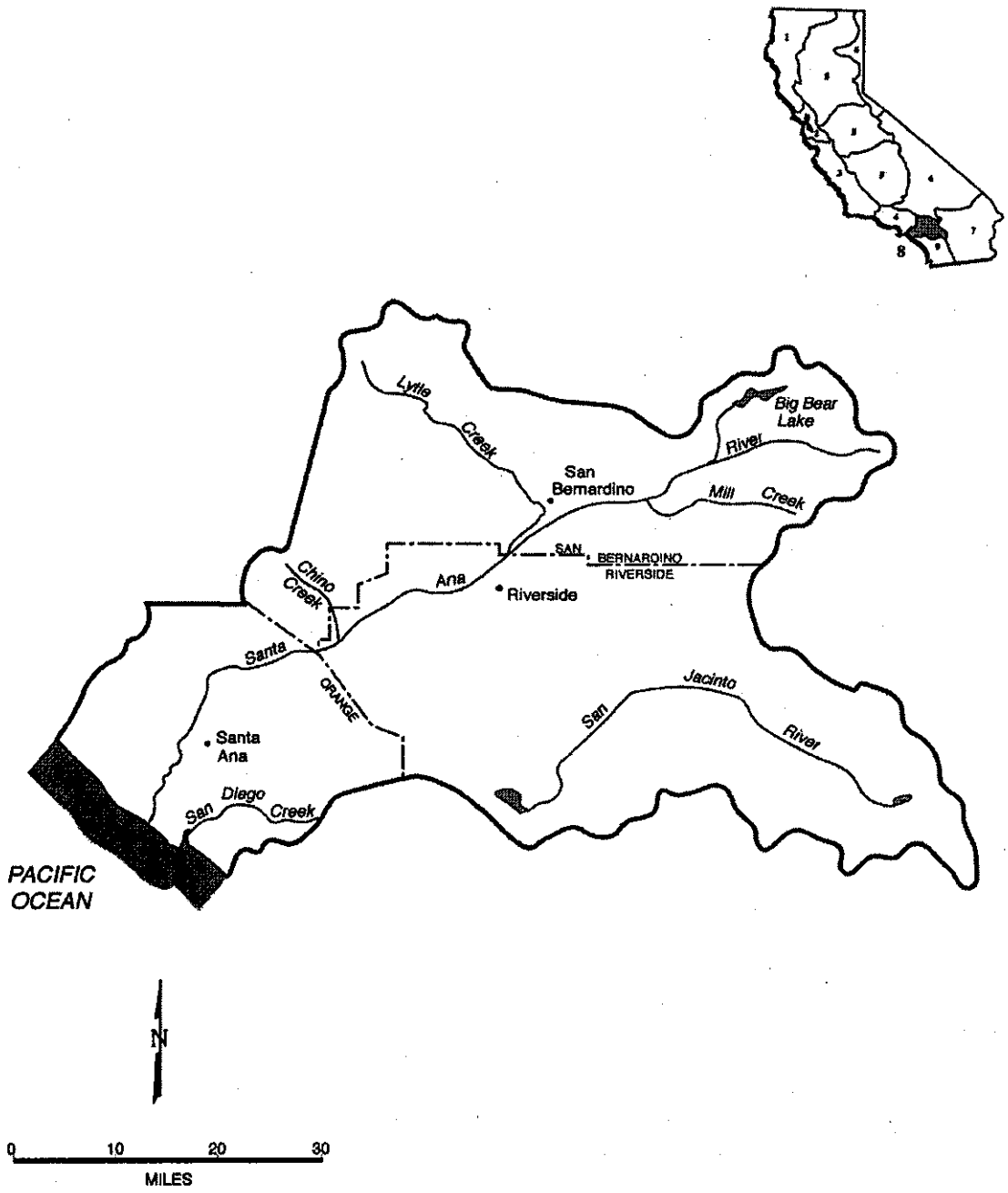
The San Diego Region comprises all basins draining into the Pacific Ocean between the southern boundary of the Santa Ana Region and the California-Mexico boundary (Figure 12). The San Diego Region is located along the coast of the Pacific Ocean from the Mexican border to north of Laguna Beach. The Region 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 deepwater 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.

The 2002 section 303(d) list for the San Diego Region included 26 water bodies affecting an estimated 6,907 acres (bays, estuaries, lakes, and wetlands) and 40 water bodies affecting 148 miles of rivers and shoreline. The major pollutants affecting these water bodies included nutrients, metals, pathogens, pesticides, and sediments among others (SWRCB, 2003a).

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.

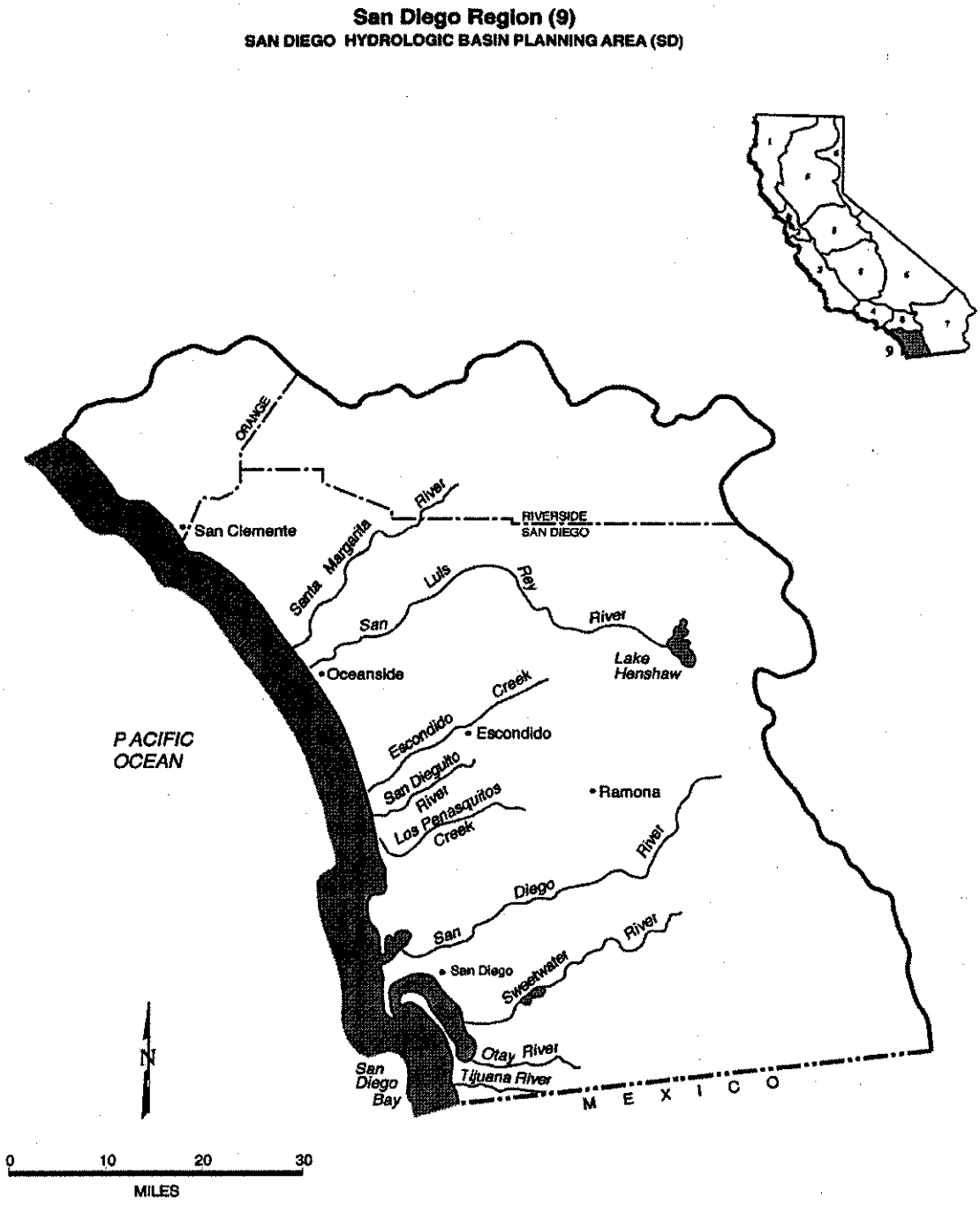
San Diego Bay is long and narrow, 15 miles in length and approximately one mile across. A deep-water harbor, San Diego Bay has experienced waste discharge from former sewage outfalls, industries, and urban runoff. Up to 9,000 vessels may be moored there. San Diego Bay also hosts four major U.S. Navy bases with approximately 80 surface ships and submarines. Coastal waters include bays, harbors, estuaries, beaches, and open ocean.

**Santa Ana Region (8)**
**SANTA ANA HYDROLOGIC BASIN PLANNING AREA (SA)**




Base map prepared by the Division of Water Rights, Graphics Services Unit

FIGURE 11: SANTA ANA REGION HYDROLOGIC BASIN




Base map prepared by the Division of Water Rights, Graphics Services Unit

FIGURE 12: SAN DIEGO REGION HYDROLOGIC BASIN

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.

## ISSUE ANALYSIS

The staff analysis of each issue addressed during the development of the 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 Appendix B. Many of the issue analyses were revised in response to the comments received.

Each issue analysis contains the following sections:

**Issue:** A brief question framing the issue or topic.

**Issue Description:** A description of the issue or topic plus (if appropriate) any additional background information, list of limitations and assumptions, descriptions of related programs or other information.

**Baseline:** A description of how the SWRCB or RWQCBs addressed the issue or topic during the development of the 2002 section 303(d) list and, if necessary, prior to 2002.

**Alternatives:** For each issue or topic, at least two alternatives are provided for SWRCB consideration.

**Recommendation:** In this section, a suggestion is made for which alternative (or combination of alternatives) should be adopted by the SWRCB. The reader is also referred to the section(s) of the proposed Policy relevant to the issue.

## *Issue 1: Scope of the Listing/Delisting Policy*

**Issue:** What factors should be addressed by the Listing/Delisting Policy?

**Issue Description:** To develop guidance on listing and delisting factors, the SWRCB held scoping meetings for the Policy with members of the AB 982 PAG as well as other constituencies interested in the development of this Policy. Some of these constituencies urged the SWRCB to consider revision of beneficial uses before any listing decisions were made. Comments have also been received suggesting that the Policy be limited to creation of the section 303(d) list since other programs focus on standards revision (e.g., triennial review of the Basin Plans). Additionally, during development of the 2002 section 303(d) list, several comments addressed the appropriateness or applicability of many of the water quality standards and beneficial use designations (SWRCB, 2003a).

CWC section 13191.3(a) requires the SWRCB to develop guidelines for listing and delisting of waters on the section 303(d) list. The development of a section 303(d) list relies on the interpretation of existing water quality standards.

**Baseline:** SWRCB is required to submit to USEPA a new section 303(d) list every two years. In 2002, SWRCB did not modify any water quality standards during the development of the section 303(d) list.

**Alternatives:**

1. Incorporate guidance on listing/delisting factors only. CWA section 303(d) requires the state to create a list of waters that do not currently meet existing water quality standards and where TMDLs are still required. This alternative is focused narrowly on developing guidance for completion of the section 303(d) list.

   Focusing the Policy on the listing/delisting factors for the section 303(d) list provide the following advantages: (1) deadlines are more likely to be met for completion of the section 303(d) list; (2) the established triennial review process for the Basin Plans and Statewide Plans would not have to conform to the 2-year time frame for development of the section 303(d) list; and (3) the process would be manageable with existing staff resources.

   The major disadvantage to this approach is that existing standards may not represent actual water body conditions and the problem identified during the listing process may no longer represent a real water quality problem.

   Another disadvantage is that, if not narrowly focused, the potential to broadly apply the Policy requirements is greater. For example, the Policy

could potentially be used to determine compliance with permit limitations or translate narrative objectives for the regulation of point sources. To avoid these problems and others, the Policy should clearly state that it is not to be used to: (1) develop or revise water quality objectives or beneficial uses (2) determine compliance with waste discharge requirements (WDRs) or National Pollutant Discharge Elimination System (NPDES) requirements, or (3) interpret narrative water quality standards for the purposes of regulating point sources. The purpose of the Policy should be clearly articulated.

Of the two alternatives considered, this is the preferred alternative because a standardized approach for developing California's section 303(d) list would be established that focuses only on development of the list.

2. Incorporate guidance on beneficial use designation/de-designation and water quality standards revision or development, as well as guidance on interpretation of water quality standards. A National Academy of Sciences (NAS) committee (2001) has recommended that beneficial uses and water quality standards be reviewed as a first step in developing the section 303(d) list. The NAS committee wrote:

> "States should develop appropriate use designations for water bodies in advance of assessment and refine these use designations prior to TMDL development."
>
> "CWA goals of fishable and swimmable waters are too broad to be operational as statements of designated uses. Thus, there should be greater stratification of designated uses at the state level (such as primary and secondary contact recreation). The appropriate designated use may not be the use that would be realized in the water's predisturbed condition. Sufficient science and examples exist for all states to inject this level of detail into their water quality standards."

The purpose of the section 303(d) list is to provide information about water bodies relative to existing standards. Preparation of the list does not require states to reexamine whether those standards are appropriate.

There are disadvantages of taking an approach that combines the section 303(d) process with standards review and revision. Any attempt to revise water quality standards before or during the listing process would almost certainly prevent timely fulfillment of section 303(d)-required tasks. The process for revising beneficial uses or water quality objectives is lengthy and it would be unlikely that the SWRCB and RWQCBs would be able to complete these revisions within the mandated 3-year time frame.

The process for examining and assessing water quality standards is distinct and by necessity separate from the section 303(d) listing process. Federal law requires the states to review water quality standards "at least once every three years" (40 CFR 131.20). During a triennial review, the:

> "State shall . . . hold public hearings for the purpose of reviewing applicable water quality standards, and, as appropriate, modifying or adopting standards. Any water body segment with water quality standards that do not include the uses specified in section 101(a)(2) of the Act shall be re-examined every three years to determine if any new information has become available."

The often lengthy and labor-intensive process to review and change water quality standards is best handled through the established Basin Plan Triennial Review process.

The advantage of combining the triennial review process and the development of the section 303(d) list is that the SWRCB would be more likely to identify real water quality problems.

**Recommendation:** Alternative 1. See Policy section 1.

## *Issue 2: Structure of the Section 303(d) List*

**Issue:** Should the State integrate the federal CWA requirements for assessing water quality? What structure should be used?

**Issue Description:** USEPA has issued guidance (USEPA, 2003b) that recommends states integrate the report requirements of sections 303(d) and 305(b). Section 305(b) of the CWA requires that states and other jurisdictions receiving CWA grant funding submit a water quality report to USEPA every two years that evaluates the quality of the state's waters. The section 305(b) report contains summary information about water quality conditions in rivers, lakes, estuaries, bays, harbors, wetlands, and coastal waters.

The SWRCB and RWQCBs prepare both the section 303(d) list and the section 305(b) report. A key portion of the listing process is deciding how to address water bodies and sites identified as not meeting water quality standards.

**Baseline:** In 2002, the SWRCB submitted four lists to the USEPA:

**Section 303(d) List of Water Quality Limited Segments.** Waters on this list did not meet water quality standards due to pollutants. It is required that USEPA approve this list.

**Enforceable Program List.** Water quality standards were not met but the problem is being addressed by another enforceable program.

**TMDL Completed List.** Water quality standards were not met; a TMDL and implementation plan has been approved for the water body-pollutant combination.

**Monitoring List.** Insufficient data and information were available to place the water body on the section 303(d) list.

In the past, California has developed the section 303(d) list independently of the CWA section 305(b) Report. After the section 303(d) list is developed it is typically incorporated into the section 305(b) report.

**Alternatives:**

1. Develop an all-inclusive list of impaired waters. This list would become the section 303(d) list. The State could develop a list of impaired waters that includes all waters that may not meet water quality standards without regard to whether the problem is best resolved by the implementation of a TMDL (i.e., due to a pollutant). The appropriate management action would then be determined in an analysis separate from, and subsequent to, the determination of whether standards are being met.

   This alternative would provide consistency in the assessment approaches used by all RWQCBs while allowing the flexibility necessary to address regional differences and site-specific concerns. The maintenance of a single "Impaired Waters List" and database would allow the state to respond to potential changes in USEPA regulations for section 303(d) implementation. Future federal regulations could require state submission of a subset of this list of impaired waters. Should federal regulations change in this regard, the structure of California's impaired waters list would be easily amenable to sorting the waters to accommodate any such requirements.

   Creating an "impaired waters" list goes beyond the requirements of state law in developing the listing and delisting Policy. CWC section 13191.3(a) (Senate Bill [SB] 469) requires the SWRCB to prepare guidelines for the listing and delisting of waters and developing and implementing the TMDL program and TMDLs pursuant to section 303(d) of the federal CWA. Since all waters that do not meet water quality standards would be placed on the section 303(d) list, the identified problems would extend beyond the scope of the TMDL program.

   This alternative is very similar to the structure of the section 303(d) list as adopted in 1998. The 1998 list included all waters that were identified as not meeting water quality standards. The expectation was that the RWQCBs would develop TMDLs for all waters on the 1998 section 303(d) list. Many of the water bodies listed were not amenable to TMDL development for a variety of reasons including standards exceedance was not due to a pollutant, additional research and monitoring was needed to identify pollutants causing adverse conditions, etc.

2. Place all waters that do not meet water quality standards on the section 303(d) list and, for those waters with inadequate monitoring data, use a watch list or preliminary list. A committee of the NAS (2001) recommended that before waters are placed on the section 303(d) list, all waters should go through an initial screening assessment. This preliminary assessment would involve comparing available, and often limited, data on water quality conditions with the existing applicable water quality standards. If, based on this initial assessment, the water body is considered to exceed standards, it is advanced to a "preliminary" list for further

consideration. The NAS committee recommended that placement on the preliminary list should be relatively easy, the consequences of which would include additional investigation to determine the nature and reality of a suspected problem. The term "preliminary" indicates that water bodies on this list may later be placed on the section 303(d) list for action. Such a preliminary list has been employed in some states (e.g., Florida).

Those water bodies placed on the preliminary list would be the focus of additional monitoring and assessment of new data and information. This additional assessment would lead to a better understanding of the impacts to beneficial uses and water quality standards exceedances. If, as a result of the more complete assessment, there were sufficient evidence to indicate that water quality standards are indeed exceeded, the water segment on the preliminary list would be moved to the section 303(d) list.

The NAS Committee has stated that this process would improve the accuracy of the listing process. Placement of a water body on the preliminary list serves as an indication to stakeholders that action should be taken soon to achieve water quality standards and avoid the costs associated with TMDL development. However, because of the consequences of movement to the section 303(d) list, there may be an incentive to keep waters on the preliminary list indefinitely. This incentive can be eliminated by requiring that a water body be automatically placed on the section 303(d) list at the end of the next rotating basin monitoring cycle if additional analyses have not been undertaken. Such a requirement may also provide an incentive for point and nonpoint pollutant sources to contribute to the monitoring program in order to avoid the consequences of placement on the section 303(d) list.

3. Use the Integrated Water Quality Report Guidance to develop the section 303(d) list and integrate it with the section 305(b) report. In 2003, USEPA issued guidance on the integration of the CWA section 305(b) requirements with the section 303(d) list (USEPA, 2003b). This guidance implemented many of the recommendations of the NAS (2001). Instead of providing a single "preliminary list," USEPA recommended the use of multiple lists depending on the type of water quality problem, availability of data and information, and actions that are being implemented in water bodies. Implementation of the USEPA guidance (2003b) would require the development of five major lists or categories of waters as follows:

   **Category 1: Attaining the water quality standard and no use is threatened.** Water bodies would be listed in this category if there are data and information that meet the requirements of the state's assessment and listing methodology and support a determination that the water quality standard is attained and no use is threatened. RWQCBs would consider scheduling these water bodies for future

monitoring to determine if the water quality standard continues to be attained.

**Category 2: Attaining some of the designated uses; no use is threatened; and insufficient or no data and information is available to determine if the remaining uses are attained or threatened.** Water bodies would be listed in this category if there were data and information which meet the requirements of the state's assessment and listing methodology to support a determination that some, but not all, uses are attained and none are threatened. Attainment status of the remaining uses is unknown because there is insufficient or no data or information. Monitoring would be scheduled for these water bodies to determine if the previously attained uses remain in attainment, and to determine the attainment status of those uses for which data and information was previously insufficient to make a determination.

**Category 3: Insufficient or no data and information to determine if any designated use is attained.** Water bodies would be listed in this category when the data or information to support an attainment determination for any use is not available, consistent with the requirements of the state's assessment and listing methodology. To assess the attainment status of these water bodies, the state should obtain supplementary data and information, or schedule monitoring as needed.

**Category 4: Impaired or threatened for one or more designated uses but does not require the development of a TMDL.**

**Category 4A: TMDL has been completed.** Water bodies would be listed in this subcategory once all TMDL(s) have been developed and approved by USEPA that, when implemented, are expected to result in full attainment of the standard. Where more than one pollutant is associated with the impairment of a water body, the water body will remain in Category 5 until all TMDLs for each pollutant have been completed and approved by USEPA. Monitoring would be scheduled for these water bodies to verify that the water quality standard is met when the water quality management actions needed to achieve all TMDLs are implemented.

**Category 4B: Other pollution control requirements are reasonably expected to result in the attainment of the water quality standard in the near future.** Consistent with 40 CFR 130.7(b)(i), (ii), and (iii), water bodies would be listed in this subcategory when other pollution control requirements required by local, state, or federal authority are stringent enough to implement any water quality standard applicable to such waters. USEPA expects these requirements to be specifically

applicable to the particular water quality problem. Monitoring would be scheduled for these water bodies to verify that the water quality standard is attained as expected.

**Category 4C: Impairment is not caused by a pollutant.** Water bodies would be listed in this subcategory if a pollutant does not cause the impairment. RWQCBs would consider scheduling these water bodies for monitoring to confirm that there continues to be no pollutant-caused impairment and to support water quality management actions necessary to address the cause(s) of the impairment.

**Category 5: The water quality standard is not attained.** The water body is impaired or threatened for one or more designated uses by a pollutant(s), and requires a TMDL. This category constitutes the section 303(d) list of waters impaired or threatened by a pollutant(s) for which one or more TMDL(s) are needed. A water body would be listed in this category if it is determined, in accordance with the state's assessment and listing methodology, that a pollutant has caused, is suspected of causing, or is projected to cause an impairment. When more than one pollutant is associated with the impairment of a single water body, the water body will remain in Category 5 until TMDLs for all pollutants have been completed and approved by USEPA.

For water bodies listed in this category, RWQCBs would provide monitoring schedules that describe when data and information will be collected to support TMDL establishment and determine if the standard is attained. USEPA recommends that while the state is monitoring the water body for a specific pollutant to develop a TMDL, it also monitor the watershed to assess the attainment status of other uses.

4. Integrate section 303(d) and section 305(b) reporting requirements but modify the use of the guidance to clearly state the consequence of listing and the conditions that would trigger listing in each category. Building on the USEPA Integrated Report Guidance (2003b), California's list structure could: (1) describe the purpose of the category or list; (2) organize the lists to distinguish waters that meet standards from those that do not; (3) state the consequence of being placed in a category or list; (4) state the conditions that would trigger listing in a category; and (5) modify the USEPA guidance to integrate with California's TMDL Program. This approach was recommended in the July 2003 version of the proposed Policy that was presented to the AB 982 PAG.

   Under this alternative, the SWRCB, in coordination with the RWQCBs, would develop an integrated water quality report that would present the condition of all the State's waters. The water quality of each water body would be assessed in the integrated report by comparison of measurements

to applicable water quality standards. After the assessment, waters would be placed in the appropriate category. The categories of waters recommended for the California Integrated Water Quality Report correspond to the categories recommended by USEPA in the Integrated Report Guidance (2003b) as follows:

| Categories | |
|---|---|
| **USEPA Guidance** | **California Integrated Report** |
| Category 1 | Standards Fully Attained List |
| Category 2 | Standards Partially Attained List |
| Category 3 | Planning List and Monitoring List |
| Category 4A | TMDLs Completed List |
| Category 4B | Enforceable Program List |
| Category 4C | Pollution List |
| Category 5 | Section 303(d) List of Water Quality Limited Segments |

In order to comply with CWA sections 303(d) and 305(b), the integrated report would be divided into two sections. The first section would assess whether water quality standards are being met. This would be accomplished by determining whether there is sufficient data and information to conclude that water quality standards are being attained. The planning list would contain waters where some data and information are available but the data and information are insufficient to conclude that water quality standards are not attained. Waters not meeting standards would be placed on the section 303(d) list unless: (1) a TMDL has been completed, (2) other pollution control measures are in place, or (3) documented impacts are not caused by a pollutant. Several states have used a planning list or preliminary list as recommended by NAS (2001).

The second section addresses several CWA section 305(b) requirements. This section would contain the standards fully attained list, standards partially attained list, and the monitoring list. Waters on the standards fully attained list attain all standards. The standards partially attained list would include waters for which one or more standards are attained and data and information related to other standards are insufficient to determine attainment. Waters would be placed on a "monitoring list" if data or information were not available to determine if water quality standards are met.

Implementation of this alternative would require the development of eight lists or categories of waters as follows:

**Waters that do not meet or potentially do not meet water quality standards**

**Planning List.** Waters would be placed on this list if some data and information are available but are insufficient to determine whether water

quality standards are attained. Water segments would be listed in this category when the data or information to support an attainment determination for any water quality standard is only partially available, consistent with the requirements of the State assessment and listing methodology.

The planning list would contain only a portion of the waters described in Category 3 of the USEPA guidance (2003b). Waters placed in this category exceed applicable water quality objectives infrequently, have too few samples to confidently assess that standards are exceeded, or lines of evidence contradict one another.

While the planning list would help focus the site-specific monitoring activities of the SWRCB and RWQCBs, it is possible that this list could be used to avoid listing waters on the section 303(d) list. To mitigate this potential problem, the planning list should have specific decision rules that require known but lower confidence for listing and require that monitoring is completed.

Waters on the planning list would be scheduled for monitoring to determine if water quality standards or beneficial uses are not attained. The waters on the planning list would also have high priority for monitoring before the next section 303(d) list is completed. Thus, the planning list would be used as the rationale to obtain the needed monitoring. Because of limited state funds available for ambient monitoring, a commitment from the SWRCB and RWQCBs to seek funding for monitoring from interested parties either on a voluntary basis or through existing regulatory mechanisms would be needed (e.g., using the authorities granted in CWC sections 13267 and 13225). As a last resort, the SWRCB and RWQCBs could use state funds identified for this purpose. State funds that could be used for this purpose include Surface Water Ambient Monitoring Program (SWAMP) funding (e.g., to complete site-specific monitoring to identify water quality problems) and TMDL program funding (e.g., to identify pollutants responsible for observed toxicity).

**Section 303(d) List of Water Quality Limited Segments.** Waters would be placed on this list if a water quality standard is not attained, the nonattainment is due to a pollutant or pollutants, and remediation of the standards attainment problem requires a TMDL.

This category would constitute the section 303(d) list of water quality limited segments for which one or more TMDL(s) are needed. A water segment would be listed in this category if it were determined, in accordance with the State assessment and listing methodology that a

pollutant has caused or is suspected of causing non-attainment of standards.

This definition was used in the development of the 2002 section 303(d) list and narrows the scope of waters that need TMDLs to waters where the water quality problem is due to a pollutant or pollutants. As TMDLs are completed for the identified waters, the water segment-pollutant combination would be removed from this list. However, where more than one pollutant is associated with standards non-attainment for a single water segment, the water segment would remain on the section 303(d) list until TMDLs for all pollutants have been completed, are approved by USEPA, and an implementation plan is adopted.

**Water Quality Standards are not met but the development of a TMDL is not required**

**TMDLs Completed List.** Water segments would be placed in this subcategory once a TMDL has been developed and approved by USEPA and, when implemented, are expected to result in full attainment of the standard. Where more than one pollutant is associated with the listed water body, the water body would remain on the section 303(d) list until all TMDLs for each pollutant have been completed and approved by USEPA. This category or list shows progress in the completion of TMDLs even though standards are not met.

To track implementation of TMDL(s), monitoring would be scheduled for these water segments to verify that the water quality standard is met once the water quality management actions are implemented.

**Enforceable Program List.** Water segments would be placed in this category if pollution control requirements, other than TMDLs, were reasonably expected to result in the attainment of the water quality standard in the near future. Water segments would be listed in this subcategory when other pollution control requirements required by local, state, or federal authority are stringent enough to implement water quality standards applicable to such waters. Criteria would be developed to ensure that there is a high probability the existing program will address the identified water quality problem so that this category could not be used to avoid placement of waters on the section 303(d) list. Waters on this list would be scheduled for monitoring as part of the enforceable program to verify that the water quality standard is attained as expected.

**Pollution List.** This category provides an approach for acknowledging water quality problems that are not due to pollutants. Water segments would be listed in this subcategory if beneficial uses are impacted but a pollutant does not cause the impact. The problems identified on this list would be those described as pollution (i.e., the man-made or man-induced

alteration of the chemical, physical, biological and radiological integrity of water (33 USC section 1362)) and would include invasive species, as well as, habitat, channel, or flow modifications that cause nonattainment of water quality standards.

Habitat, channel, or flow modification may affect water quality standards attainment under two sets of circumstances: (1) situations where these three factors cause direct impairment of beneficial uses; and (2) where they influence one or more water quality parameters (e.g., temperature or sediment) leading to impairment of beneficial uses.

The waters on this list would be scheduled for monitoring to confirm that there continues to be no pollutant-caused impairment and to support water quality management actions.

**Waters that meet water quality standards or no data available**

**Standards Fully Attained List.** Water bodies placed in this category attain all water quality standards. Water segments would be listed in this category if available data and information demonstrate standards are met and support a determination that all water quality standards are attained. Waters on this list may be scheduled for periodic monitoring to confirm that the waters are still clean.

**Standards Partially Attained List.** Waters placed in this category attain some water quality standards. Data and information are insufficient to determine if the remaining water quality standards are attained. Waters would be listed in this category if data and information support a determination that some, but not all, standards are attained. Attainment status of the remaining standards would be unknown because data or information is insufficient. Monitoring would be scheduled for these waters to determine if the previously attained standards remain in attainment, and to determine the attainment status of those water quality standards for which data and information was previously insufficient to make a determination.

**Monitoring List.** Waters would be placed on this list if data and information were not available to determine if water quality standards are attained. This concept is similar to the planning list. This list would be developed in stages because the number of waters with no information could be quite large. To be manageable, the development of this list would be completed on the same schedule as the rotating basin monitoring conducted by SWAMP.

5. Narrow the focus of the Policy to section 303(d) list only. The SWRCB could focus the Policy on the development of a narrowly defined section 303(d) list. The list would include only those waters that do not

meet water quality standards and a TMDL is needed to resolve the pollutant problem and those waters that do not meet standards but (1) other programs address water quality impacts or (2) a TMDL has been completed and an implementation plan has been approved. The section 303(d) list would, therefore, have two distinct categories of water quality limited segments: (1) waters still requiring a TMDL, and (2) waters where the water quality limited segment is being addressed.

General guidelines for the placement of the categories described above could be provided to assure that these categories are used consistently. For example, waters could be placed in the water quality limited segments still needing TMDLs category if the conditions are met for placement in the water quality limited segments category (section 3.1). Conversely, if a TMDL has been completed, the water could be placed in the second category if standards are not met and: (1) a TMDL has been approved by USEPA for the pollutant-water segment combination, and (2) an implementation plan has been approved for the TMDL.

Waters could also be put in the second category if water quality standards are not met and there is an existing program being implemented to address the identified problem. General guidelines for including a water segment could include:

- For point sources, the discharge controls are enforceable. The control mechanism for nonpoint sources should be included in an agency-sponsored watershed plan, inter-agency agreement, or other program that will obviate the need for a TMDL.
- Controls are specific to the water body and pollutant(s) of concern.
- A demonstration that controls are in place or scheduled for implementation. Documentation could include permits, WDRs, contracts, Superfund site remediation planning documents, or enforcement orders. Documentation that Best Management Practices (BMPs) will lead to attainment of water quality standards should be based on the potential for standards attainment if future compliance cannot be demonstrated with high certainty. BMPs effectiveness could be based on site-specific study, case studies from other similar locations, or research results from applicable situations.
- Presentation of the timeframe for implementation.
- The controls are sufficient to assess if water quality standards will be attained within a reasonable time. Documentation could include an estimate of when attainment of water quality standards is expected. RWQCB should be encouraged to consider a variety of timeframes for standards attainment. Some examples are: (1) before next listing cycle, (2) within the life of the permit, (3) prior to renewal of the WDR, (4) within the compliance schedule, or (5) within the schedule presented in a watershed plan.

- Water quality standards attainment can be demonstrated through an existing monitoring program or a future monitoring program with reasonable assurance of implementation.

These factors could be addressed by reference to the certification process in the Water Quality Control Policy for Addressing Impaired Waters (SWRCB, 2004). RWQCBs could certify under the provisions of the Water Quality Control Policy for Addressing Impaired Waters: Regulatory Structure and Options (sections I.D.3 or I.D.4) that pollution control requirements other than TMDLs are reasonably expected to result in the attainment of water quality standards. This would avoid unnecessary duplication of any requirements for certifying programs that are expected to solve the identified standards exceedance. The time for implementation of the program should be limited to a time frame established by SWRCB or RWQCB so it is know when the water quality problem will be addressed.

By using this alternative the scope of the Policy is limited to the section 303(d) list but this does not prevent SWRCB from using USEPA guidance (2003b) in developing the CWA section 305(b) report. For example, the SWRCB could accomplish the integration of these reporting requirements through the CWA section 106 work plan. A disadvantage of not linking the section 303(d) and 305(b) reporting requirements is that any needed monitoring to identify waters not meeting standards would not be mandated in statewide Policy.

This alternative is the preferred alternative because narrowly focusing the listing process on the section 303(d) list complies with the requirements of state law in developing the listing and delisting Policy. Waters that do not meet water quality standards related to pollutants or toxicity would be placed on the section 303(d) list. The additional category identifying water quality limited segments currently being addressed either through other programs or approved TMDLs would help the RWQCBs and SWRCB focus attention on waters where TMDLs are still required.

**Recommendation**: Alternative 5. See Policy section 2.

## *Issue 3: Weight of Evidence for Listing and Delisting*

**Issue:** What factors should comprise California's weight-of-evidence approach? What should the relationship among the various factors be?

**Issue Description:** The 2001 Budget Act Supplemental Report required the use of a "weight of evidence" approach in developing the Policy for listing and delisting waters and to include criteria that ensure the data and information used are accurate and verifiable.

The expression "weight of evidence" describes whether the evidence in favor or against some hypothesis is more or less strong (Good, 1985). In general, components of the weight-of-evidence consist of the strength or persuasiveness of each measurement endpoint and concurrence among various endpoints. Confidence in the measurement endpoints can vary depending on the type or quality of the data and information available or the manner in which the data and information is used to determine impairment.

Scientists have used a variety of definitions for "weight of evidence." A scientific conclusion based on the weight of evidence is often assembled from multiple sets of data and information or lines of evidence. Lines of evidence can be chemical measurements, biological measurements (bioassessment), and concentrations of chemicals in aquatic life tissue.

**Baseline:** In 2002, SWRCB used a weight-of-evidence approach to evaluate RWQCB recommendations. Ten factors were used to assess the quality of the measurement endpoints: (1) extent to which data quality requirements are met; (2) linkage between measurement endpoints and beneficial use or standard; (3) correlation of stressor to response; (4) utility of measurement for judging if standards or uses are not attained; (5) water body specific information; (6) sensitivity of the measurement endpoint for detecting a response; (7) spatial representativeness; (8) temporal representativeness; (9) quantitativeness; and (10) use of standard methods. Each water body-pollutant combination was evaluated case-by-case.

**Alternatives:**

1. <u>Provide general description of the weight-of-evidence approach.</u> The Policy would, under this alternative, require a weight of evidence approach to confirm that the available data and information favors or does not favor placing waters on, or

removing waters from, the section 303(d) list. In applying the weight-of-evidence approach to listing decisions, the Policy would provide guidance on data and information preprocessing, data and information processing; and data assessment (i.e., combining estimates of standards exceedance).

The weight of evidence approach would be a narrative process where individual lines of evidence are evaluated separately and combined using the professional judgement of the RWQCBs and SWRCB. The lines of evidence would be combined to make a stronger inference about water quality standards attainment. Lines of evidence are typically data or information that pertain to an important aspect of a water body. Using this approach the SWRCB and RWQCBs would use their judgement to weigh the lines of evidence to determine the attainment of standards based on the available data. This general approach was used by the SWRCB in developing the 2002 section 303(d) list (SWRCB, 2003a).

Using this approach, a single line of evidence, under certain circumstances, could be *sufficient by itself* to demonstrate water quality standards attainment. In other situations and with many data types, multiple lines of evidence would be needed to determine if standards are attained.

This approach would follow a two-step process to accommodate the variety of data that may be encountered. The first step is screening the available data and information for comparison with numeric water quality objectives that would be *sufficient by themselves* to demonstrate standards attainment. The second step would be to consider the available data and information using a variety of listing factors that require multiple lines of evidence for listing. The listing factors that require multiple lines of evidence include: (1) Human Health, (2) Toxicity, (3) Nuisance Condition, (4) Adverse Biological Response, (5) Degradation of Biological Populations or Communities, and (6) Trends in Water Quality.

It is possible that RWQCBs may have justification for listing or delisting a water body but, under the Policy listing factors, action would not be taken. In some instances, the available lines of evidence may conflict making it difficult or impossible to determine if water quality standards are attained. While most lines of evidence are addressed by the assessment and listing methodology, there may be circumstances when, due to additional or conflicting lines of evidence, RWQCBs may still feel compelled to place water bodies on the section 303(d) list. The Policy could

approach this circumstance by specifying the factors to evaluate data and information, but also allow the use of additional lines of evidence, alternate data analysis procedures, and alternate exceedance frequencies depending on site-specific factors. However, an approach of this sort may exclude some data and information that still could support a listing or delisting decision.

Under these circumstances, RWQCBs should be allowed to recommend a listing or delisting based on a situation-specific weight of evidence (i.e., where there is information showing standards are attained or not attained). If this approach were used, RWQCBs would be afforded significant discretion in determining the basis for listing or delisting. To make sure the decision is transparent RWQCBs should be required to justify its recommendation by:

- Providing any data or information supporting the listing;
- Describing in fact sheets how the data or information affords a substantial basis in fact from which listing can reasonably be inferred;
- Demonstrating that the weight of evidence of the data and information indicate that the water quality standard is not attained; and
- Demonstrating that the approach used is scientifically defensible and reproducible.

SWRCB would consider the basis for the situation-specific analysis in the course of the approval of the section 303(d) list.

The disadvantage of a situation-specific weight of evidence listing and delisting factor is that listings could be decided inconsistently. The advantage is that the decision rules used for these cases would be transparent.

This alternative has been identified as the preferred alternative because the Policy would establish decision rules for assessing compliance with water quality standards and allow flexibility to interpret multiple lines of evidence as dictated by circumstances present in the water body.

2. Provide specific description of the weight of evidence approach. Under this alternative, the weight-of-evidence approach would be a numerical process where individual lines of evidence are evaluated separately and then combined by converting the data to a single format and comparing the line of evidence mathematically. Statistical weight of evidence approaches have been proposed

(e.g., Smith et al., 2002; Bettinger et al., 1995) but have not been widely used for placement of waters on the section 303(d) list.

Smith et al. (2002) presented a quantitative approach that provides a way to combine multiple lines of evidence in a calculation of a weight-of-evidence. A single number can then summarize the weight-of-evidence. In this example, the method uses statistical theory and odds ratios to combine the measures of risk from different lines of evidence. By collapsing many lines of evidence into one metric, this approach has the potential to lose information when the data are summarized. In addition, all types of data and information may not be amenable to such a quantitative approach.

The Massachusetts Weight-of Evidence Workgroup (Bettinger et al., 1995) defined weight-of evidence as the process by which measurement endpoint(s) are related to an assessment endpoint to evaluate if there is a significant risk of harm to the environment. This quantitative approach includes methods for: (1) weighting the individual measurement endpoints by evaluating how well they score against a set of ten attributes; (2) determining whether harm or lack of harm is indicated and the magnitude of response, and; (3) graphically displaying the measurement endpoints in a matrix so the concurrence can be examined. This approach uses quantitative methodology in order to make the assessment process more transparent and objective.

3. Use best professional judgement (BPJ) of each RWQCB to determine weight-of-evidence in all circumstances. Under this alternative, each RWQCB would use its own approach and make its own judgements of the methodology to use. This approach would allow RWQCBs to use a case-by-case assessment of which lines of evidence to use, alternate data analysis procedures, and exceedance frequencies depending on site-specific factors.

   While this approach would provide the maximum amount of flexibility for the RWQCBs, it is possible that the lists generated would be very inconsistent from region to region.

**Recommendation:** Alternative 1. See Policy sections 1, 3, 3.1.11, 4, and 4.11.

## *Issue 4:* *Listing or Delisting with Single Line of Evidence*

A variety of numeric or narrative water quality objectives and beneficial uses can be used by themselves to assess whether water quality standards are attained. Using this approach, a single line of evidence, under certain circumstances, is strong enough to make a conclusion about water quality standards attainment. Approaches for assessing these lines of evidence that could be used by themselves include:

A. Numeric water quality objectives, criteria, or other applicable standards;

B. Marine bacterial standards;

C. Freshwater bacterial standards;

D. Narrative water quality objectives;

E. Tissue data;

F. Trash;

G. Nutrients; and

H. Invasive species.

These categories are discussed separately in Issues 4A through 4H.

*Issue 4A:* ***Interpreting Numeric Water Quality Objectives and Criteria***

**Issue:** How are exceedances of a water quality objective or criterion evaluated?

**Issue Description:** Water quality objectives or federally promulgated water quality criteria represent water quality levels that are not to be exceeded, or exceeded only infrequently, in order to protect the designated beneficial uses of state waters. Water quality objectives and the beneficial uses form two components of water quality standards; the third component is implementation of an antidegradation policy.

Water quality objectives or criteria can be either numeric or narrative. In general, numeric water quality objectives and criteria may quantitatively address magnitude, frequency and/or duration of exposure to toxic chemicals or conditions. The chemical concentration addresses the magnitude component of the objective (i.e., how much of a pollutant is allowable). Water quality objectives are the limit or level of a constituent or characteristic that is established for the reasonable protection of a beneficial use of the water or the prevention of a nuisance in a specific area [CWC section 13050(h)]. Water quality objectives are generally established as maximum levels or concentrations of a pollutant, but may be set as a minimum level for certain water quality parameters such as dissolved oxygen, or as a range for other parameters, such as pH. However, many water quality objectives are expressed as averages, medians, or as a percentage of samples that exceed a numeric value.

USEPA has promulgated numeric criteria for toxic pollutants that supplement existing state water quality standards. Regional water quality control plans (Basin Plans) contain designated beneficial uses, water quality objectives, and an implementation program to achieve these objectives. Applicable statewide plans and policies include, but are not limited to, the State Policy for Implementation of Toxics Standards in Inland Surface Waters, Enclosed Bays, and Estuaries; California Ocean Plan, the Thermal Plan, and State Water Resources Control Board Resolution 68-16. USEPA's criteria for toxic pollutants are found in the California Toxics Rule (CTR). Applicable standards are also promulgated by the California Department of Health Services (DHS).

Prior to conducting list assessments, RWQCBs should consider a number of factors. It should be determined if there is a sufficient number of samples and whether those samples are spatially and temporally representative of the water quality in the water segment. Additionally, the duration (i.e., averaging period) of concentrations expressed in the water quality objective or criterion should be addressed. Samples should, then be

compared to the water quality objective to determine if an exceedance has occurred.

**Baseline:** During the 2002 section 303(d) listing process, data were evaluated on a case-by-case basis. RWQCB staff used the magnitude and duration expressed in the water quality objectives to assess the State's waters in the Basin Plans. Data evaluation was usually expressed as the number of samples exceeding the standard or guideline out of a total number of samples. When appropriate, the magnitude of the measurements was also considered.

**Alternatives:**

1. Evaluate numeric data using only the magnitude portion of numeric water quality objectives or criteria. Under this alternative, data would be compared to the magnitude component of water quality objectives only. Duration and frequency stated in the water quality objective would not be considered. This alternative would treat all water quality objectives as if the duration was expressed as an instantaneous maximum. The advantage of this approach is that the analysis is simple and data do not need to be assessed before statistical analysis. The major disadvantage is that the duration and frequency components of the water quality objectives are ignored and the water quality objectives are not interpreted as presented in the Basin Plans, statewide plans, or federal regulation.

2. Evaluate numeric data in terms expressed in the numeric water quality objective or criterion. The evaluation of numeric data should be consistent with the expression of the numeric water quality objectives or water quality criteria. If the water quality objectives or criteria state a specific averaging period and/or mathematical conversion, the data should be converted in a consistent manner prior to conducting list assessments. Sufficient data are frequently not available to assess compliance during the stated averaging period. In these cases, the available data should be used to represent the averaging period. For example, if the water quality standard is based on a four-day average and the RWQCB has only one sample for the four consecutive day period, that data should be used to represent the four-day average.

   Under this alternative, to the extent possible, RWQCBs would use the measure that corresponds directly with the duration, magnitude, and frequency portions of the water quality objective or criterion to represent the data set. Some examples follow:

   A. Several measures of central tendency are associated with a number of water quality standards, objectives, or criteria. Basin plans, statewide plans, and federal regulation contain standards with a variety of averaging periods, such as:

- Annual average
- Four-day average
- 24-hour average
- One-hour average
- Median
- Geometric mean

B. Several water quality objectives are based on the maximum value, minimum value, or worst case value of the data set. Basin Plans, statewide plans, and federal regulation contain water quality standards, objectives, or criteria focused on maximum values such as:

   - Acute water quality criteria
   - "Not to be exceeded" maximum or minimum water quality objectives

C. Some water quality objectives have built in exceedance frequencies. These types of water quality objectives include standards based on percentile of samples exceeded as stated in the water quality objective or criterion.

D. Many standards or objectives do not have stated averaging periods. For data that are not temporally independent (e.g., when multiple samples are collected at a single location on the same day), the measurements should be combined and represented by a single resultant value before the determination is made whether the standard is met. For these values, it is necessary to consider averaging the data, if it is likely that samples are not temporally independent. For example, samples collected at the same location less than seven days apart should be considered as one sample, with the median value used to represent the sampling period. A 7-day averaging period has been used by many states to avoid problems with temporal independence of samples (Arizona Department of Environmental Quality (DEQ), 2000. Florida Department of Environmental Protection (DEP), 2002).

Once raw data have undergone the necessary mathematical conversions to represent magnitude, frequency, and duration it is ready to be compared against water quality objectives or criteria to determine whether water quality standards are attained.

The disadvantage of this alternative is that when data are limited, assumptions about the duration and frequency portions of the water quality objective will have to be made unless it is determined that only large extensive data sets will be used to assess standards attainment. The advantage of this alternative is that the form and expression of the water quality objective is used in section 303(d) list assessments; therefore, staff has identified this alternative as the preferred alternative.

**Recommendation:** Alternative 2. See Policy sections 6.1.5.6 and 6.1.5.7.

*Issue 4B:* ***Interpreting Numeric Marine Bacterial Water Quality Standards***

**Issue:** How should numeric marine bacterial water quality standards be interpreted?

**Issue Description:** Water quality standards for beaches are contained in the California Ocean Plan and have been promulgated by DHS (pursuant to AB 411 [Title 17, CCR]). The Ocean Plan standards are implemented through NPDES permits. Local public health agencies implement the AB 411 standards and, if exceeded, beaches are posted. Postings indicate impaired water quality and the loss of a beneficial use.

Environmental health agencies may also permanently post a beach at storm drain outlets because the ocean water at the discharge (based on water quality monitoring) exceed bacterial standards or as a precautionary measure. The latter action may not be based on water quality monitoring data.

**Baseline:** Before 2002, RWQCBs used a variety of approaches for evaluating marine beach water quality data, postings, and closure information. The general approach for developing recommendations for the 2002 section 303(d) list related to bacterial standards exceedances, beach postings, and beach closures included:

- recommendations based on the frequency of water quality standards exceedances;
- the consideration of frequency of water quality standard exceedances and additional, site-specific information, when appropriate; and
- placement of a beach on the section 303(d) list when there was no other means to address the problem.

Ideally, the frequency threshold for listing was the number of water quality standard exceedances in a relatively unimpaired watershed. Since site-specific background data were not available, 10 percent of the total days exceeding standards per year was used as the threshold for listing. This value is based on studies of natural background conditions observed on some southern California beaches. If sample collection was consistent over the sampling period, the number of samples exceeding standards was equivalent to the number of days exceeding the standard per year.

Permanent postings were counted as exceedances when they were based on site-specific water quality data. "Precautionary" postings were not counted as exceeding water quality standards.

The number of postings (the posting of warning signs on the beach by the local environmental health agency) or the total number of days posted was not used in the assessment. "Rain Advisories" were considered in the same manner as precautionary postings. Site-specific data collected during storm events was used for listing determinations.

**Alternatives:**

1. Interpret water quality standards case-by-case. Under this alternative, RWQCBs would be given significant latitude in deciding what constituted a standards exceedance. For each circumstance, RWQCBs would decide which waters to list, after considering the available data and information for the site. The Policy would not provide guidance on data and information to use, standards exceedance frequency, estimated area affected, number of postings or closures that would trigger a listing, which standards to apply, or other factors. This alternative was used for section 303(d) listing decisions before 2002.

   This alternative would foster inconsistent interpretation of standards, posting, and closure data and information because each RWQCB would develop its own set of decision rules. Conceivably, this alternative would allow listing of beaches with little information available as well as listing of sites that are well studied. Broad interpretation of standards could lead to large portions of California's coastline, including enclosed bays and estuaries, to be placed on the section 303(d) list. A very broad interpretation would make it difficult for the SWRCB and RWQCBs in planning for the development of TMDLs and focus efforts where regulatory response is needed most.

2. Establish consistent process and decision rules to trigger listing. Under this alternative, the SWRCB and RWQCBs would assess compliance with each water quality standard using data and information generated by RWQCB regulatory activities and various local agencies. The data and information would come from the monitoring and regulatory activities of the local environmental health agencies, monitoring activities demonstrating compliance with NPDES permits, and special studies conducted by RWQCBs and recognized private and public institutions.

   During 2002, the Beach Water Quality Workgroup (BWQW) endorsed recommendations of their Monitoring and Reporting Subcommittee regarding criteria to support listing sites on the section 303(d) list (BWQW, 2003). The BWQW is a group of state agencies, environmental health agencies, environmental organizations, the regulated community, and other institutions focused on the improvement of water quality at beaches throughout California. The Monitoring and Reporting Subcommittee consists of representatives from the SWRCB, RWQCBs, local environmental health agencies, regulated dischargers and Heal the Bay.

**Recommendations of the Monitoring and Reporting Subcommittee of the BWQW**

**A. Listing should be based on the frequency of water quality standards exceedances.** The frequency of exceedances of water quality objectives established by the SWRCB in the Ocean Plan, and the exceedances of standards established by DHS (Title 17 CCR) should determine when an ocean water body/beach segment is listed. This represents the most appropriate means of measuring the failure to meet water quality objectives and the loss of a recreational (REC-1) designated beneficial use.

Numerous studies indicate that bacterial levels vary considerably over short periods of time and distances. The magnitude of bacterial levels usually vary by source, the concentration of the source contaminate, and the volume of discharge. The magnitude of bacteria does not justify the use of bacterial levels for section 303(d) listing since they measure neither loss of beneficial use nor a failure to attain water quality objectives. Monitoring frequencies, with the exception of daily monitoring, employed by environmental health agencies and many dischargers do not accurately reflect the duration of the failure to meet the established standards. Consequently, only the frequency of exceedances should be used.

SWRCB and DHS (AB 411, Statutes of 1997) have respectively established water quality objectives and bacterial standards for marine beaches. When these bacterial standards are exceeded, the local health officer/environmental health agency must warn the public that standards have been exceeded by posting warning signs on the beach where the standard exceedances have occurred. The posting of warning signs on the beach constitutes a failure to meet water quality objectives/standards and the loss of REC-1 beneficial use for that water body.

Routine bacteriological monitoring of ocean water is conducted in accordance with the requirements of AB 411 and various NPDES permits issued by RWQCB. AB 411 monitoring is conducted by local environmental health agencies. The latter monitoring is conducted by agencies discharging sewage effluent into the ocean waters. The data collected in these monitoring programs should be used to identify beaches where water quality does not meet state bacteriological standards for marine beaches.

**Implementation:** RWQCB staff may use the frequency of "postings" by the local environmental health agency as the "first screen" to determine if a water body should be listed. When beaches are rarely or never posted and when they are frequently posted, the RWQCB may be able to make the appropriate determination without reviewing the bacteriological data. This data must clearly be indicative of the water quality at the monitoring

station in question. The number of postings and the total number of days a beach is posted should not be considered alone since postings may not accurately reflect the frequency that the water body does not meet the health standards or water quality objectives. An analysis of the bacteriological data should be conducted when posting data reported to the SWRCB by local agencies does not provide a clear method for making a listing decision.

A beach should be listed when there is no enforcement action available to address the water quality impairment, and the most appropriate means to address the water quality impairment is a TMDL. Generally, the number of beach closures should not be considered in the listing criteria since the causes of beach closures can usually be addressed by RWQCB enforcement actions. If site-specific conditions warrant their use, e.g., beach closures caused by high indicator bacterial densities with an unknown source, RWQCB staff may use this data. Other site-specific information should be considered when appropriate. For example, BMPs may have been instituted to address impairment and a TMDL may no longer be required to address the problem.

B. **The threshold frequency for listing should be the number of water quality standard exceedances in a watershed that is minimally impacted by human activities.** At least portions of total and fecal coliform and enterococcus bacteria are naturally occurring in the environment, and their presence does not necessarily indicate fecal pollution from human and domestic animals. As a result, the receiving water from natural runoff in creeks and streams may contain significant levels of coliform and enterococcus bacteria causing the water body to exceed the bacterial standards.

To adequately compensate for natural occurring indicator bacteria, each RWQCB should establish a "reference" beach in their region where possible. The reference beach is one where adequate bacteriological data has been collected and is available from a minimally impacted water body, i.e., one that is not impacted or only minimally altered by human activity. The frequency of exceedances at this site becomes the threshold for determining a bacteriological impaired water body. This requires the identification of watersheds within defined regions that have not been environmentally altered by human activity where possible.

If data is not available from a minimally impacted water body, USEPA recommends that the threshold for exceedances should be 10 percent of the total samples collected. If water quality monitoring at any given site is only conducted during the AB 411 period (April 1 through October 31), the threshold frequency for exceedances at that site should be set at 4 percent of the total samples (Noble et al., 1999).

**Implementation:** RWQCBs should identify, where possible, a minimally impacted water body within that region and collect bacteriological data to determine what is the appropriate threshold to use for the frequency criteria. Lacking a reference beach, the RWQCB must select and use the most appropriate threshold frequency. This will generally be either 10 percent or 4 percent of the samples as the exceedance threshold. Significant rainfall may occur during the AB 411 period, however. When this occurs, RWQCBs should consider excluding the wet-weather data from the data set if the 4 percent threshold is used since the use of 4 percent is based on dry-weather monitoring.

C. **Listing should be based on a valid data set. RWQCBs should have confidence that the bacteriological data set is adequate and unbiased for listing purposes.** In most instances, the data set for a given location should be derived from routine monitoring by either a discharger or the local environmental health agency.

**Implementation:** RWQCB staff must ascertain the validity of their data set. There may be instances where the number of samples collected may be inadequate for determining the impairment of a water body or, when doubts exist, determining that it is unimpaired. Every effort should be made to collect a sufficient amount of data before this determination is made. This may involve special studies or increased monitoring.

D. **Listing should be based on the frequency of water quality standards exceeding the threshold number in multiple years**. The entire bacteriological data set for the time period between listings for any given site should be used to determine impairment and the need to implement a TMDL. The CWA calls for listings to be conducted every two years, but the period has been lengthened to three-year intervals.[1] Using multiple years of data is more likely to ensure the listing is representative of the actual water quality at the beach since an unusually wet or dry year should not unduly affect the data set.

**Implementation:** The entire data set between listing periods should be used to determine if the frequency threshold has been exceeded, unless there is a reason to consider the data on a yearly basis. A suitable reason for considering less than the entire data set may be the implementation of a BMP. If only one year in the period exceeds the threshold, professional judgment should be exercised in determining if the water body in question should be listed.

[1] Some members of the Monitoring and Reporting Subcommittee believe that the minimum amount of data used for listing purposes should encompass a minimum of three years.

**E. Permanent postings should be counted as exceedances when they are based on site-specific water quality data.** "Precautionary" postings should not count as water quality exceedances. Local environmental health agencies may permanently "post" beach areas adjacent to storm drains and creek discharges with warning signs. These postings are long term and are based on the experience of the local agency and the accumulation of sufficient data to show that the ocean water in the area is often impaired when there is a discharge. This type of posting is a "permanent posting". There are other instances when warning signs are posted because the local health agency believes that the receiving water will be impaired by the discharge even though there is little or no confirmation monitoring to validate this belief. These are referred to as "precautionary postings".

As discussed under Recommendation A, beach listings for impairment due to elevated levels of bacteria should be based on water quality data. Since permanent postings are typically based on monitoring results, these postings should be counted as exceedances of water quality parameters and used in the listing process.

A permanent posting therefore constitutes water quality impairment and must be listed. Precautionary postings not supported by water quality data should not be considered in the listing process even though both types of postings result in a loss of beneficial use in the area of the posting.

**Implementation:** RWQCB staff must obtain posting information from each local environmental health jurisdiction to differentiate permanent postings from precautionary postings. A revised data collection and processing system to be employed by the SWRCB may allow this information to be posted on their web site.

**F. "Rain Advisories" should be considered in the same manner as precautionary postings.** "Rain advisories" are issued by local health jurisdictions when rainfall is imminent or after rainfall has begun. These advisories are precautionary in nature and are not issued on the basis of monitoring data. These advisories are usually issued in lieu of posting the beach during the non-AB 411 periods. During the AB 411 period, routine monitoring is required, and if the AB 411 standards are exceeded the beach must be posted. Consequently, monitoring data is usable to the degree that it is appropriate during rainfall.

AB 411 and its regulations do not authorize the use of "rain advisories". They are an activity that local health jurisdictions generally conducted before the passage of AB 411 and the practice has been continued. No protocols have been established for the issuance of these advisories.

Most routine bacteriological monitoring by both dischargers and environmental health agencies continues as scheduled during wet-weather periods. If an agency suspends monitoring during rainfall or within 72 hours of rainfall, the involved monitoring stations are, in effect, monitored only during dry-weather since bacterial levels usually revert to background levels 72 hours following rainfall. Consequently, the frequency threshold for listing should be reduced to 4 percent of the samples collected.

**Implementation:** No implementation issues exist since the recommendation essentially says to ignore these advisories.

G. **Establish monitoring stations at defined distances from storm drain discharges in order to enhance data consistency.** Monitoring locations have been established in NPDES permits by RWQCBs and the local health agency establishes monitoring locations for its AB 411 regulatory activities. AB 411 and its regulations do not prescribe the location of monitoring stations in relation to storm drain discharges. As a result, no consistency exists between the agencies conducting monitoring activities relative to the distances samples are collected from storm drain discharges.

The BWQW has recommended that the distance of a monitoring station from a storm drain discharge be set at 25 yards, but it is unknown how many health agencies or RWQCBs are following this recommendation.

**Implementation:** Neither RWQCBs nor DHS have the authority to establish a consistent location for monitoring stations from storm drain discharges. RWQCBs set the monitoring locations for NPDES compliance but they have no authority over health jurisdictions' monitoring locations. DHS may have the statutory authority to determine monitoring locations, but, if so, it did not exercise this authority in the regulations. TMDL compliance monitoring may further complicate any action regarding this recommendation.

H. **Differences in the results of laboratory analyses utilizing different laboratory methods are insignificant.** Currently, most health agencies use a defined substrate methodology for the laboratory analyses of their collected samples. Because USEPA has not approved this method, dischargers are either using membrane filter or multiple tube fermentation methodologies for sample analysis. Bight '98 studies (Noble et al., 1999) and correlation studies conducted by local public health laboratories and approved by DHS demonstrated that there was no significant difference in the results each method produced.

**Implementation:** No implementation issues exist.

I. **In the absence of site-specific data, the length of beach to be listed should be 50 yards on each side of the storm drain discharge.** The Monitoring and Reporting Subcommittee has recommended that monitoring stations be located 25 yards from the source of the impairment, e.g., storm drain discharge. When the bacterial standard(s) are exceeded, signs are routinely posted at 25 yards on each side of the source of the impairment. They can be seen for a distance of approximately 25 yards. Consequently, the loss of beneficial use is approximately 50 yards on each side of the source of impairment.

In order to assess the area of beach impacted by the storm drain discharge, "adaptive" sampling may be employed by some agencies when a monitoring station frequently exceeds bacterial standards. In these cases, signs are posted at a greater distance from the source discharge point. These distances are reported to SWRCB and are in the database.

In some cases, two monitoring stations may be linked by hydrological conditions. It may also be demonstrated, in the future, that the amount of flow and its pattern from the discharge point can significantly increase the amount of beach affected by the discharge. In both cases, the entire area affected should be listed.

**Implementation:** The distance recommended is for guidance purposes only. The establishment of a TMDL, when appropriate, should address the problem regardless of the distance cited in the listing.

**SWRCB Staff Response to the BWQW Recommendations**

A. **Listing should be based on the frequency of water quality standards exceedances.** Frequency of water quality standard exceedances should be used to determine compliance with California Ocean Plan and AB 411 standards. It is recommended that a beach be placed on the section 303(d) list when there is no other way to address the problem. For example, beach closures will not be listed if the closure is due solely to a pipe breakage because the most efficient way to address this problem would be through some form of enforcement action. Site-specific data and information shall be used to determine if a TMDL is the most appropriate approach to address the problem. RWQCBs shall be asked to assemble information regarding the implementation of other enforceable efforts to address the identified problem.

B. **The threshold frequency for listing should be the number of water quality standard exceedances in a watershed that is minimally impacted by human activities.** The threshold frequency for listing should be the number of water quality standard exceedances in a watershed that is minimally impacted by human activities. RWQCBs shall be asked to

identify one or more reference beaches in a relatively unimpaired watershed to account for any naturally occurring indicator bacteria.

In the absence of site-specific background data or other site-specific study, 10 percent of the total samples collected will be used as the threshold for listing. If water quality monitoring is conducted only during April 1 through October 31, four percent of the total samples shall be used as the threshold for listing.

C. **Listing should be based on a valid data set.** The confidence in the data set used to make listing decisions shall be temporally and spatially representative of the conditions at the beaches.

D. **Listing should be based on the frequency of water quality standards exceeding the threshold number in multiple years.** The entire data set between listing periods (i.e., multiple years) shall be used to assess standards exceedance. Shorter time frames are allowable if management actions have been implemented that improve water quality. In these cases, only data and information collected after the management action implementation shall be used in the assessment.

E. **Permanent postings should be counted as exceedances when they are based on site-specific water quality data.** Permanent postings based on site-specific water quality data shall be counted as exceedances and placed on the section 303(d) list. Precautionary postings shall not be counted as water quality standards exceedances.

F. **"Rain Advisories" should be considered in the same manner as precautionary postings.** Site-specific data collected during storm events shall be used for listing determinations. If data collection by local agencies is halted during rainfall or within 72 hours of rainfall, the monitoring shall be considered dry weather monitoring and the four-percent exceedance frequency shall be used.

G. **Establish monitoring stations at defined distances from storm drain discharges in order to enhance data consistency.** Data from all monitoring stations shall be used in the assessments supporting the section 303(d) list. In reporting the spatial characteristics of the sample location, RWQCBs report the sample location distance from storm drains or other discharge points.

H. **Differences in the results of laboratory analyses utilizing different laboratory methods are insignificant.** The RWQCBs shall aggregate data from all methods and analyze as one data set.

I. **The length of beach to be listed shall be 50 yards on each side of the storm drain discharge.** The distance recommended is for guidance purposes only. The establishment of a TMDL, when appropriate, should address the problem regardless of the distance cited in the listing. If site specific data are available, RWQCBs should be allowed to determine the length of beach to list on a case-by-case basis, the length of beach to be listed on each side of the discharge point, or the sampling location. No specific guidance should be provided that limits the RWQCBs discretion to establish the area affected.

This alternative has been identified as the preferred alternative because it provides for consistent interpretation of the applicable standards, by standardizing, to the extent possible, the approach for interpreting marine beach water quality data and information.

**Recommendation:** Alternative 2. See Policy sections 3.1, 3.1.3, and 4.3.

*Issue 4C:* ***Interpreting Numeric Freshwater Bacterial Water Quality Standards***

**Issue:** How should numeric freshwater bacterial water quality standards be interpreted?

**Issue Description:** Several counties have ordinances containing bacterial standards that can trigger freshwater beach swimming warnings, postings, or closures (DHS, 2001). As with marine waters, postings are indicative of impaired water quality and the number of postings measure loss of a beneficial use.

The RWQCBs have not previously implemented a consistent approach for evaluating freshwater beach water quality data, postings, and closure information.

**Baseline:** During the 2002 listing process, RWQCBs developed recommendations for freshwater bacterial water quality objectives on a case-by-case basis. For freshwater bodies, each RWQCB compared monitoring data to Basin Plan water quality objectives. No specific approach or guidelines were mandated. Frequency of standards exceedance was used to assess nonattainment. Typically, RWQCBs used an exceedance frequency of 10 percent.

**Alternatives:**

1. Interpret freshwater bacterial standards on a case-by-case basis.
Under this alternative, RWQCBs would be given significant latitude in deciding what constitutes a standards exceedance. For each situation, RWQCBs would decide which waters to list after considering the available data and information for the site. The Policy would not provide guidance on what data and information to use, standards exceedance frequency, estimated area affected, number of postings or closures that would trigger a listing, which standards to apply, or other factors. This alternative has been used for all freshwater bacterial standards section 303(d) listing decisions.

   This alternative would allow a region-specific interpretation of standards, posting, and closure data and information because each RWQCB would continue to develop its own set of decision rules. Conceivably, this alternative would allow listing of freshwater bodies with little information available as well as sites that are well studied. This alternative would allow for a broad interpretation of standards and place of large portions of California's lakes, rivers, streams, and canals on the section 303(d) list. A broad interpretation would not help the SWRCB and RWQCBs in correcting problems through the development of TMDLs. Additionally, it would be difficult to focus efforts where regulatory response is needed most.

2. Establish consistent process and decision rules to trigger listing based on the BWQW recommendations. Under this alternative, SWRCB and RWQCBs would assess compliance with each water quality standard using the data and information generated by the regulatory activities of the RWQCBs and various local agencies. Data and information would come from the monitoring and regulatory activities of the local environmental health agencies, monitoring activities conducted to demonstrate compliance with NPDES permits, and special studies that may be conducted by RWQCBs or recognized private and public institutions. These changes would be compared to applicable water quality standards in regional water quality control plans (basin plans) or bacterial standards contained in CCR.

   Although specifically focused on marine water quality, the BWQW recommendations could be used as the foundation for developing listing recommendations for freshwaters. The advantage of using these recommendations is that the State would use a consistent approach for addressing bacterial standards in fresh and saltwater. The disadvantage is that some of the BWQW recommendations are focused only on marine waters (e.g., the use of the 4 percent exceedance frequency).

   Another disadvantage is that the monitoring of freshwater lakes, rivers, streams and canals may not occur as frequently as monitoring on marine beaches. This problem could be addressed by providing limited guidance on the characteristics of an acceptable data set. For freshwaters, the data should be sufficient to assess compliance with applicable water quality standards. Data collected less frequently than weekly should be used with caution and monitoring collected during wet and dry conditions should be identified.

   Monthly data or a limited, non-routine data set (e.g., sampling frequency is less than once per month) can be used when coupled with an understanding of the watershed, including potential sources of the bacteria, and bacterial fate and transport processes.

   This alternative is the preferred alternative because it provides for the consistent interpretation of the applicable standard and standardizes, to the extent possible, the interpretation of freshwater bacterial water quality data and information.

**Recommendation:** Alternative 2. See Policy sections 3.1, 3.1.3, and 4.3.

*Issue 4D:* ***Interpreting Narrative Water Quality Objectives***

**Issue:** How should SWRCB and RWQCBs interpret narrative water quality standards?

**Issue Description:** Water quality standards often contain narrative water quality objectives to describe a requirement or a prohibition for a constituent or parameter that, if not exceeded, will provide reasonable protection for beneficial uses of the specified water body. The SWRCB and RWQCBs have used a variety of guidelines or scientifically derived values to interpret narrative water quality objectives.

Federal regulation explicitly states that narrative water quality standards should be assessed in developing the section 303(d) list. Narrative water quality standards are subject to substantial subjectivity in interpretation and typically take the form: *No toxics shall be discharged in toxic amounts*. For example, the San Diego RWQCBs Basin Plan toxicity objective states that "all waters shall be maintained free of toxic substances in concentrations that are toxic to, or that produce detrimental physiological responses in human, plant, animal or aquatic life." To ensure that the designated beneficial uses have been protected the toxicity objective further states, "compliance with this objective will be determined by use of indicator organisms, analyses of species diversity, population density, growth anomalies, bioassays of appropriate duration, or other appropriate methods as specified by the Regional Board" (San Diego RWQCB, 1994).

**Baseline:** In developing the 2002 section 303(d) list, the determination of standard or use attainment were based on the RWQCB and SWRCB interpretation of narrative water quality objectives. Compliance with narrative water quality objectives was considered on a case-by-case basis using all relevant data submitted to the RWQCBs. Data were evaluated using relevant and well-accepted standards, criteria, guidelines, or other objective measures that interpret the sensitivity of a benchmark in determining standards or beneficial use attainment. Guidelines that were well accepted and had high levels of certainty and applicability were used. Each of these evaluation guidelines had a strong scientific basis. Examples included: NAS tissue guidelines, U.S. Food and Drug Administration (USFDA) action levels, USEPA screening values, Maximum Contaminant Levels (MCLs); fish advisories; approaches used in the Bay Protection and Toxic Cleanup Program (BPTCP); published temperature thresholds; published sedimentation thresholds; Federal agency and other state sediment quality guidelines (SQGs); DHS bacterial standards; California Department of Fish and Game (DFG) guidelines, Maximum Tissue Residue Levels (MTRLs), etc.

Evaluation guidelines with no scientific basis for judging standards or beneficial use attainment were not used. Overall, in the 2002 section 303(d) list, constituents that violated the narrative water quality objective and were not supported with acceptable evaluation guidelines were not listed or were recommended for placement on the monitoring list. The exceptions were two listings that exceeded the water quality standard for aquatic life. One was for sedimentation that was based on a 1998 DFG bioassessment report; and the second was a listing for nutrients, continued from the 1998 list that was a part of the Salton Sea TMDL.

**Alternatives:**

1. Do not allow the use of any guidelines for interpreting narrative water quality standards. This alternative would provide the RWQCBs with the greatest flexibility for interpreting narrative water quality standards and can be advantageous when applied to regional and site-specific water body conditions. However, with nine RWQCBs, multiple interpretations of narrative water quality standards could result and listing or delisting decisions could be inconsistent.

   When the interpretation of a narrative water quality standard has pointed to a listing decision, the SWRCB and RWQCBs have used available defensible guidelines to assess quantitatively the potential for standards to be exceeded. This includes guidelines used as translators and draft guidelines that have a strong scientific basis. Specific evaluation values should address the beneficial use, applicability of the evaluation value, previous use of the criteria, as well as other factors. Draft guidance could be used when no other criteria are available and the scientific foundation and application of the criteria are not in question.

   Narrative objectives have been interpreted in two ways–comparison to the strictly narrative objective or interpretation using local, state, or federal criteria or guidelines. An example of evaluation criteria based on State guidelines to protect a beneficial use is the Los Angeles RWQCBs use of DFG guidelines for macroinvertebrate and bioassessment, supporting the conclusion that sedimentation impacts were detrimental to aquatic life in the Calleguas Creek Watershed (Anderson et al., 1998). A determination of exceedance of the narrative water quality objective was based on the use of standard bioassessment methods and a 1998 bioassessment report. The DFG guideline further provides guidance in sampling and defines water quality objectives by statistical distribution when appropriate.

   The Central Valley RWQCB's water quality objective for color–"Water shall be free of discoloration that causes nuisance or adversely affects beneficial uses"–is an example of a narrative water quality objective, common in many Basin Plans, that does not have a quantitative translator. Narrative water quality objectives devoid of a translator are subjective; some rely primarily on BPJ. BPJ can be defined as the ability to draw

conclusions and make interpretations based on experiments, measurements, literature, or other forms of information. BPJ is subjective and open to a variety of interpretations based on individual observations, knowledge, and experience. While BPJ differs among various personnel–the applicable knowledge and experience of each individual will vary–conclusions using BPJ must be based on scientifically defensible data.

Narrative water quality objectives do not quantify the water quality parameters necessary to clearly determine if beneficial uses are being protected. Presence of a pollutant does not automatically translate into impairment of a beneficial use. To be most useful, a narrative water quality objective should include a description of the process used to derive a quantitative evaluation value to help interpret the narrative water quality objective. Interpretive evaluation guidelines can identify the difference between the impaired and unimpaired state of the water body by using indicators as a quantitative measure of water quality and can be used to establish relationships between pollutants and their impact on water quality. Examples of indicators are suspended sediment concentrations, numbers of spawning fish, algal biomass, or total phosphorus concentration. The selected target value must lead to achievement of water quality standards.

The use of a narrative water quality objective without a translator is often not scientifically defensible because the interpretation of impairment becomes subjective. The water quality objective is presumed to be protective of beneficial uses. Without a quantifiable evaluation guideline, the water quality standard is only a description of the desired level of water quality; sufficient data to show cause for a listing is not provided.

2. On a case-by-case basis, allow RWQCBs to establish the method and approach for interpreting narrative water quality standards. This alternative would provide flexibility for the RWQCBs and would address site-specific concerns. Various guidelines and criteria are available from state and federal agencies, as well as other countries that the RWQCBs could use to ensure attainment of water quality objectives. However, guideline selection on a case-by-case basis would lack statewide consistency. USEPA (2002a) provides guidance on the organizational structure for documenting assessment and listing methodology and also provides information on the content of these methodologies.

   For narrative water quality objectives, USEPA (2002a) states –

   > "Narrative criteria are adopted to supplement numeric criteria or if numerical criteria cannot be determined. Narrative criteria are descriptions of the conditions necessary for a water body to attain its designated use, whereas numeric criteria are values expressed as

chemical concentrations, toxicity units, aquatic community index levels, or other numbers deemed necessary to protect designated uses. A "translator" identifies a process, methodology, or guidance to quantitatively interpret narrative criteria statements. Translators may consist of biological assessment methods (e.g., field measures of the biological community), biological monitoring methods (e.g., laboratory toxicity tests), models or formulae that use input of site-specific information/data, or other scientifically defensible methods. Translators are particularly useful for addressing water quality conditions that require a greater degree of sophistication to assess than can be typically expressed by numerical criteria that apply broadly to all waters with a given use designation. Criteria must be based on sound scientific rationale and should contain sufficient parameters or constituents to protect the designated use."

From the above guidance, interpretation of narrative water quality objectives without a translator would not be transparent or consistent and very difficult to defend if the scientific rationale for the listing is not presented. A number of guidelines and criteria exist that can be used to help interpret narrative water quality objectives. For example, translators of narrative water quality objectives can be pulled from numerous sources. Table 2 lists some beneficial uses and the guidelines that have been used by the various RWQCBs to interpret narrative water quality objectives. Under this alternative, the RWQCBs would be able to use any guidelines for interpreting narrative water quality objectives. However, without specific guidance to the RWQCBs in the interpretation of narrative water quality objectives, different endpoints could result leading to inconsistencies in interpretation of water quality standards.

TABLE 2: AVAILABLE GUIDELINES FOR THE INTERPRETATION OF NARRATIVE WATER QUALITY OBJECTIVES

| Beneficial Use | Evaluation Guidelines |
|---|---|
| Aquatic Life | NAS tissue guidelines, BPTCP approaches to identify toxic hot spots, published temperature thresholds; published sedimentation thresholds; Federal agency and other state SQGs, DFG guidelines, Sediment Apparent Effects Thresholds from California and other states toxicity guidelines |
| Fish Consumption | NAS tissue guidelines, USEPA screening values fish advisories, State Action levels; Fish and Shellfish Consumption Advisories; USEPA Water Quality Advisories |
| Shellfish Harvesting | Shellfish harvesting bans |

| Beneficial Use | Evaluation Guidelines |
|---|---|
| Drinking Water | DHS Primary MCLs, Secondary MCLs; USEPA Primary MCLs, Secondary MCLs; MCL goals; Office of Environmental Health Hazard Assessment (OEHHA) Public Health Goals (PHGs); DHS Action Levels; Drinking Water Health Advisories; Water Quality Advisories; Suggested No-Adverse-Response Levels (SNARLs); Prop 65 levels; California Environmental Protection Agency (CalEPA), USEPA and NAS drinking water Cancer Risk |
| Taste and Odor | DHS Secondary MCLs, USEPA Secondary MCLs, State action levels (taste and odor-based), USEPA Drinking Water Contaminant Fact Sheets |
| Agricultural Water Supply | Agricultural Water Quality Goals published by the Food and Agriculture Organization of the United Nations |

Adapted from Marshak, 2000.

3. Establish general guidance for the interpretation of narrative standards. State the types of interpretative guidelines that may be used. When selecting interpretative evaluation guidelines to translate narrative water quality objectives, the most appropriate water quality limit would be selected to protect the applicable beneficial use within a water segment. The examples of interpretative guidelines, presented in Table 2 could be used by the RWQCBs for interpreting narrative water quality objectives while still providing flexibility in dealing with site-specific circumstances. However, this list is not inclusive and, by itself, does not achieve the statewide consistency desired in a listing policy.

   When evaluating narrative water quality objectives or beneficial use protection, RWQCBs and the SWRCB should identify interpretative evaluation guidelines that represent standards attainment or beneficial use protection. The Policy should provide specific guidance on selection of interpretative evaluation guidelines to the extent possible. Guidance on selection of evaluation guidelines for tissue and sediment quality is presented in Issues 4E and 5C, respectively.

   For some parameters, however, evaluation guidelines may be required outside of those recommended by the Policy. In order to make sure the guidelines are selected transparently and are applicable to the circumstance before the RWQCB, an alternate evaluation guideline could be used if it can be demonstrated that the evaluation guideline is:

   - Applicable to the beneficial use
   - Protective of the beneficial use

- Linked to the pollutant under consideration
- Scientifically-based and peer reviewed
- Well described

RWQCBs should assess the appropriateness of the guidelines for use in the hydrographic unit and present justification for the alternate guideline in the water body fact sheet.

Staff has chosen this alternative as the preferred alternative because it provides RWQCBs the flexibility to identify the appropriate interpretative evaluation guideline that represents standards attainment or beneficial use protection while the mechanism used to reach the listing decision is transparent.

4. Establish explicit guidance for specific parameters specifying which guidelines should be used. List the guidelines in the Policy. The SWRCB and RWQCBs can strengthen the use of chemical, physical, and biological data in the assessment of narrative water quality objectives and develop a scientifically defensible listing process by establishing explicit guidance for the parameters that will be used to list a water quality impairment. A listing based strictly on a narrative water quality objective without a translator is subjective and relies exclusively on case-by-case judgement to list a water body as impaired on the section 303(d) list. Therefore, to make the mechanisms used to reach these judgements transparent, exceedances based on a narrative water quality objective must be suitable for calculation and specific evaluation guidelines should be presented in the Policy.

   Under this alternative, RWQCBs would be required to use specific values and would not have the flexibility to compare data sets to measures that best represent site-specific conditions. If specific guidelines were required, RWQCBs would not be able to incorporate the most recent versions of the available guidelines or the most recent research that may set values that are more protective of the designated beneficial use.

**Recommendation:** Alternative 3. See Policy section 6.1.3.

*Issue 4E:* ***Interpreting Aquatic Life Tissue Data***

**Issue:** How should chemical residue concentrations in tissue be interpreted?

**Issue Description:** The presence of toxic substances in water bodies can be determined by analyzing tissues from aquatic organisms. Concentrations of toxic substances in water are often too low or transitory to be reliably detected through the more traditional methods of water sample analysis. Also, many toxic substances are not water soluble, but can be found associated with sediment or organic matter. Aquatic organisms are sampled because they bioaccumulate and bioconcentrate toxic substances to levels that may be many hundreds of times the levels actually in the water. This concentration factor facilitates detection of toxic pollutants.

The tissue pollutant levels of aquatic organisms, collected from a water body, determine whether substances are bioaccumulating and detect potential impacts to aquatic life and on human health from the consumption of fish and shellfish. Bioaccumulation reflects the uptake and retention of a chemical by an aquatic organism from all surrounding media (e.g., water, food, and sediment). Bioconcentration refers to the uptake and retention of a chemical by an aquatic organism from water only. Both bioaccumulation and bioconcentration can be viewed simply as the result of competing rates of chemical uptake and depuration (chemical loss) by an aquatic organism (USEPA 2000d).

Bioaccumulation is a measurable phenomenon, rather than an effect. Merely identifying the presence of a chemical substance in the tissues of an organism is not sufficient information to conclude that the chemical will produce an adverse effect. All chemical substances have the potential to produce adverse effects (e.g., toxicity). The likelihood that a chemical substance, in the tissues of an organism, will produce an adverse effect is a function of the physical and chemical properties of the substance, the concentration of the chemical in the tissues of the organism, and the length of time the organism is exposed to the compound. Environmental pollutants vary widely in their potential to produce toxicity. Therefore, pollutant-specific information must be used to determine the potential for a bioaccumulated substance to produce adverse effects.

Trace metals such as mercury and lead, and trace organic compounds such as DDT (dichlorodiphenyltrichloroethane), PCBs (polychlorinated biphenyls) and PAHs (polynuclear aromatic hydrocarbons) are bioaccumulative substances commonly measured. Fish and shellfish typically take in these substances at a greater rate than they can eliminate them, causing the substance to accumulate in tissue over their lifetimes. Concentrations in aquatic organisms from highly bioaccumulative chemicals may pose unacceptable human health risks from fish and

shellfish consumption and may also biomagnify in aquatic food webs, a process whereby chemical concentrations increase in aquatic organisms of each successive trophic level due to increasing dietary exposures (e.g., increasing concentrations from algae, to zooplankton, to forage fish, to predatory fish) (USEPA 2000d).

Evaluation of tissue chemical concentrations are based on screening values established by USEPA, NAS, and additional criteria used in the State Mussel Watch Program (SMWP) reports, such as elevated data levels (EDLs) and MTRLs for the protection of human health and wildlife. Data is collected to determine the prevalence of selected bioaccumulative pollutants in fish and shellfish and to identify sources of these pollutants. In addition, human health risks are estimated for those pollutants for which cancer potency factors and/or reference doses have been established.

**Baseline:**

In developing the 2002 section 303(d) list measures used to interpret chemical residue concentrations in tissue included MTRLs and public health guidelines. In addition to MTRLs, guidelines that were well accepted and had a strong scientific basis with high levels of certainty and applicability were used. Examples included: NAS tissue guidelines, USFDA action levels, USEPA screening values, MCLs; and fish advisories. The use of numeric evaluation values, focused on protection from consumption of aquatic species (e.g., MTRLs or USFDA values), was sufficient by themselves to demonstrate standards attainment. The State did not set a minimum number of samples; however, at least two samples were sufficient to determine attainment.

**Alternatives:**

1. Do not use this factor. It has been suggested that analysis of fish and shellfish tissue concentrations is not needed to determine attainment of water quality standards because scientifically defensible methods for determining standards attainment already exists through numeric ambient water quality criteria.

   Measurements for ambient water column concentrations of pollutants are a basis for determining impairment. However, the lack of pollutants in the water column does not always mean that designated uses are being protected. Water body-specific factors sometimes cause pollutants, including pathogens, to accumulate in fish and shellfish tissue at higher levels than predicted by the methodology used to derive numeric human health or aquatic life criteria. Examples of such factors include water temperature, nutrient levels, food web structure, the concentration of dissolved organic carbon in ambient water, and accumulations in the sediment. Therefore, a water body can meet numeric ambient water quality criteria, but not attain designated uses because fish or shellfish tissue concentrations exceed levels that are protective of human health or aquatic life.

The use of numeric evaluation values to interpret chemical residue concentrations in tissue is an important indicator that designated uses are being attained. The use of tissue measurements adheres to USEPA's guidance to use all readily available data and information.

2. Interpret bioaccumulation data on a case-by-case basis. This alternative provides the RWQCBs with the most flexibility, as it would account for a variety of site-specific conditions that could be encountered. However, this could also lead to inconsistencies in assessment methodology. Guidance by USEPA (2003b) recommends that, when determining whether a pollutant impairs a segment, listing methodologies should be consistently applied and scientifically valid. The decision rules in the methodology should provide the opportunity to see exactly how assessment decisions are made.

   There are many measurements that can be used to interpret chemical residue concentrations in tissue. Screening values developed by OEHHA and USEPA measure contaminant concentrations found in aquatic organisms for the protection of human health. The USFDA has also established maximum concentration levels for some toxic substances in human foods (USFDA, 1987) and NAS has established recommended maximum concentrations of toxic substances in animals (NAS, 1972). The USFDA levels are based on specific assumptions on the quantities of food consumed by humans and the frequency of their consumption. The USFDA limits are intended to protect humans from the chronic effects of toxic substances consumed in commercial foodstuffs and include economic considerations. The NAS limits were established not only to protect organisms containing toxic compounds, but also to protect species that consume these contaminated organisms. The NAS has set guidelines for marine fish but not for marine shellfish.

   MTRLs and measurement endpoints from other State and federal agencies, other states, and other countries are also available for comparison. MTRLs were developed by SWRCB staff from the human health water quality objectives in the 1997 *California Ocean Plan* (SWRCB, 2001b) and from the CTR (40 CFR Part 131, May 18, 2000). These objectives represent levels that protect human health from consumption of fish, shellfish, and water (freshwater only). MTRLs are used as alert levels or guidelines indicating water bodies with potential human health concerns. However, MTRLs are a calculated value derived by multiplying the human health water quality objectives by the bioconcentration factor (BCF) for each substance as recommended in the USEPA Draft Assessment and Control of Bioconcentratable Contaminants in Surface Waters (USEPA, 1991a). They are an assessment tool and are not compliance or enforcement criteria. While MTRLs have value as alert levels, their use is questionable in assessing water bodies for placement on the section 303(d) list. MTRLs are

not based on any site-specific considerations. As such MTRLs should not be used to evaluate fish or shellfish tissue data for listing decisions.

To ensure consistency in listing, specified numeric values should be used to trigger a listing. Consistent values can be developed to provide limited flexibility to address site-specific situations encountered by the RWQCBs. Without guidance, listings could be based on screening values that are not the most protective of the designated beneficial use.

3. Establish consistent value to trigger listing. Tissue concentrations are difficult to evaluate in terms of impact on aquatic life; however 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 and has made recommendations that reflect scientific understanding of the relationship between aquatic organisms and their environment. Screening values (Table 3) represent levels that are protective of aquatic life.

   Screening values developed by the OEHHA and the USEPA assume that human exposure to contaminants can result from edible aquatic species and are based on the general U.S. population's average consumption rate for fish and shellfish. The criteria, therefore, represent concentrations in water that protect against the consumption of aquatic organisms containing chemicals at levels greater than those predicted to result in significant human health problems. The current values are listed in Table 4.

TABLE 3: WILDLIFE PROTECTION CRITERIA FOR EVALUATION OF BIOACCUMULATION MONITORING DATA

| **Contaminant** | **NAS Guidelines*** |
|---|---|
| Aldrin | 100 µg/kg |
| Total DDT | 1,000 µg/kg |
| Total PCBs | 500 µg/kg |
| Chlordane (total) | 100 µg/kg |
| Dieldrin | 100 µg/kg |
| Endosulfan (total) | 100 µg/kg |
| Endrin | 100 µg/kg |
| Lindane (gamma hexachloro-cyclohexane) | 100 µg/kg |
| hexachloro-cyclohexane (total) | 100 µg/kg |
| Heptachlor | 100 µg/kg |
| Heptachlor epoxide | 100 µg/kg |
| Toxaphene | 100 µg/kg |

*NAS, 1972. µg/kg = micrograms per kilogram (measurements based on wet tissue samples)

The values from these two tables apply to muscle tissue (e.g., fillets) or edible flesh (e.g., whole mussels or clams) samples collected in all types of waters (marine, estuarine, fresh).

In the 2002 list, USFDA action levels were used as an evaluation value. However, USFDA action levels were established to address levels of contamination in foods sold in interstate commerce. Thus, the methodology used by USFDA in establishing tolerances is directed at health risks of contaminants in commercial fish and shellfish (for interstate commerce) rather than in locally harvested fish and shellfish and were never intended to be protective of local water bodies and recreational and subsistence fisherman. USEPA has concluded that USFDA action levels do not provide as great a level of protection for consumers of fish and shellfish caught and consumed than do human health criteria (USEPA, 2003b). Listings based on USFDA action levels may not be the most protective of beneficial uses and, therefore, should be accompanied by water body-specific data showing nonattainment of beneficial uses.

Additional values may also be available from the SMWP. The SMWP has been evaluating bioaccumulation in mussels, fresh water clams, and oyster tissues since mid 1970 and use EDLs and MTRLs. EDLs provide a comparative measure that ranks a given concentration of a particular substance with previous data collected by the SMWP. EDLs were determined by pooling all SMWP data from 1977 through 1997 by species and exposure, ranking the concentrations of each toxicant from highest to lowest concentration (including nondetects), calculating the cumulative frequency of occurrence and percentile ranking for all concentrations, and identifying and designating the concentrations of the toxic substance representing the 85th percentile (EDL 85) and the 95th percentile (EDL 95). EDLs are based on the relative ranking of each measurement, rather than a percentage of the highest concentration obtained and reflect the biases of the data upon which they have been based. EDLs do not assess adverse impacts, nor do they represent concentrations that may be damaging to the mussels, clams, or to a human consuming these species. They do not directly relate to MTRLs, FDA action levels, or NAS guidelines. Therefore, EDLs should not be used to evaluate shellfish or fish tissue data.

The use of consistent values aid in the interpretation of chemicals bioaccumulated in fish or shellfish tissue. Evaluation of tissue chemical concentrations based on screening values established by the USEPA and NAS provide consistent interpretation of the levels of chemical residue concentrations in tissue that impact beneficial uses.

TABLE 4: SCREENING VALUES FOR THE PROTECTION OF HUMAN HEALTH FROM THE CONSUMPTION OF FISH AND SHELLFISH

| Contaminant | OEHHA Screening Values* | USEPA Screening Values** |
|---|---|---|
| Arsenic | 1.0 mg/kg | 1.2 mg/kg*** |
| Cadmium | 3.0 mg/kg | |
| Mercury | 0.3 mg/kg | |
| Selenium | 2.0 mg/kg | |
| Tributyltin | | 1.2 mg/kg |
| Total DDT | 100 µg/kg | |
| Total PCBs | 20 µg/kg | |
| Total PAHs | | 5.47 µg/kg |
| Chlordane (total) | 30 µg/kg | |
| Dieldrin | 2.0 µg/kg | |
| Endosulfan (total) | 20,000 µg/kg | |
| Endrin | 1,000 µg/kg | |
| Lindane (gamma hexachloro-cyclohexane) | 30 µg/kg | |
| Heptachlor epoxide | 4.0 µg/kg | |
| Hexachlorobenzene | 20 µg/kg | |
| Mirex | | 800 µg/kg |
| Toxaphene | 30 µg/kg | |
| Diazinon | 300 µg/kg | |
| Chlorpyrifos | 10,000 µg/kg | |
| Disulfoton | 100 µg/kg | |
| Terbufos | | 80 µg/kg |
| Oxyfluorfen | | 546 µg/kg |
| Ethion | 2,000 µg/kg | |
| Dioxin | 0.3 ng/kg | |

*Brodberg and Pollock, 1999
**USEPA, 2000c
***USEPA, 2000b
mg/kg = milligrams per kilogram (parts per million)
ng/kg = nanograms per kilogram
(measurements based on wet tissue samples)

4. Provide guidance to trigger listing. Various measures exist that can be used to interpret chemical residue concentrations in tissue. Tissue pollutant levels of organisms can be compared to values established by OEHHA or USEPA for the protection of human health or NAS for the protection of aquatic life to determine if beneficial uses have been impaired. Measurement endpoints from other State and federal agencies can also be used to translate appropriate narrative water quality objectives.

   Acceptable tissue concentrations can be measured either as muscle tissue (preferred) or whole body residues. Residues in liver tissue alone are not considered a suitable measure because livers are generally not targeted for consumption. Composite samples may yield a cost-effective and perhaps more accurate estimate of tissue concentration because many tissue samples are combined before chemical analysis.

Analyzing the tissue from one bottom-feeding fish species (a trophic level three species) and one predator fish species (a trophic level four species) at each site can adequately assess differences in bioaccumulation of various contaminants. Bottom-feeding species accumulate contaminant concentrations by consuming benthic invertebrates and epibenthic organisms living in contaminated sediment. Predator species are good indicators of persistent pollutants that can biomagnify through several trophic levels of the food web.

The discovery of specific contaminants during water quality or sediment studies, or the identification of pollutant sources is one reason for conducting fish tissue analysis. Site-specific information (water or sediment data, data from municipal and industrial sources, or pesticide use data) are critical factors in assessing the impact of a contaminant. Additionally, tissue from appropriate target species permits comparison of fish, and shellfish contamination over a wide geographic area.

This is the preferred alternative because RWQCBs would have the flexibility to compare data sets to the most appropriate measure that can be used to interpret chemical residue concentrations in tissue. Screening values that could trigger a listing decision are described in Alternative 3. By not requiring specific guidance, RWQCBs could incorporate the most recent versions of the aforementioned documents or the most recent research that may set values that are more protective of the designated beneficial use (as long as the evaluation guideline meet the criteria in section 6.1.3 of the Policy).

**Recommendation:** Alternative 4. See Policy sections 3.1.5, 4.5, and 6.1.3.

*Issue 4F:* ***Interpreting Data on Trash Impacts to Water Bodies***

**Issue:** How should data on trash be interpreted?

**Issue Description:** Trash or litter that accumulates in waterways may be offensive and cause a nuisance condition. Nuisance is defined in the CWC and in narrative water quality objectives in Basin Plans. Trash can be floating material, such as solids that can cause nuisance or adversely affect beneficial uses. Table 5 presents some examples of types and sources of floatable debris as reported by USEPA.

TABLE 5: TYPES AND SOURCES OF FLOATABLE DEBRIS

| Source | Examples of Debris Released |
|---|---|
| Storm Water Discharges | Street litter (e.g., cigarette butts, filters, and filter elements), medical items (i.e., syringes), resin pellets, food packaging, beverage containers, and other material from storm drains, ditches, or runoff. |
| Combined Sewer Overflows | Street litter, sewage-related items (condoms, tampons, and applicators), medical items (i.e., syringes), resin pellets, and other material from storm drains, ditches, or runoff. |
| Beachgoers and Other Nonpoint Sources (NPS) | Food packaging, beverage containers, cigarette butts, toys, sewage, pieces of wood and siding from construction projects, and trash (e.g., beverage containers, food packaging) left behind by workers in forestry, agriculture, construction, and mining. |
| Ships and Other Vessels | Fishing equipment (e.g., nets, lures, lines, bait boxes, ropes, and rods), strapping bands, light sticks (used by recreational divers and by fishermen to light up fishing lines), plastic salt bags, galley wastes, household trash, plastic bags and sheeting, and beverage yokes (six pack rings for beverage containers). |
| Solid Waste Disposal and Landfills | Materials such as garbage and medical waste. |
| Offshore Mineral and Oil and Gas Exploration | Data recording tape, plastic drill pipe thread protectors, hard hats, gloves, and 55-gallon drums. |
| Industrial Activities | Plastic pellets and other materials |
| Illegal Dumping or Littering | Food packaging, beverage containers, cigarette butts, appliances, electronics, and ocean and street litter. |

Adapted from Woodley, 2002.

Land-based sources of debris cause 80 percent of the marine debris found on our beaches and waterways (USEPA, 2003c). Floatable debris on beaches and in waterways is considered an aesthetic problem.

Suspended or settleable materials must also be considered as defined in the Basin Plans. Examples of these narrative water quality objectives are: "waters shall not contain suspended or settleable materials in concentrations that cause nuisance or adversely affect beneficial uses." Unlike floatables, settleable materials are not always noticeable. These materials include glass, cigarette butts, construction debris, batteries, and diapers. Settleables can be a source of bacteria and toxic substances and can also impact wildlife.

Many types of data and information can be used to support a finding of nuisance but primarily non-numeric information has been used. Some numeric data submitted comes from "Clean-Up Days". Organizations throughout the state sponsor cleanup days, usually along the coast or creeks typically for one day. These events result in trash and debris collections from the beaches and waterways.

**Baseline:** During the 2002 section 303(d) listing process, SWRCB and RWQCBs' received several submittals of non-numeric information and limited amounts of data in support of trash listing decisions. In general, it could not be determined if these submittals were temporally or spatially representative of water body conditions. Currently, there are 30 pollutant/water body combinations that are listed due to trash impacts.

**Alternatives:**

1. Use non-numeric information (such as photographs) to support listing decisions. Under this alternative, water bodies would be listed if non-numeric or qualitative information were available to show that water quality standards were not met. Non-numeric information would include visual assessments. Visual assessment documents waterway and watershed conditions and uses. These assessments require minimal technical equipment or training and rely primarily on an individual's sensory abilities and common sense.

   Photographic monitoring, also referred to as "photo documentation," provides a permanent visual documentation of specific waterway and/or watershed conditions. Visual assessments can be used to document conditions from the viewpoint of the individual observer, and are therefore usually qualitative or, at best, semi-quantitative. This type of assessment can be used as a baseline for gross problem identification, or for tracking gross changes over time. Photographs are easy to understand but interpretation between sites in a water body or between different locations is difficult to do in a consistent manner.

Using photo documentation by itself, without any other supportive information, to list a water body for trash raises some important issues. Photographs alone are difficult to interpret spatially and temporally. In addition, photographs can be easily modified or altered to portray the desired effect or the bias of the photographer.

Even though photographs by themselves may be equivocal evidence that standards are not met; they can be used to support listing decisions or indicate that additional monitoring is needed to better characterize trash accumulation. Photo documentation is most useful as a secondary line of evidence, used in conjunction with other lines of evidence.

2. List trash using numeric data with non-numeric information in the assessments to support numeric data. This alternative would require that both numeric and non-numeric data and information be used to support listing decisions. Even though there are limitations in using non-numeric information such as photographs in the listing process, this information could serve as an indication that additional monitoring needs to be performed to better characterize the problem.

   The types of numeric data that could be used include trash cleanup day data or spatially and temporally representative measurements of trash in waterways or at beaches. In order for these data to be interpreted, RWQCBs would need some numeric way of translating the narrative water quality objectives for nuisance so the data can be clearly and predictably interpreted. At present, numeric evaluation guidelines are not available to interpret trash data in terms of water quality objectives or beneficial use attainment. An alternative to a trash evaluation guideline is to compare trash accumulation to reference conditions (i.e., waters scarcely impacted by trash accumulations). Waters would be placed on the section 303(d) list if visual assessments and numeric water quality objectives or evaluation guidelines show that trash is a water quality problem.

   It would be difficult for the RWQCBs to implement either of these approaches.

3. Identify trash as a problem using numerical data and non-numeric information (as described in Alternative 2) but allow existing programs to address any identified water-related trash problem. This option would require placement of water bodies on the section 303(d) list, as described in Alternative 2, but would establish a specific mechanism to place waters in the Water Quality Limited Segments category where an existing program is addressing the water quality problem in lieu of a TMDL. Trash is typically thrown directly on beaches and into rivers and streams. Some trash enters waterways by blowing in from adjacent areas, but most

trash enters these waterways via storm drains. Litter is intentionally or accidentally discarded in watersheds and, during major storms, flushed through the storm drains into the rivers and streams.

If trash is a nuisance in water bodies of the State and storm drains are the major source, then existing storm water permits could be used to reduce the trash discharged via storm drains.

Typically, storm water permits require the permittee to develop and implement a Storm Water Management Plan (SWMP) that is intended to reduce pollutant discharged in storm water to the "maximum extent practicable." The SWMP provides the framework for the development and implementation of specific program components, ranging from legal authority and funding, to BMP programs. The storm water permits require that standards are met, but the mechanism used to meet the standards is the use of ever evolving and more effective BMPs, which can include structural controls. All permit requirements are enforceable.

Water bodies could be placed in the Water Quality Limited Segments Being Addressed category if an existing program is addressing the water quality problem for trash. Some criteria that could be used to substantiate placement in this category could include:

- For point sources, the discharge controls are enforceable.
- The controls are specific to the water body and pollutant(s) of concern.
- If the enforceable program is a permit or WDR, the majority of the pollutant loading is associated with the permitted source.
- The controls are in place or scheduled for implementation.
- Documentation that BMPs will lead to attainment of water quality standards shall be based on site-specific study, case studies from other similar locations, or research results from applicable situations.
- The timeframe for implementation is established.
- The controls are sufficient to assess if water quality standards will be attained within a reasonable time. Documentation should include an estimate of when attainment of water quality standards is expected. Acceptable timeframes for standards attainment are: (1) before next listing cycle, (2) within the life of the permit, (3) prior to renewal of the WDR, (4) within the compliance schedule, or (5) within the schedule presented in a watershed plan.
- Water quality standards attainment can be demonstrated through an existing monitoring program or a future monitoring program with reasonable assurance of implementation.

This alternative is the preferred alternative because the criteria cited above duplicate the recently revised provisions of the Draft Water Quality Control Policy for Addressing Impaired Waters: Regulatory Structure and

Options (SWRCB, 2004). This policy offers a mechanism to certify that a program will address water quality standards exceedances in lieu of a TMDL. As used in that draft policy, the term "certification" refers to a formal statement by a RWQCB that a specific program of implementation, proposed by another regulatory or non-regulatory entity, would be consistent with the assumptions and requirements of a RWQCB-established TMDL that is set at a level that will ensure attainment of water quality standards, considering seasonal variations and a margin of safety. The Listing Policy could avoid duplication with the Guidance Policy by simply referring the certification process as a means for RWQCBs to decide the best course of action on waters that do not meet water quality standards.

**Recommendation:** Alternative 3. See Policy sections 3.1.7, 3.1.7.2, 3.2, and 4.7.2.

*Issue 4G:* ***Interpreting Nutrient Data***

**Issue:** How should nutrient data be interpreted?

**Issue Description:** Nutrients, in appropriate amounts, are essential to the health and continued functioning of aquatic ecosystems. Excessive nutrients, however, can result in undesirable growth of macrophytes or phytoplankton and potentially harmful algal blooms, leading to oxygen declines, imbalance of aquatic species, public health risks, and a general decline of the aquatic resource.

Excessive nutrient loading has been identified as one of the leading causes of water quality impairments of the nation's waters. Nitrogen and phosphorus are the primary causes of cultural eutrophication; the most recognizable manifestation is algal blooms. Other chronic symptoms include low dissolved oxygen (DO), fish kills, murky water, and depletion of desirable flora and fauna.

Narrative objectives for nutrients are not directly tied to a set pollutant concentration below which beneficial uses are protected. Basin Plans, for the most part, lack a set of numeric nutrient objectives.

Impairments occur when biostimulatory substances promote aquatic growths in concentrations that cause nuisance or adversely affect beneficial uses.

**Baseline:** RWQCBs recommendations for nutrient listings for the 2000 section 303(d) list included listings for DO, nitrates, ammonia and other nitrogen-related substances. The 2002 section 303(d) list also cited growth of noxious plants, algae, eutrophication, and increased turbidity (i.e., decreased water clarity) as problems.

**Alternatives:**

1. Use criteria from USEPA. Under this alternative, RWQCBs would use the USEPA recommended parameters for nutrient assessment, which are total phosphorus, total nitrogen, chlorophyll-*a*, and some measure of water clarity (USEPA, 1998c). USEPA criteria establish nitrogen and phosphorus as the main causal agents of enrichment and chlorophyll-*a* and water clarity as response variables. Criteria developed by USEPA uses an ecoregion approach, establish target regional nutrient ranges for phosphorus and nitrogen, and recognizes ambient "natural" background levels of nutrients in each region.

   This alternative is not preferable since the criteria are based on numerous assumptions that do not apply to the western U.S. Using USEPA reference-based values would result in the listing of a large number of potentially unimpacted water bodies. In the development of their

guidance, USEPA recognized that flexibility is important and encouraged states to develop regional nutrient criteria. Therefore, in acknowledgement of the differences posed by the western U.S., the USEPA Region IX Regional Technical Advisory Group (RTAG) for developing nutrient criteria has unanimously chosen to develop its own criteria.

2. Wait for RTAG to complete its work before making any further nutrient listings. In 2001, the SWRCB created the State Regional Technical Advisory Group (STRTAG) to work with RTAG to develop nutrient criteria for California and better coordinate the activities of the RWQCBs.

   This alternative would provide the RWQCBs with consistent numeric endpoints upon which to base nutrient listings. However, this alternative would also require waiting at least two years for RTAG/STRTAG nutrient criteria to be developed and several more years before they are adopted and implemented.

3. Provide guidance to trigger listing. To place a water body on the section 303(d) list based on a narrative objective, it should be shown that a nuisance condition exists or that beneficial uses are being adversely impacted. Nuisance or adverse impacts may be established by showing: (1) degradation of the aquatic community or its habitat; (2) complaints from the public; (3) presence of objectionable tastes or odors in drinking water supplies; (4) presence of weeds that impede recreation or navigation; or (5) low DO.

   Once nuisance or an adverse impact is shown, it is necessary to demonstrate the problem is caused by excessive nutrients. Establishing the role of nutrients may be accomplished by: (1) using computer models; (2) reviewing relevant scientific literature; (3) making comparisons with historical data for the area; (4) comparing monitoring data with similar water bodies that are not impaired; or (5) any scientifically defensible method that demonstrates the observed nutrient concentrations result in excessive aquatic growths.

   Data requirements vary based on the rationale for listing and the availability of supporting information. If listing for nitrogen or phosphorus specifically, RWQCBs should consider whether the ratio of these two nutrients provides an indication of which is the limiting agent. Individual datum points should have an identifiable location, quality assurance/quality control (QA/QC) procedures, sample collection methods and analytical methods.

   In the absence of RTAG/STRTAG nutrient criteria, RWQCBs should use models, evaluation guidelines for excessive algae growth, unnatural foam, odor, and taste, scientific literature, data comparisons to historical values

or to similar but unimpacted streams, Basin Plan objectives, or other scientifically defensible methods to demonstrate that nutrients are to blame for the observed impacts. Nutrient-related nuisance may also be placed on the section 303(d) list when a significant nuisance condition exists when compared to reference conditions.

RWQCBs should first determine the endpoints that are impacted and whether the nutrient is causing or not causing biostimulation. Next the RWQCBs should determine the beneficial use that is impacted (Figure 13). RWQCBs should follow the guidance provided below when nutrient listing decisions are being made:

**Listing for excessive nitrates**

Compare the nitrate data to water quality objectives intended to protect drinking water quality or compare data to the MCL. If it is suspected that the aquatic life use is impacted, compare the nitrate data to relevant guidelines available that meet the requirements of section 6.1.3 of the Policy. If listing for nitrogen or phosphorus specifically, RWQCBs should consider examining whether the ratio of these two nutrients provides an indication of which is determined to be the limiting agent.

**Listing for violating ammonia objectives to protect aquatic life**

Compare the ammonia data to appropriate use-specific objectives and use the approach described for other toxics.

**Listing for violating DO objective**

Compare the DO data to appropriate use-specific objectives. Data should be sufficient to document the extent and severity of the impairment as well as any temporal/seasonal trends.

When continuous monitoring data are available, the seven-day average of daily minimum measurements should be assessed. For depressed DO, if measurements taken over the day (diel) show low concentrations in the morning and sufficient concentrations in the afternoon, then it should be assumed that nutrients are responsible for the observed DO concentrations if riparian cover, substrate composition or other pertinent factors can be ruled out as controlling DO fluctuations. In the absence of diel measurements, concurrently collected measurements of nutrient concentration should be assessed as described in section 3.1.1 to applicable and appropriate water quality objectives or acceptable evaluation guidelines (section 6.1.3). If diel pattern is not seen, the impairment may be the result of excessive biological oxygen demand (BOD) or chemical oxygen demand (COD).

When continuous monitoring data is not available, but data are available from at least seven days in any 30-day period, the average of the lowest

measurement on seven consecutive days on which measurements were taken should be assessed.

This is the preferred alternative because in the absence of RTAG/STRTAG nutrient criteria, the Policy provides general guidance in the use of models and applicable evaluation guidelines.

**Recommendation:** Alternative 3. See Policy sections 3.1.1, 3.1.2, 3.1.7.1, 4.1, 4.2, and 4.7.1.

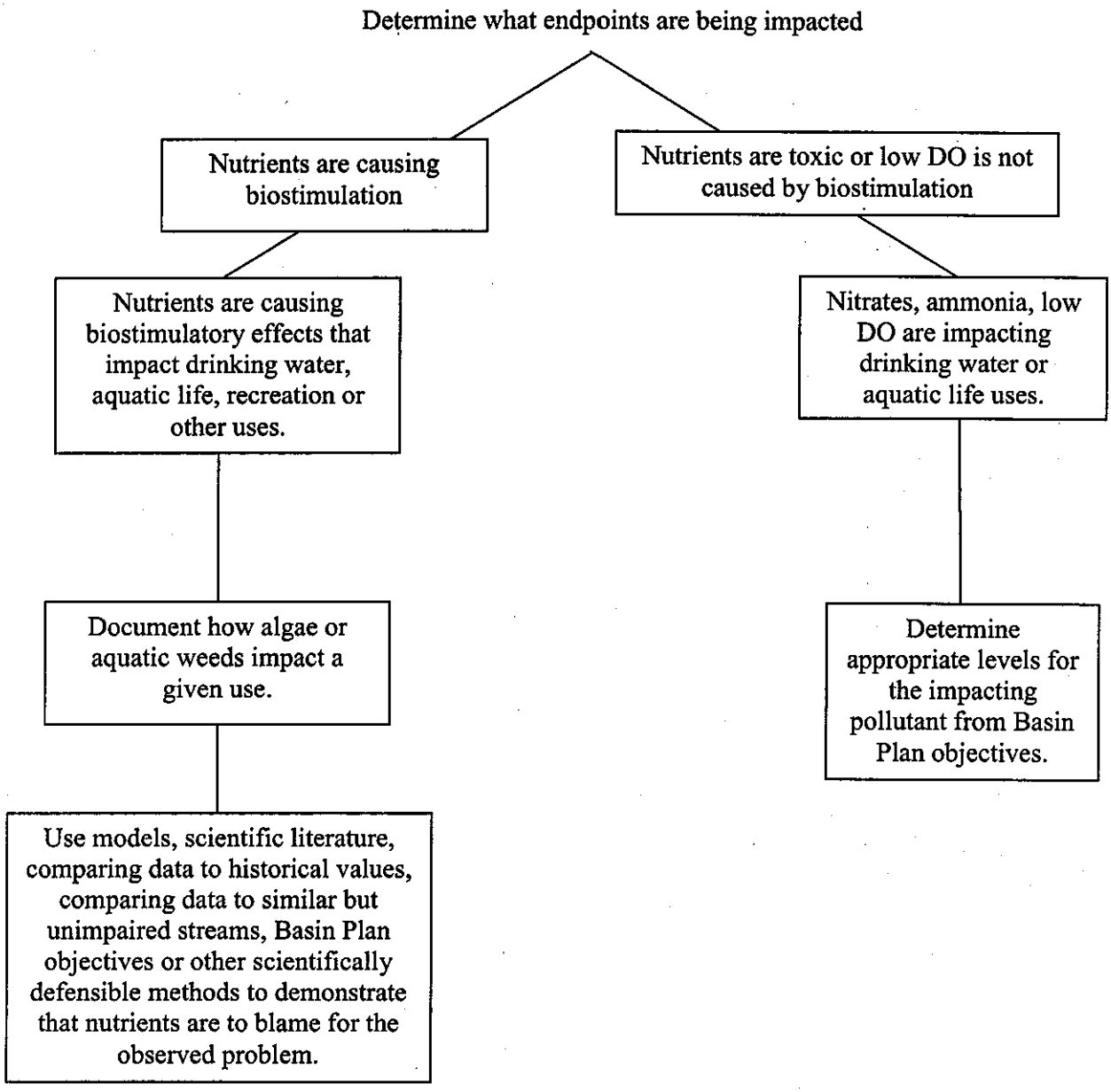



FIGURE 13: NUTRIENT LISTING OPTIONS FLOW CHART

*Issue 4H:* ***Impacts of Invasive Species on Water Quality***

**Issue:** How should invasive species impacts be addressed?

**Issue Description:** Natural barriers, such as mountains, deserts, and oceans have historically acted to restrict the natural dispersion of different types of plants and animals. Human activities, the advent of progressively more advanced technologies in worldwide transportation, and increased global trade have helped reduce the effects of these natural barriers allowing nonindigenous organisms to become introduced into new habitats. Although many of these introduced organisms have minimal or no effect on their new habitats, some have caused enormous negative impacts on the environment and economy.

Human activities have helped to remove the effects of natural barriers through the:

- discharge of organisms from ships ballast water and ships surfaces;
- release of organisms from home aquariums;
- dumping of live bait containers and packing materials;
- discharge of organisms attached to recreational boats, shipping crates, or fishing gear;
- escape of organisms from shipments of live seafood, soil, or seed;
- transfer of aquaculture products or fish stocks;
- intentional introduction of organisms to establish new fisheries;
- propagation of landscape plantings or ornamental ponds; and
- intentional introduction of organisms to control other pests.

As a result of increasing introductions from many sources, nonindigenous aquatic organisms can now be found in many coastal and inland waters across the state, e.g., San Francisco Bay (Cohen, 1998; Cohen and Carlton, 1997; Veldhuizen, 2001).

Recent studies indicate that the rate of such introductions are increasing exponentially, with more invasions being reported along the Pacific coast than the Atlantic or Gulf coasts (Ruiz et al., 2000). It is likely that the rate of introductions will continue, as ships and port systems become larger as global commerce grows, and as investigators find new organisms from other sources. These invasive organisms can clog waterways, impair recreational boating, threaten shellfish production, and interfere with irrigation operations and power generation.

Nonindigenous organisms present unique challenges; they are natural biological entities that have been translocated from one ecosystem to another, either by natural biogeographical processes or by human

activities. The introductions of such species occur through point and nonpoint sources. The organisms vary widely, ranging from virus and bacteria unicellular organisms to vascular plants, clams, crabs and fish. Each type of organism can cause different problems. Nonindigenous invasive organisms are capable of creating public health hazards, disrupting trophic structures, and displacing native organisms by out-competing native species for resources and upsetting predator-prey relationships.

Once introduced into a new habitat, invading organisms are virtually impossible to eliminate. Nonindigenous species propagate to become invasive causing permanent impacts that amplify over time.

Many interested parties are attempting to prevent the introduction of nonindigenous species through public awareness, education, and the implementation of non-regulatory prevention practices. A number of federal and state agencies are in the process of implementing laws designed to prevent and /or eradicate all or specific introduced species.

A recent petition to USEPA requested that ballast water discharges be regulated under the NPDES program (USEPA, 1999b). However, USEPA denied the petition (USEPA, 2003g). NPDES permits impose effluent limits designed to remediate the discharge of pollutants to waters of the state from point source discharges. The goal of developing and imposing effluent limits in NPDES permits is to allow the discharge of specific levels of pollutants at specifically calculated concentrations so that designated beneficial uses of the receiving waters are still protected. The issued permits allow discrete loads of pollutants to be discharged into receiving waters.

Another alternative has been to use invasive species as a factor for section 303(d) listing eventually leading to the development of TMDLs.

**Baseline:** The San Francisco Bay RWQCB listed San Francisco Bay for exotic species on the 1998 section 303(d) list, which was ultimately approved by the SWRCB.

In the 2002 section 303(d) listing process, the SWRCB did not list any new water bodies proposed for listing under section 303(d) for invasive species.

**Alternatives:**

1. <u>List water bodies under CWA section 303(d) for invasive species that impact water quality and develop TMDLs</u>. At present, documented population explosions of many introduced invasive species have a significant impact on designated beneficial uses in many of our state's waters. Examples include: disruption of commercial and recreational

fisheries beneficial use (COMM), interfering with the delivery of agriculture water supply (AGR) and industrial process supply (IND), obstruction of waterways (navigational beneficial use, NAV), and obstruction of hydropower generation structures (POW). Invasive species can also impact native aquatic habitats.

If the presence of invasive species were used as a listing factor, a TMDL would need to be developed for the impacted water body. Although it may be possible to list a water body for invasive species under section 303(d), it may not be possible to develop a TMDL. Invasive species can affect beneficial uses by obstructing waterways, industrial and agricultural water conveyance structures, affecting water quality parameters such as DO, or causing human health hazards due to population explosions. However, most documented impacts to beneficial uses due to degraded water quality are usually not caused by invasive species. Many invasive species prevent indigenous organisms from maintaining a "balanced indigenous population" but this impact is not the result of a water quality parameter being affected. Obstruction-related impacts require immediate response for which there are some controls already in place, such as eradication and removal. Other impacts, require time to naturally subside. The TMDL process would not be the most effective or appropriate way to address these specific impacts.

The section 303(d) listing and TMDL process comprises the next remediation step in reducing waste loads in water bodies that do not meet water quality standards. TMDLs not only take into account the sum of individual point source waste load allocations established through permits, but also the load allocations for nonpoint sources, plus the natural background loads from tributaries or adjacent water segments. As with the application of NPDES permits, TMDLs are remediation plans designed to further reduce pollutant loads in a more comprehensive fashion while still allowing discrete loads of pollutants to be discharged into receiving waters.

It would be theoretically possible to develop TMDLs based on either taxa or a specific-sized population for the discharge of nonindigenous species into receiving waters. The International Maritime Organization and the U.S. Coast Guard are currently developing such standards for ballast water (Federal Register, 2002; Globalast, 2002). Initially, such loads would be driven by current treatment technology, which would not necessarily protect water bodies from invasive species impacts. There would be no assurance that any or all organisms discharged as part of the load allocation would not become invasive at some time in the future. The load allocations would need to be restrictive enough to impart confidence that the organisms being discharged have a very low probability of survival. The same assurances would also need to be extended for discharges or

releases from other sources of introduction. This would include discharges and releases from surfaces of boats or ships, aquariums, or authorized and unauthorized releases of nonindigenous organisms. Regulation and control of these types of discharges would be very difficult to achieve.

It would, therefore, be impractical to regulate invasive species through load allocations that would allow for the discharge of nonindigenous species into the waters of the state without assurance that any organism discharged would not become invasive.

2. Do not list waters impacted by invasive species on the section 303(d) list. Instead, place such identified waters on a subcategory list for impacts not caused by a pollutant. Water bodies impacted by invasive species could be listed under a subcategory for impacts to beneficial uses not caused by a pollutant (USEPA, 2003b). TMDL development would not be required for these waters; the listing would support other appropriate water quality management actions that would address the cause of the impact. Water bodies placed on this list would still be included as part of the water quality monitoring and assessment report submitted in compliance with CWA sections 305(b) and 303(d), creating the much-needed awareness regarding this increasingly important problem.

   At present the SWRCB, must rely on USEPA to determine that nonindigenous species fall under the CWA definition of "pollutant". The CWA defines "pollutant" to include such things as dredge spoils, solid waste, incinerator residue, sewage, garbage, sewage sludge, munitions, chemical waste, biological material, radioactive materials, heat, wrecked and discarded equipment, rock, sand, cellar dirt, and industrial, municipal and agricultural waste discharges. Some courts have found that biological organisms such as bacteria, dead and live fish, and plant materials are pollutants. While some invasive organisms may be considered pollutants, USEPA has not concluded that all aquatic invasive species are pollutants (USEPA, 2001a). At this time, USEPA believes that invasive species should not be included within the definition of "pollutant", as defined by the CWA, and, therefore, State's are under no obligation to develop TMDLs for waters impacted by nonindigenous species under section 303(d) (USEPA, 1999c).

   A TMDL would not be the most appropriate tool to address invasive species because this program is designed to remediate water quality problems by reducing load amounts from different sources into receiving waters in an attempt to restore beneficial uses. If the intent were to prevent further introductions of nonindigenous species into waters of the state, then allowing some predetermined load to be discharged would seem inappropriate.

Current ballast water management law in effect prohibits the discharge of ballast water unless the master in charge of the vessel employs one of several ballast water management practices. This includes exchanging ballast water in mid-ocean, retaining ballast water, removing or killing nonindigenous organisms in the ballast water through the application of an alternate treatment technology, or discharging ballast water in an approved facility.

The draft San Francisco Bay RWQCB TMDL (2000) reached essentially the same conclusion and recommended a load of zero discharge of nonindigenous organisms into regional waters.

3. Do not list waters impacted by invasive species on the section 303(d) list and delist already listed waters during subsequent listing cycles. Since invasive species are not pollutants (refer to Alternative 2 for discussion) and USEPA has found NPDES permits or TMDLs are not needed for these types of problems, RWQCBs would not need to list waters for invasive species. In 1999, USEPA did not disapprove the inclusion of San Francisco Bay waters listed in the 1998 section 303(d) list for impacts associated with invasive species (USEPA, 1999c). However, USEPA stated that neither the State nor USEPA had an obligation under current regulations to develop TMDLs for such waters because a pollutant was not impacting such waters.

   Under this alternative, exotic species listings currently on the section 303(d) list would be removed during the next listing cycle. Invasive species impacts continue to be addressed through other regulatory and non-regulatory approaches, and other programs would continue to support the research necessary to effectively prevent and eradicate invasive species in California's aquatic systems. Waters impacted by invasive species could be acknowledged in fact sheets but no judgement would be made on their disposition with regard to section 303(d) listing. However, this information would be useful in the development of the section 305(b) report.

   In the 1998 section 303(d) listing process, nine water body segments were listed for exotic species impacts. During the 2002 303(d) listing cycle, SWRCB did not adopt any further additions to the list. Current listings focused on exotic species would be removed from the section 303(d) list.

   This alternative is the preferred alternative because USEPA does not consider invasive species to be a pollutant and it would be difficult or impossible to develop TMDLs for invasive species.

**Recommendation:** Alternative 3.

## *Issue 5: Listing or Delisting with Multiple Lines of Evidence*

For many data types, multiple lines of evidence are needed to determine if standards are attained. Listing or delisting with multiple lines of evidence is based on the weight of evidence assembled from multiple sets of data and information, the strength or persuasiveness of each measurement endpoint, and concurrence among various endpoints. With the exception of toxicity, the listing factors that require multiple lines of evidence are:

A. Health advisories;

B. Nuisance condition;

C. Toxicity (listings may be made with or without the pollutant identified);

D. Sedimentation (under certain circumstances);

E. Water temperature (under certain circumstances);

F. Adverse biological response;

G. Degradation of biological populations or communities; and

H. Trends in water quality.

These categories are discussed separately in Issues 5A through 5H.

*Issue 5A:* ***Interpreting Health Advisories***

**Issue:** How should health advisory information be interpreted?

**Issue Description:** When water bodies contain fish with high levels of chemicals or metals, OEHHA issues health advisories. Health advisories advise against fish consumption or provide guidelines for limiting consumption in particular areas. The guidelines usually specify how many meals of specific fish, if any, may safely be eaten per week or per month. Often the guidelines specify lower eating limits for some population subgroups, such as pregnant or nursing women or children, because of their higher sensitivity.

Section 101(a)(2) of the CWA establishes as a national goal "water quality which provides for the protection and propagation of fish, shellfish, and wildlife, and recreation in and on the water, wherever attainable." These are commonly referred to as the "fishable/swimmable" goals of the Act. USEPA interprets "fishable" uses to include, at a minimum, designated uses providing for the protection of aquatic communities and human health related to consumption of fish and shellfish. In other words, USEPA views "fishable" to mean, not only can fish and shellfish thrive in a water body, but when caught can also be safely eaten by humans.

Fish consumption rates are a factor in the development of water quality standards and are used to prevent human risk. In order to characterize human exposure to contaminated fish and shellfish, the population at-risk must be identified, the consumable concentrations of contaminants in fish and shellfish tissues must be measured, and the types and quantities of fish and shellfish consumed must be determined. OEHHA health advisories are an important indicator that beneficial uses have been impacted and, because they are typically based on the water body of concern and describe actual consumption rates of fish and/or shellfish, are an appropriate indicator of potential health impacts.

The major types of advisories and bans issued to protect both the general public and specific subgroups are:

- No consumption advisories;
- No consumption advisories targeted to sensitive subgroups;
- Advisories recommending either the general population or sensitive subgroups restrict their consumption of a specific species; and
- Commercial fishing bans which prohibit the commercial harvest, sale and, by inference, consumption of the species identified in the ban.

Fish advisories developed by OEHHA are published in the California Sport Fishing Regulations and California Sport Fish Consumption Advisories (OEHHA, 2001a).

**Baseline:** In the past, water bodies with issued health advisories or shellfish bans were automatically considered water quality limited segments and subsequently listed on the section 303(d) list. The approach for developing recommendations for the 2002 section 303(d) list related to health advisories required multiple lines of evidence to list or delist a water body. Each of these lines of evidence generally needed the pollutant(s) that caused or contributed to the adverse condition.

**Alternatives:**

1. Use OEHHA advisories alone or as an indicator of beneficial use impairment. Health advisories issued against the consumption of edible resident non-migratory organisms or shellfish harvesting bans by OEHHA are acknowledged as indicators that the beneficial use to protect human health is impaired. OEHHA's fish advisories are based on site-specific samples from the water body in question. Additionally, supporting data, when available, is analyzed to assess the likelihood and degree of human exposure. These advisories are based on chemical specific values for tissue concentrations that are intended to protect human health.

   OEHHA is the agency responsible for evaluating potential public health risks from chemical contamination of sport fish. Therefore, fish advisories issued by OEHHA provides scientifically credible evidence of an impairment of the fishable beneficial use. However, advisories can be issued to be protective of subgroups or restrict consumption. Levels of fish tissue contamination may, therefore, be lower than the value set in the Basin Plan or statewide water quality objective. More than one criterion may be necessary to determine impairment. Additionally, USEPA and local health agencies can issue advisories for fish, as well as for drinking water and swimming impacts. Using only OEHHA advisories would disregard valid advisories issued by these other agencies. Therefore, to be most protective of the fishable beneficial uses, all lines of evidence should be considered.

2. Use all types of advisories. Fish or shellfish consumption advisories are sometimes issued by a local agency or a national health advisory can be issued by USEPA. Local advisories can be relied upon if the advisory is based upon methodologies similar to OEHHA and data supporting the advisory exists. To use a health advisory issued by an agency other than OEHHA, the advisory should demonstrate:

   - The advisory is based on fish or shellfish tissue data;
   - The chemical or biological contaminant is associated with sediment or water in the segment;

- The data are collected from the specific water body in question; and
- The risk assessment parameters (e.g., toxicity, risk level, exposure duration and consumption rate) of the advisory or classification are cumulatively equal to or less protective than those in the water quality standards.

This applies to all pollutants that constitute potential risks to human health, regardless of the source of the pollutant.

Some health advisories are based on exceedances of the USFDA action levels. As discussed in Issue 4E, USEPA has concluded that USFDA action levels should not be the sole basis for a decision to list a water body. Water bodies with a fish or shellfish consumption advisory based on USFDA action levels should only be listed as impaired when site specific data support nonattainment of the water quality criteria for human health.

DHS and USEPA issue drinking water health advisories as well. Where drinking water is a designated use, USEPA recommends the inclusion of the drinking water exposure pathway for derivation of the ambient water quality criteria for human health. Water Quality Advisories contain human health related criteria that assume exposure through both drinking water and consumption of contaminated fish and shellfish from the same water. For waters that are sources of drinking water, exposure is assumed both from drinking the water and consuming aquatic organisms (fish and shellfish) that live in the water. For waters that are not sources of drinking water, exposure is assumed to be from the consumption of aquatic organisms only. Aquatic organisms are known to bioaccumulate certain toxic pollutants in their tissues, so as to magnify human exposures. The criteria also include threshold health protective criteria for non-carcinogens. Incremental cancer risk estimates for carcinogens are presented at a variety of risk levels. Organoleptic (taste- and odor-based) levels are also provided for some chemicals to protect human welfare.

Health Advisories are published by USEPA for short-term (1-day exposure or less or 10-day exposure or less), long-term (7-year exposure or less), and lifetime human exposures through drinking water. Health advisories for non-carcinogens and for possible human carcinogens are calculated for chemicals where sufficient toxicologic data exist.

MTRLs are an assessment tool, developed by SWRCB that have been used to access concentrations of chemicals in fish. As discussed in Issue 4E, MTRLs should not be used to evaluate fish or shellfish tissue data for listing decisions.

Health advisories are issued based on real water quality or fish tissue data or they can be issued as a precautionary tool. If the advisory is based on water quality data from a specific water body, the water quality limited segment of the water body should be listed. If the advisory is based on regional water quality and the advisory is precautionary, the data may be used as evidence in support of a listing but should not be used as the sole basis for a listing.

3. Use advisories if associated with water measurements. The issuance of a health advisory provides sufficient evidence that some portion of a water body is impaired due to a specific pollutant as described in Alternative 2. However, a health advisory for an entire water body issued as a public health precaution should not be used alone as basis for placement of a water on the section 303(d) list because some areas covered by the advisory may not reflect the contaminant problems identified in the advisory. In evaluating water segments for the section 303(d) list, the assessment needs to evaluate the segment and determine if the contaminant is associated with water concentrations or tissue burdens in the segment.

   When using health advisories to list a water quality limited segment, it is important to consider if their use targets a population subgroup, recommends restricting consumption, or is preventative. In these instances, the level of contamination in fish tissue may be lower than the value set in the Basin Plan, statewide plan, or CTR. More than one criterion may be necessary to determine if the water segment is impaired.

   Additional indicators to assess attainment with fish and shellfish consumption-based advisories include:

   - Chemical data – from fish tissue and water column;
   - Shellfish growing area classifications – developed by the National Shellfish Sanitation Program (NSSP); and
   - Bacteria criteria – the use of fecal coliform as a water quality indicator.

   There are several advantages to combining the above data with health advisories. Direct measurements of the levels of chemical pollutants in fish tissues can be used in support of health advisories for calculating human health screening values and determining fish consumption levels in the contaminated segment. Additionally, levels of chemical pollutants in fish tissue tend to reflect an integration of the wide fluctuations that occur in chemical concentrations in the water column over time. Measurements of tissue data are also an indicator of the bioaccumulation processes that occur in fish and shellfish that can be concentrated at levels higher than those present in the water column.

Site-specific measurements of chemicals in the water column can provide a link from the source of contamination to the health advisory. Water column data are typically based on total concentrations of chemicals in the water. For some chemicals that require relatively long periods of time before they are detected in fish and shellfish tissues, changes in water column concentrations may occur on a more rapid time scale compared to the corresponding changes in tissue concentrations. Therefore, chemical concentrations found in tissue samples may have little resemblance to measurements based on water column concentrations which are averaged over a sufficient period of time.

Shellfish growing area classifications developed by NSSP uses water column and tissue data (where available). NSSP classifications are not appropriate to consider when performing a beneficial use assessment but they can provide supporting documentation. Measurements of fecal coliform are used to determine if water quality is safe for shellfish consumption.

In some cases, it may not be appropriate to list a water body even though an advisory has been issued (e.g., where an advisory covers a large geographic region, but the sampling data were limited to certain water bodies or where an advisory pertains to migratory or highly mobile species). Also, a water body need not be listed if more recent data or information indicates that designated beneficial uses are being attained and that the advisory is no longer representative of current conditions.

This alternative is the preferred alternative because this alternative provides additional evidence that pollutants in the water segment contribute to the conditions addressed in health advisories. The use of all the lines of evidence listed above would support the use of a health advisory by providing additional documentation that the chemical or biological contaminant is associated with water or tissue in the segment.

4. Use Advisories if associated with water or sediment measurements but do not specify how to evaluate the measurements in the Policy. This alternative would provide the RWQCBs with more flexibility in determining how to evaluate water and sediment measurements in association with health advisories. However, without guidance to assist in evaluating measurements, interpretations could vary by region and evaluation guidelines could be used inappropriately. For example, measurements of sediment concentrations can potentially provide a picture of the levels of environmental contamination for those contaminants that are metabolized by physiological processes in fish tissues. However, as a method of evaluation, direct toxicity testing of sediments provide a chemical-by-chemical specification of sediment concentrations that would

be protective of benthic aquatic life but have not been used in association with impacts on human health.

USEPA is implicit in it's guidance that for purposes of determining whether a water body is impaired and should be included on the section 303(d) list, the methodology and documentation should clearly describe the rationale for identifying potential violations of numeric and narrative criteria. In its 2004 guidance, USEPA (2003b) stresses the need for a consistent approach and thorough documentation of the scientific and technical rationale for listing impaired water bodies.

**Recommendation:** Alternative 3. See Policy sections 3.1.4 and 4.4.

***Issue 5B:*** ***Interpreting Data Related to Nuisance***

**Issue:** How should data related to nuisance conditions (e.g., odor, foam, oil sheen, excessive algae, taste, and color) be interpreted?

**Issue Description:** As defined in CWC section 13050(m), nuisance is anything that is injurious to health, indecent or offensive to the senses, or an obstruction to the free use of property and interferes with the comfortable enjoyment of life or property. The Basin Plans variously define nuisance as solids, liquids, foams, oils, taste, color, odor, floating material and scum in concentrations that can cause nuisance or adversely affect beneficial uses.

The extent, to which beneficial uses are impacted, in many of the Basin Plans, relies on a narrative objective and is defined as "concentrations that adversely affect beneficial uses." For example, the objective for color in the North Coast RWQCB Basin Plan states "Waters shall be free of coloration that adversely affects beneficial uses" (North Coast RWQCB, 1994). The Los Angeles RWQCB Basin Plan has a similar narrative objective for oil and grease. It states, "waters shall not contain oils, greases, waxes or other materials in concentrations that result in a visible film or coating on the surface of the water or on objects in the water that cause nuisance, or that otherwise adversely affect beneficial uses" (Los Angeles RWQCB, 1995).

The SWRCB and RWQCBs have received information describing nuisance conditions in many waters of the State. This documentation, for the most part, has been qualitative (e.g., photographs, accounts from individuals, etc.). Some numeric data have been provided that describes nuisance conditions (e.g., measures of algae cover or water color).

**Baseline:** In 2002, water segments were not recommended for placement on the section 303(d) list for nuisance conditions related to assessments of color, odor, excessive algae, and scum.

**Alternatives:**

1. Use only quantitative data in the evaluation of nuisance. The Basin Plans provide narrative objectives for the various types of nuisance conditions. These types of narrative objectives are subjective and difficult to interpret unless there is a numeric evaluation guideline available that represents a quantifiable level of beneficial use protection.

Some Basin Plans have numeric objectives that protect waters from nuisance. An example is the San Diego RWQCB's Basin Plan objective for color. The objective is:

> "Waters shall be free of coloration that causes nuisance or adversely affects beneficial uses. The natural color of fish, shellfish, or other resources in inland surface waters, coastal lagoon, or bay and estuary shall not be impaired. Inland surface waters shall not contain color in concentrations in excess of the numerical objectives described in Table 3-2 (20 Color Units)."

When a numeric water quality objective or guideline is available for nuisance conditions, it provides a comparative value upon which numeric data can be directly assessed to determine if water quality standards are met.

A benefit of listing, based on such numeric water quality objectives, is that it is less subjective and reproducible. With all other listing requirements satisfied, such as data quality and quantity requirements, if the data shows an exceedance of the objective and is not attaining standards than the determination that the water segment is impacted is scientifically defensible.

In many cases, nuisance conditions are symptoms of problems and are the manifestation of the effects of pollutants. For example, excessive algae growth is typically caused by unnaturally high concentrations of nutrients. Therefore, a listing based on nutrient-related impairment may be more appropriate. Caution should be exercised in listing decisions related solely to nuisance conditions because many of these factors can also be natural conditions of water bodies (e.g. foam, algae growth, and odors).

2. Use qualitative information to evaluate nuisance. Photographic information and other types of visual assessments are useful as supporting documentation of water quality problems but its value is debatable unless accompanied by quantitative data.

   Visual assessments require minimal technical equipment or training and rely primarily on the individual's sensory abilities and common sense to document water body conditions. There are two general approaches used to develop visual assessments. The first, a narrative approach, involves the use of standardized forms to interpret visual (and other sensory) observations into words or numeric descriptions. The second approach, photographic monitoring also referred to as "photo documentation," provides a

permanent visual documentation of specific waterway and/or watershed conditions.

The RWQCBs have, in previous listing cycles, recommended water segments for the list using qualitative information. For example, Calleguas Creek Watershed-Conejo Creek/Reach 9B was recommended for listing due to unnatural foam and scum during the development of the 2002 section 303(d) list. The recommendation was based on photographic documentation. The photographic evidence provided was for one photograph (SWRCB, 2003a). The pollutant was not identified, the potential sources were unknown, and the only evidence provided to document impairment were photographic visual assessments.

Photographs and other qualitative information can be subject to multiple interpretations. Used alone it is difficult to differentiate between natural and human–caused water quality problems. Qualitative information alone (even if it is subject to multiple interpretations and sampling bias) can be used to evaluate the potential for nuisance conditions and to plan for future monitoring efforts.

3. Use both quantitative and qualitative data and information in the evaluation of nuisance. Qualitative information and quantitative data in combination can provide a strong basis for placement of waters on the section 303(d) list. Qualitative information can be used to evaluate the potential for nuisance conditions and to plan for future monitoring efforts. Qualitative information should not be discouraged. When qualitative information is combined with quantitative data related to pollutants, such as excessive nutrients, multiple lines of evidence provide strong support for placement on the section 303(d) list.

   When submitting photo documentation to support a listing, the submission should describe events or conditions that indicate impairments of water quality that are outside the expected natural range of conditions. The documentation should also provide linkage between the measurement endpoint (e.g., a study that may have been performed for some other purpose) and the water quality standard of interest. Documentation should include the analysts' credentials and training, and be verifiable by the RWQCB or SWRCB.

   For photo documentation to be most useful the date and location on a general area map should be provided. If known latitude/longitude coordinates should be provided or the location

marked on an U.S. Geological Survey (USGS) 7.5-minute quad map. The documentation should provide a thorough description of the photo(s) and describe conditions that are not represented by the photo in surrounding areas. For photo documentation of impairment, linkage should be provided between photo-represented conditions and conditions that indicate impairments of water quality that are outside the expected natural range of conditions. The photographer's rationale for the area photographed, the camera settings utilized, and scale should be provided. The organization submitting photos should submit its entire photo set for a given condition in order to document spatial/temporal conditions for the time frame specified.

For the section 303(d) list, the pollutant or pollutants that cause or contribute to the observed impacts should be identified. To do this, the RWQCBs should rely on existing numeric water quality objectives (related to nutrients or other pollutants) or evaluation guidelines that represent an acceptable level of beneficial use protection. The guidelines should satisfy the requirement of section 6.1.3 of the Policy. It is also defensible to compare water bodies conditions to reference conditions, if they have been identified.

This alternative represents the preferred alternative because using established guidelines or comparisons to reference conditions for quantitative and qualitative data and information could lead to better assessments of nuisance conditions.

**Recommendation:** Alternative 3. See Policy sections 3.1.7, 3.1.7.2, 4.7, 4.7.2, and 6.1.3.

*Issue 5C:* ***Interpreting Toxicity Data***

**Issue:** How should toxicity data be interpreted?

**Issue Description:** Toxicity is a direct measurement of the health of the water body. Toxicity measurements assess the response of aquatic organisms to pollutants by directly measuring the organism's exposure to a water or sediment sample. Assessing the response of a number of different organisms ensures a greater opportunity to identify water quality problems. Toxicity measurements can assess the relationship of complex mixtures of pollutants or individual substances and can evaluate acute or chronic exposures in test systems.

Toxicity tests are conducted in water or sediment for freshwater, estuarine, and marine environments. Several lines of evidence can be used to identify toxic effects and several approaches are available to assess what pollutant might have caused or contributed to the observed toxicity.

**Baseline:** During the development of the 2002 section 303(d) list, toxicity testing was used as a basis for listing as long as concurrently sampled chemical data was available to show the chemical caused or contributed to the toxic effect.

**Alternatives:**

1. Provide no guidance on methods or approaches for interpreting toxicity data. Under this alternative, the RWQCBs would be given significant flexibility on the use of toxicity data for determining the attainment of water quality standards. Guidance would not be established in the Policy for evaluating toxicity information and data. The RWQCBs would be able to exercise BPJ in determining which waters would be placed on the section 303(d) list. The disadvantage of this alternative is that it would allow potentially significant inconsistencies in listings for toxicity among the various RWQCBs.

2. Use toxicity alone as a listing factor. Using this alternative, the RWQCBs would be required to use well-established toxicity testing methods to make listing determinations, as long as appropriate reference and control measures are included in the toxicity tests.

   One disadvantage of this alternative is that it is very difficult to complete a TMDL on toxicity alone. In addition, there are no examples in California where a TMDL has been developed for toxicity in the absence of the pollutant. When toxicity has been identified, the RWQCBs have, in a few cases, sponsored studies to identify the pollutant causing the toxicity (e.g., Foe et al., 1998). The performance of these types of studies may delay development of TMDLs. To reduce the effect of this disadvantage,

TMDLs should be scheduled to proceed even if the pollutants are not identified. Federal regulation allows for developing TMDLs for the identified pollutants causing or expected to cause water quality standards violations (40 CFR 130.7(b)((4)). The exception is toxicity. The definition of a TMDL (40 CFR 130.2(i)) allows for "TMDLs to be expressed in terms of either mass per time, toxicity or other appropriate measure." In order for TMDLs to be expressed in terms of toxicity, it is necessary for TMDLs to be developed for toxicity.

In assessing toxicity data several considerations need to be addressed including:

- toxicity test methods;
- assessment of statistical significance of toxicity; and
- persistence of toxicity.

**Toxicity Test Methods**

Several species have been used in acute and chronic toxicity testing for fresh and marine waters. Toxicity tests typically compare ambient water to either standard control waters or unpolluted receiving water (as specified in the testing manual) or sediments to a reference condition.

Currently, no single toxicity test can adequately characterize the toxicity that pollutants may cause in water or sediment. For freshwaters, USEPA (1991f) recommends selection of toxicity tests, using species from ecologically diverse taxa and the screening of ambient water with three species (a fish, an invertebrate, and a plant) for chronic testing and two species (a fish and an invertebrate) for acute testing (Table 6). This recommendation is based on differences in species sensitivity among groups of organisms to different toxicants.

TABLE 6: FRESHWATER TOXICITY TESTS

| Species | Effect | Reference |
|---|---|---|
| Fish | | |
| Fathead minnow, *Pimephales promelas* | Survival; Survival and growth | USEPA, 1993c*<br>USEPA, 2002d*<br>USEPA, 1994c**<br>USEPA, 2002c**<br>ASTM, 2002c |
| Rainbow trout, *Oncorhynchus mykiss* | Larval survival | USEPA, 1993c*<br>USEPA, 2002d*<br>ASTM, 2002c |

| Species | Effect | Reference |
|---|---|---|
| Brook Trout, *Salvelinius fontinalis* | Larval survival | USEPA, 1993c*<br>USEPA, 2002d*<br>ASTM, 2002c |
| Bluegill Sunfish, *Lepomis macrochinus* | Survival and growth (48 hours to 32 days) | ASTM, 2002c |
| Channel Catfish, *Ictalurus punctatus* | Survival and growth | ASTM, 2002c |
| Rotifer, *Brachionus calyciflorus* | Embryo survival | ASTM, 2002e |
| **Invertebrate** | | |
| Water flea (Invertebrate), *Ceriodaphnia dubia* | Survival | USEPA, 1993c*<br>USEPA, 2002d* |
| | Survival and reproduction | ASTM, 2002b<br>USEPA, 1994c**<br>USEPA, 2002c**<br>ASTM, 2002b |
| Water flea (Invertebrate), *Daphnia pulex* and *Daphnia magna* | Survival | USEPA, 1993c*<br>USEPA, 2002d*<br>ASTM, 2002b |
| Water flea (Invertebrate), *Daphnia magna* | Survival, growth and reproduction | USEPA, 1994c**<br>USEPA, 2002c**<br>ASTM, 2002b |
| Rotifer, *Brachionus calyciflorus* | Embryo survival | ASTM, 2002e |
| **Plant** | | |
| Green algae, *Raphidocelis subcapitata* (=*Selenastrum capricornutum*) | Growth | USEPA, 1994c**<br>USEPA, 2002c** |

*Acute test
**Chronic test

For marine waters (Table 7), a variety of tests are included in the California Ocean Plan that address the responses from a range of organisms (SWRCB, 1996; SWRCB, 2001b).

TABLE 7: MARINE WATER TOXICITY TESTS

| Species | Effect | Reference |
|---|---|---|
| Giant Kelp, *Macrocystis pyrifera* | Percent germination; germ tube length | USEPA, 1995[**]<br>SWRCB, 1996[**] |
| Red abalone, *Haliotis rufescens* | Abnormal shell development | USEPA, 1995[**]<br>SWRCB, 1996[**] |
| Pacific Oyster, *Crassostrea gigas*; Mussels, *Mytilus* spp. | Abnormal shell development; percent survival | USEPA, 1995[**]<br>SWRCB, 1996[**] |
| Urchin, *Strongylocentrotus purpuratus*; alternate species (*S. franciscanus, S. droebachiensis, Dendraster excentricus, L. pictus*) Sand dollar, *Dendraster excentricus* | Percent normal development | USEPA, 1995[**]<br>SWRCB, 1996[**] |
| Urchin, *Strongylocentrotus purpuratus*; alternate species (*S. franciscanus, S. droebachiensis, Dendraster excentricus, L. pictus*) Sand dollar, *Dendraster excentricus* | Percent fertilization | USEPA, 1995[**]<br>SWRCB, 1996[**] |
| Shrimp, *Holmesimysis costata* | Percent survival; growth | USEPA, 1995[**]<br>SWRCB, 1996[**]<br>ASTM, 2002h |
| Shrimp, *Americanmysis* (*Mysidopsis*) *bahia* | Percent survival; Growth | USEPA, 1993c[*]<br>USEPA, 2002d[*]<br>USEPA, 1994b[**]<br>USEPA, 2002e[**]<br>ASTM, 2002h |
| Shrimp, *Neomysid mercedis* | Percent survival | US EPA, 1994b[**]<br>USEPA, 2002e[**]<br>ASTM, 2002h |
| Topsmelt, *Atherinops affinis* | Larval growth rate; percent survival | USEPA, 1995[**]<br>SWRCB, 1996[**]<br>ASTM, 2002a |

| Species | Effect | Reference |
|---|---|---|
| Silversides,<br>*Menidia beryllina* | Larval growth rate;<br>percent survival | USEPA, 1993c*<br>USEPA, 2002d*<br>USEPA, 1994c**<br>USEPA, 2002c**<br>USEPA, 2002e**<br>ASTM, 2002a |

*Acute test **Chronic test

Toxicity tests are also available for fresh and marine sediments (Tables 8, 9, and 10). A variety of tests have been used throughout the state by a number of monitoring programs (e.g., SWAMP, SCCWRP (Southern California Coastal Water Research Project), SFEI (San Francisco Estuary Institute), and BPTCP). These programs have used well-developed and accepted toxicity tests with amphipods, polychaete worms, and midges, etc. Toxicity tests are available to test toxic effects on organisms of pore water (i.e., the water between sediment particles) or the sediment-water interface (the effect of chemicals released from the sediment to water).

TABLE 8: MARINE SEDIMENT TOXICITY TESTS

| Species | Effect | Reference |
|---|---|---|
| Amphipods:<br>*Rhepoxynius abronius,*<br>*Eohaustorius estuarius,*<br>*Leptocheirus plumulosus,*<br>*Grandidierella japonica,*<br>*Ampelisca abdita* | Acute survival | USEPA, 1994a<br>ASTM, 2002g |
| Polychaete,<br>*Nereis (Neanthes)*<br>*arenaceodentata* | Survival (10 day)<br><br>Survival and Growth (28 day) | ASTM, 2002f<br>USEPA, 1998a<br>ASTM, 2002f |

TABLE 9: FRESHWATER WHOLE SEDIMENT AND POREWATER TEST ORGANISMS

| Species | Effect | Reference |
|---|---|---|
| Amphipod, *Hyalella azteca* | Survival and Growth (10 days) | USEPA, 2000e |
| Amphipod, *Hyalella azteca* | Survival, Growth, and Reproduction (28-42 days) | USEPA, 2000e |
| Midge, *Chironomus tentans* | Survival and Growth (10 days)<br>Survival and Growth (long-term) | USEPA, 2000e<br>USEPA, 2000e |

TABLE 10: CHRONIC TESTS FOR MARINE SEDIMENT PORE WATER AND SEDIMENT-WATER INTERFACE

| Species | Effect | Reference |
|---|---|---|
| **Porewater** | | |
| Urchin, *Strongylocentrotus purpuratus* | Percent normal development | USEPA, 1995<br>SWRCB, 1996 |
| Urchin, *Strongylocentrotus purpuratus*; alternate species *S. franciscanus, S. droebachiensis, Dendraster excentricus, L. pictus,* | Percent fertilization | USEPA, 1995<br>SWRCB, 1996 |
| Bivalve, Bay Mussel *Mytilis galloprovincialis* | | USEPA, 1995<br>SWRCB, 1996 |
| **Sediment-water Interface** | | |
| Urchin, *Strongylocentrotus purpuratus* | Percent normal development | USEPA, 1995<br>SWRCB, 1996 |
| Bivalve, Bay Mussel, *Mytilis galloprovincialis* | Abnormal shell development; percent survival | USEPA, 1995<br>SWRCB, 1996 |

Many toxicity tests are used by a variety of monitoring programs throughout the State. These methods should be encouraged for use in section 303(d) listing decisions. Acceptable methods include those listed in water quality control plans or used by SWAMP (Puckett, 2002), SCCWRP (SCCWRP, 1998), USEPA Environmental and Assessment Program (EMAP) (USEPA, 1997a; USEPA, 2001b; USEPA, 2003d), the Regional Monitoring Program (RMP) for SFEI (Lowe et al., 1999), and BPTCP (Stephenson et al., 1994). Other SWRCB and RWQCB-approved methods should also be encouraged on a case-by-case basis.

**Assessing Significant Toxicity**

In toxicity tests, the most common approach to assess endpoints is to statistically compare the ambient water or sediment toxicity to a reference condition. Other approaches have been used extensively and are also valid. For example, comparison of ambient toxicity to reference conditions using a "reference envelope" or to a percentage of the minimum significant difference (MSD) have been used in water quality protection programs such as the BPTCP (SWRCB, 1998). The reference envelope is a statistical approach (Smith, 2002; Fairey et al., 1996) that allows a comparison of sites to reference sites. The approach considers all sources of field and laboratory variation.

The MSD compares differences between the control and ambient waters to determine whether the sample is toxic. Using this approach, the magnitude of difference depends on the selected Type I error rate (e.g., $p<0.05$; refer to Issue 6 for more complete description of Type I error), the level of between-replicate variation, and the number of replicates specific to the experiment. With the number of replicates and the error level held constant, the MSD varies with the degree of between-replicate variation. The "detectable difference" for a specific toxicity test protocol can be determined by the magnitude of difference detected by the protocol 90 percent of the time (Schimmel et al., 1994; Thursby and Schlekat, 1993) and is equivalent to setting the level of statistical power at 90 percent (refer to Issue 6 for definition of statistical power). This is accomplished by determining the MSD for each t-test conducted, ranking them in ascending order, and identifying the $90^{th}$ percentile MSD; the MSD that is larger than or equal to 90 percent of the MSD values generated (Anderson et al., 1998). The MSD considers laboratory variation only and is specific to each toxicity test protocol.

Another common method for assessing statistical significance in toxicity tests is by comparing reference or control conditions to ambient waters using a statistical test like the "t-test". A "t-test" compares the differences between an ambient water sample and control. If the difference is large, relative to the variance observed, then the difference is significant. In

many cases, however, a low between-replicate variance causes a comparison to be considered significant, even though the magnitude of toxicity may not be biologically meaningful (Anderson et al., 1998).

Each of these approaches have been used to decide if a water or sediment sample is toxic and could be used to support section 303(d) listing decisions.

**Persistence of Toxicity**

Another factor that should be considered when assessing toxicity is persistence in water or sediments. As with all kinds of measurements of environmental conditions, toxicity measurements are uncertain because of the inherent difficulty in using sampling data to represent actual environmental conditions (USEPA, 2000b). In most cases, the smaller the data set, the larger the statistical uncertainty. The uncertainty of these toxicity test measurements is reduced when acute and chronic toxicity is measured on a number of samples. USEPA (Denton and Narvaez, 1996) has recommended consideration of the following factors when selecting the frequency of toxicity monitoring:

- environmental significance and the nature of the pollutant,
- cost of monitoring relative to the capabilities and benefits obtained,
- history of the health of the water body,
- water and sediment variability,
- the presence of legacy pollutants, and
- the number of samples required to make an assessment.

Toxicity testing is integrative of environmental conditions, depending on the length of exposure to pollutants that may cause or contribute to the toxic effect. While it is desirable to have a large number of samples for decision making, findings of repeated occurrences of toxicity can be determined with relatively few samples. In one program, two samples was the minimum number of samples needed to assess the persistence or recurrence of toxicity (SWRCB, 1998).

3. Use a weight of evidence approach to determine the pollutant(s) that may cause toxicity. This alternative would require that toxicity be used as one line of evidence to place waters on the section 303(d) list (as described in Alternative 2). In general, pollutants need to be identified before a TMDL can be developed for a water placed on the section 303(d) list (40 CFR 130.7; USEPA, 2003b). Toxicity is not a pollutant, but is a manifestation of effects caused by pollutant concentrations.

   A second line of evidence to justify placement of waters on the section 303(d) list would be concurrently collected chemical data.

Chemical data would be interpreted using evaluation guidelines, toxicological information, or studies that identify the pollutant causing the toxicity. The advantage of this alternative is that if pollutants are associated with the observed toxicity, RWQCBs will have a better chance of completing TMDLs.

There are several approaches available that can be used to assess if pollutants in ambient water or sediment contribute to toxic or other effects. These approaches include:

- Toxicity Identification Evaluations;
- Sediment Quality Guidelines; and
- Statistical Correlation.

**Toxicity Identification Evaluations (TIEs)**

TIEs are scientific studies used to determine the cause of toxicity or other biological effect. To complete TIEs, water or sediment is separated into various components to assess which portion causes the toxicity. Sediment, water, and porewater samples can be manipulated to alter or render biologically unavailable generic classes of chemicals (USEPA, 1991c). Because sediments, water, and porewater posing potential risks are usually toxic to aquatic organisms, portions or fractions of the water or sediment exhibiting toxicity can reveal the nature of the toxicant(s). Depending upon the response, toxicant(s) can be tentatively categorized as having chemical characteristics of non-polar organics, cationic metals, or confounding factors, such as ammonia. TIE methods identify the toxicant group, the chemical causing the effect, and confirm the toxicant effects (Table 11).

TABLE 11: TIE PROCEDURES FOR EFFLUENT AND AMBIENT WATER, SEDIMENT EULTRIATE, PORE WATER, AND LEACHATES

| Test | Reference |
|---|---|
| Characterization Procedures | USEPA, 1991c |
| Procedures for samples exhibiting acute and chronic toxicity | USEPA, 1993a |
| Confirmation Procedures | USEPA, 1993b |
| Characterization Procedures for Marine Species | USEPA, 1996b |

**Sediment Quality Guidelines (SQGs)**

When SQGs are used to determine the toxic effect of a sample, concurrently collected measurements of chemical concentrations can be used to associate toxic effects with toxicity or other biological effects. SQGs are widely used, empirically derived guidelines that predict or associate the chemical concentrations likely to be associated with the measurable biological response.

Several evaluation guidelines are available that can be used to assess association between toxicity or other measures of effect and the pollutants that may cause or contribute to the observed effects.

The predictability of toxicity, using the sediment values reported (Long et al., 1998), is reasonably good and is 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. Since these values often are not good predictors of toxicity alone, SQGs that predict toxicity in 50 percent or more samples, should be used in making decisions to place a water body on the section 303(d) list. The guidelines presented in Table 12 are the guidelines most predictive of biological effects.

TABLE 12: SEDIMENT QUALITY GUIDELINES FOR MARINE, ESTUARINE, AND FRESHWATER SEDIMENTS

| | Marine and Estuarine Sediments | | | Freshwater Sediments |
|---|---|---|---|---|
| **Chemical** | **Effects Range-Median[1]** | **Probable Effects Level[2]** | **Other Sediment Quality Guidelines** | **Probable Effect Concentration[3]** |
| Antimony | 25 ug/g dw | | | |
| Arsenic | 70 ug/g dw | | | 33.0 mg/kg dw |
| Cadmium | | 4.21 ug/g dw | | 4.98 mg/kg dw |
| Chromium | 370 ug/g dw | | | 111 mg/kg dw |
| Copper | 270 ug/g dw | | | 149 mg/kg dw |
| Lead | | 112.18 ug/g dw | | 128 mg/kg dw |
| Mercury | | | 2.1 ug/g[4] | 1.06 mg/kg dw |
| Nickel | | | | 48.6 mg/kg dw |
| Silver | | 1.77 ug/g dw | | |
| Zinc | 410 ug/g dw | | | 459 mg/kg dw |
| Chlordane | | | | 17.6 ug/kg dw |
| Total Chlordane | 6 ng/g[5] dw | | | |
| Dieldrin | 8 ng/g dw | | | 61.8 ug/kg dw |
| Sum DDD | | | | 28.0 ug/kg dw |
| Sum DDE | | | | 31.3 ug/kg dw |
| Sum DDT | | | | 62.9 ug/kg dw |
| Total DDTs | | | | 572 ug/kg dw |
| Endrin | | | 0.76 ug/g oc[6] | 207 ug/kg dw |
| Lindane | | | 0.37 ug/g oc[8] | 4.99 ug/kg dw |

| Chemical | Marine and Estuarine Sediments | | | Freshwater Sediments |
|---|---|---|---|---|
| | Effects Range-Median[1] | Probable Effects Level[2] | Other Sediment Quality Guidelines | Probable Effect Concentration[3] |
| Total PCBs | | | 400 ng/g[7] | 676 ug/kg dw |
| Anthrazene | | | | 845 ug/kg dw |
| Fluorene | | | | 536 ug/kg dw |
| Naphthalene | | | | 561 ug/kg dw |
| 2-methyl-naphthalene | | 201.28 ng/g dw | | |
| Phenanthrene | | 543.53 ng/g dw | | 1170 ug/kg dw |
| Low molecular weight PAHs | | 1442 ng/g dw | | |
| Benz[a]anthrazene | | 692.53 ng/g dw | | 1050 ug/kg dw |
| Benzo[a]pyrene | | 763.22 ng/g dw | | 1450 ug/kg dw |
| Chrysene | | 845.98 ng/g dw | | 1290 ug/kg dw |
| Dibenz[a,h]-anthrazene | 260 ng/g dw | | | |
| Fluoranthene | | | | 2230 ug/kg dw |
| Pyrene | | 1397.4 ng/g dw | | 1520 ug/kg dw |
| High molecular weight PAHs | 9600 ng/g dw | | | |
| Total PAHs | | | 1800 ug/g[8] | 22800 ug/kg dw |

[1]Long et al., 1995.
[2]MacDonald et al., 1996.
[3]MacDonald et al., 2000a.
dw = Dry Weight
[4]PTI Environmental Services, 1991.
[5]Long and Morgan, 1990.
[6]USEPA, 1993d.
[7]MacDonald et al., 2000b.
[8]Fairey et al., 2001
oc = Organic Carbon

The SQGs in Table 12 are based on empirical data compiled from numerous field and laboratory studies performed in North America. Chemistry data and a variety of different types of biological data for numerous taxa were derived from bioassays of field collected samples, laboratory toxicity test of clean sediments spiked with specific toxicants, benthic community analyses, or equilibrium-partitioning models. These guidelines are not intended as toxicity thresholds above which effects are always expected. Rather, the use of these values is to determine the incidence of significant toxicity among samples that exceed the values.

SQGs should be used with caution because they are not perfect predictors of toxicity and are most useful when accompanied by data from in situ biological analyses, other toxicologic assays, and other interpretive tools, such as metals-to-aluminum ratios and other guidelines derived either from empirical approaches and /or cause-effects studies.

The following sections briefly describe several SQGs:

*Effects Range Median (ERM), Probable Effects Level (PEL)*

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

Long et al. (1995) assembled data from throughout the country that correlated chemical concentrations 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 $10^{th}$ percentile of the ranked data and represents the point below which adverse effects are not expected to occur. The second level, the ERM, was set at the $50^{th}$ percentile and is 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 a site. Either one, both, or neither of the two substances of concern could cause the adverse effect in field data.

The State of Florida efforts (McDonald, 1994) revised and expanded the Long and Morgan (1990) data set and identified two levels of concern for each substance: the "TEL" or threshold effects level, and the PEL. 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 achieved due to inclusion of new information.

The development of TELs and PELs differ from the development of ERLs and ERMs 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. Taking the geometric mean of the $50^{th}$ percentile value in the effects database and the $85^{th}$ percentile value of the no-effects database generated the PEL. Taking the geometric mean of the $15^{th}$ percentile value in the effects database and the $50^{th}$ percentile value of the no-effects database generated the TEL. 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.

*Probable Effect Concentrations (PECs)*

For freshwater sediment, another benchmark is available, the consensus based PEC. PECs are based on empirical measurements that relate pollutant concentration to harmful effects on sediment-dwelling organisms and are intended to be predictive of those effects. These values were derived from a large database with matching sediment chemistry and toxicity information from field studies conducted throughout the United States. The SQG, expressed on an organic carbon-normalized basis, were converted to dry weight-normalized values at one percent organic carbon (MacDonald et al., 1994; MacDonald et al., 1996; USEPA, 1997d). PECs are intended to identify harmful effects on sediment-dwelling organisms from contaminant concentrations.

*Equilibrium Partitioning (EqP)*

EqP values are theoretical SQGs, derived from effect concentrations measured in water only exposures. In sediment exposures, the effect is predicted to occur when the same concentration occurs in the pore water of the sediment. The premise of the EqP SQG is that if chemical concentrations in pore water are not at toxic levels, then the sediment will not be toxic. EqPs were developed for non-ionic chemicals. This approach is based on the distribution of contaminant between sediment solids and pore water, and is predictable based on their physical and chemical properties, assuming continuous equilibrium exchange between sediment and pore water.

The EqP approach is supported by the results of spiked-sediment toxicity tests, which indicate that positive correlation exists between the biological effects observed and the concentration of the contaminants measured in pore water. The primary strength of this approach is that the bioavailability of a class of compounds is addressed. The SQG is calculated by using the appropriate water quality criteria (i.e., final chronic value, or equivalent value; USEPA 1997d) in conjunction with the sediment-water partition coefficient for the specific contaminants. However, other effect concentrations can be used, such as an $LC_{50}$ (lethal concentration for fifty percent of the population) for a particular species. The EqP predicts fifty percent mortality occurs at a pore water concentration equal to the water only $LC_{50}$.

**Correlations**

Correlations between toxicity, or other 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 data set), may contribute to toxicity or benthic effects (Fairey et al., 1996; Anderson et al., 1997). Correlations provide additional evidence that the observed toxicity could be caused by sediment-based or water concentrations of chemicals. Simple rank

correlation can be used to determine the co-occurrence of chemical concentrations and toxicity or other effects.

The preferred alternative is a combination of alternative 2 and 3 because the CWA allows the placement waters on the section 303(d) list for toxicity alone; however, once the pollutant is identified, the pollutant causing or contributing to the toxicity should be added to the section 303(d) list as soon as possible (e.g., during the next listing cycle). Alternative 3 lists various approaches that can be used to identify the pollutant.

**Recommendation:** Alternative 2 and 3. See Policy section 3.1.6, 4.6, and 6.1.3.

*Issue 5D:* ***Interpreting Sedimentation Data***

**Issue:** How should impacts due to sedimentation be addressed?

**Issue Description:** Increased sedimentation can cause nuisance or adverse effects to many beneficial uses. Water quality objectives for sediment are typically narrative and based on nuisance condition or an adverse effect to a beneficial use from increased sediment loads over natural levels. Sediment-related water quality objectives are also expressed as numeric objectives based on turbidity.

RWQCBs face a variety of challenges when determining whether a water body is impacted by sediment. Data that characterize beneficial use impairment due to excess sedimentation often do not lend themselves to conventional measures of data quality. Given the natural variability in sediment supply and transport capacity, representativeness of data is difficult to establish. Determining cause and effect relationships for sediment-related impacts is challenging due to changes in sediment supply, transport capacity, and channel configuration, which can all produce similar effects in a water segment.

For most RWQCBs, determining the impacts of sediment has been based on non-attainment of numeric water quality objectives and the threat to designated beneficial uses. Basin Plans contain applicable water quality objectives for sediment, settleable material, and turbidity. Examples of Basin Plan water quality objectives for sediment, settleable material, and turbidity include:

> "The suspended sediment load and suspended sediment discharge rate of surface waters shall not be altered in such a manner as to cause nuisance or adversely affect beneficial uses." (Lahontan RWQCB, 1995)
>
> "Water shall not contain substances in concentrations that result in deposition of material that causes nuisance or adversely affect beneficial uses." (North Coast RWQCB, 1994)
>
> "Turbidity shall not be increased more than 20 percent above naturally occurring background levels. Allowable zones of dilution within which higher percentages can be tolerated may be defined for specific discharges upon the issuance of discharge permits or waiver thereof." (North Coast RWQCB, 1994)

**Baseline:** Sediment or sedimentation listings for the 2002 section 303(d) list were based primarily on exceedances of numeric objectives.

**Alternatives:**

1. Interpret case-by-case. Establish general guidelines to trigger listing. This alternative provides the RWQCBs with the most flexibility, as it would account for a variety of site-specific conditions that could be encountered. However, this could also lead to inconsistencies in assessments. USEPA (2003b) recommends that, to determine whether a pollutant impairs a segment, decision rules in the listing methodology should provide the opportunity to see exactly how assessment decisions were made.

   There are many measurements that can be used to interpret concentrations or loads of sediment in water or in the channel. For example, with respect to cold freshwater habitat, beneficial uses may be threatened due to conditions either in the water column (e.g., suspended sediment and/or turbidity) or on the streambed (settleable material), or both. Indicators of streambed condition include channel morphology, such as riffle (pool ratios, residual pool depth), the index V* (a measure of the sediment which has filled in pools), cross-section, and thalwag profiles. Substrate conditions, such as percent of fine sediment in the total bulk core sample, median particle size, and riffle embeddedness are also indicators of the stream bed condition. Beneficial use impairment can be assessed by evaluating site specific suspended sediment concentrations, turbidity levels, and/or substrate conditions and comparing the data to threshold levels and/or critical aquatic life stage requirements.

   Under this alternative, a water body would be listed if any one of the following conditions were met:

   - **Beneficial use impairment caused by increased sediment loads.** This condition would require evidence that beneficial use impacts are caused by increased sediment loads. Evidence of beneficial use impacts could include documentation of adverse biological responses, degradation of aquatic life populations or communities, or restrictions on recreation, navigation, or other beneficial uses. Comparison to reference conditions within watersheds or ecoregions would be appropriate in order to establish these impacts, as would documented declines in aquatic populations and aquatic community diversity.
   - **Evidence that beneficial use impacts are caused by sediment should describe the link between the documented impact and the presence of sediment in the water, or stored in the channel.** This evidence could include documented occurrence of conditions that are recognized as having the impacts observed. For example, the filling of a stream's pools with fine sediment reduces rearing opportunities for certain fish and, as a consequence, reduces their populations. Where no single condition is compelling, multiple lines of evidence could support the determination that an impact has occurred, or that the impact is caused by sediment.
   - **Nuisance caused by sediment loads (CWC section 13050).**

Nuisance conditions could be documented through visual assessment or other methods conducted in a manner consistent with QA practices for reducing error and subjectivity.

- **Exceedance of turbidity objective, where turbidity is caused by increased suspended sediment loads.** Water bodies would not be listed for sediment based on turbidity unless it can be demonstrated that the cause of increased turbidity is an increased delivery of sediment. For example, increased turbidities that are related to reservoir releases should not lead to a sediment listing.

Determinations that Basin Plan turbidity objectives are exceeded, due to increased delivery of sediment, should be based on data collected from the water body over a period of time that accounts for the variable nature of sediment delivery and transport.

This alternative is the preferred alternative because waters would be listed based on sufficient credible data and information that indicate water quality standards for sediment are not met by comparison to acceptable evaluation guidelines, or that impacts to beneficial uses are caused by sediment. This alternative would result in no change to existing listings, and would help provide guidance if other sedimentation listings are proposed. At present there are 135 pollutant/water body combinations that are listed due to sediment impacts.

2. Provide specific guidance to interpret narrative objectives. Under this alternative, all the requirements of Alternative 1 would apply but the RWQCBs would also be required to compare data sets to selected evaluation guidelines in order to interpret sediment concentration or load data. A disadvantage of this alternative is that these evaluation values may not be applicable throughout the State.

   Scientific understanding of linkage between sediment supply and specific impacts to aquatic species in a given watershed is often poor because habitat conditions in streams are shaped not just by sediment load, but also by the interactions of stream flow and in-channel and streamside vegetation and obstructions. Literature related to suspended sediment/turbidity and streambed condition thresholds or life stage requirements and measurements that could possibly be used to interpret these impacts are reviewed briefly below.

   It is generally accepted that for fish, the severity of the effect of suspended sediment increases as a function of sediment concentration and duration of exposure. However, identification of a specific threshold causing impairment is difficult. While research to date is suitable for assessing effects of discrete suspended sediment (or turbidity) events, it is unsuitable for measuring the cumulative effect of multiple events over the course of a

storm season. Fish experience reduced short term feeding rates and feeding success when exposed to a suspended sediment concentration of 20 mg/L (milligrams per liter; parts per million) for three hours (Newcombe and Jensen, 1996). Additionally, juvenile and adult salmonids have been shown to undergo major physiological stress and experience long-term reduction in feeding rates and feeding success when exposed to suspended sediment concentrations exceeding 148 mg/L for a duration of six days (Bjornn and Reiser, 1991). Direct mortality of under yearling salmonids has been tied to suspended sediment concentrations of 1,200 mg/L, while concentrations in the 300 mg/L range caused reduced growth and feeding (Meehan, 1991). Feeding and territorial behavior have been reported to be disrupted by short term exposures (2.5-4.5 days) to turbid water with up to 60 NTU (nephelometric turbidity units) (Bjornn and Reiser, 1991). Juvenile coho salmon avoid water with turbidities that exceeded 70 NTU (Bisson and Bilby, 1982). Additionally, turbidities in the 25-50 NTU range (equivalent to 125-275 mg/L of bentonite clay) reduced growth and caused more newly emerged salmonids to emigrate from laboratory streams than did clear water (Sigler et al., 1984).

As the percentage of fine sediment (percent fines) in a channel increases as a proportion of the total bulk core sample, the survival to emergence decreases. The percent fines ≤0.85-mm (millimeter) is defined as the percentage of subsurface fine material in pool tail-outs ≤0.85 mm in diameter. Identifying a specific percentage of fines that can comprise the bulk core sample and still ensure adequate embryo survival is not clearly established. Research conducted in unmanaged streams (streams without a history of land management activities) in Washington recommended the use of 11 percent fines ≤0.85-mm as a target. Percent fines ≤0.85 mm ranged from four percent in the Queen Charlotte Islands to 28 percent on the Oregon Coast, with a median value for all the data of about 11 percent (Bjornn and Reiser, 1991).

A three-year study was conducted in Northern California streams, including three streams classified as unmanaged (Burns, 1970). The values for fines <0.85 mm ranged from 17 to 18 percent, 16 to 22 percent, and 18 to 23 percent. The numeric target representative of properly functioning conditions for fines <0.85 mm used in several TMDLs for North Coast streams is 14 percent. Another evaluation tool, V*, is representative of the in-channel supply of mobile bedload sediment (Lisle and Hilton, 1992). The usefulness of this parameter is further demonstrated by comparing annual sediment yields of select streams with their average V* values. The comparison indicated that V* is well correlated to annual sediment yield and quickly responded to changes in sediment supply. For example, V* values in French Creek, a tributary to the Scott River in the North Coast Region, decreased to approximately one-third the initial value soon after an erosion control program focusing

on roads was implemented. V* values for Elder Creek, an undisturbed tributary of the South Fork Eel River averaged only 0.09 (Lisle and Hilton, 1999). A study of over sixty streams in Northern California found that mean V* values of 21 percent or less represented good stream conditions (Knopp, 1993). The difference in the V* values is indicative of the variability inherent in V* measurements.

**Recommendation:** Alternative 1. See Policy sections 3.1.1, 3.1.2, 3.1.7.2, 3.1.8, 3.1.9, 4.1, 4.2, 4.7.2, 4.8, and 4.9.

*Issue 5E:* ***Interpreting Temperature Water Quality Objectives***

**Issue:** How should water temperature data be interpreted?

**Issue Description:**

> "Water temperature is a catalyst, a depressant, an activator, a restrictor, a stimulator, a controller, a killer, one of the most important and most influential water quality characteristics to life in water."- The Federal Water Pollution Control Administration (USEPA, 1986).

Temperature can adversely affect the beneficial uses of water. Beneficial uses that are related to temperature impacts include cold water fisheries; warm water fisheries; wildlife habitat; and aquatic organisms migration, spawning, reproduction, and endangered species.

Ambient water temperature is one of the most important factors affecting the success of fish and other aquatic life. With regard to coho salmon and steelhead trout, temperature influences growth and feeding rates; metabolism; development of embryos and juveniles; timing of life history events, such as upstream migration, spawning, freshwater rearing, and seaward migration; and food availability (North Coast RWQCB, 2000). Elevated temperatures can cause stress and lethality.

Water quality objectives for temperature are specified in Basin Plans and the "Water Quality Control Plan for Control of Temperature in the Coastal and Interstate Waters and Enclosed Bays of California" (SWRCB,1975). Generally, Basin Plans define temperature objectives in two parts:

> "The natural receiving water temperature in (intrastate and/or inland surface) waters shall not be altered unless it can be demonstrated to the RWQCB that such alteration in temperature does not adversely affect beneficial uses." (North Coast RWQCB, 1994)

> "At no time or place shall the temperature of any cold (and/or warm) freshwater habitat be increased by more than 5°F (2.8°C) above natural receiving water temperature." (North Coast RWQCB, 1994)

In most circumstances, natural receiving water temperature is not defined. The Thermal Plan describes natural receiving water temperature as "The temperature of the receiving water at locations, depths, and times which represent conditions unaffected by any elevated temperature, waste discharge, or irrigation return waters."

The major difficulty in assessing whether a water body is meeting water quality objectives requires making a determination of the natural receiving water temperatures. Determining "natural receiving water" temperature is

limited by the availability of historic temperature monitoring data that is considered representative of unaltered and/or natural conditions in a water body.

**Baseline:**

In 2002, section 303(d) listings were proposed for several North Coast rivers. These recommendations were based on evaluation of the Maximum Weekly Average Temperature (MWAT) data ranges, as compared to evaluation values for impacts on anadromous fish species. In addition, the temperature data were evaluated with respect to the current and historic presence of cold water fish. If a stream, which exhibits temperatures within the chronic reduced-growth MWAT ranges, and had a decreased salmonid fishery compared with historic levels, then it was listed using inferred historical stream MWATs. At present there are 37 pollutant/water body combinations that are listed due to temperature impacts.

**Alternatives:**

1. List using the Basin Plans objective(s) for temperature as the sole basis for listing. When data of sufficient quantity and quality are available, a comparison of current and "historic" or "natural" receiving water temperatures can be made to determine whether water quality objectives are being met.

   Determination of "natural receiving water" temperatures is limited by the availability of natural background and ambient temperature monitoring data for water bodies. Assessment of natural receiving water temperatures is complicated by the fact that water temperature of streams vary substantially due to drainage area, stream size, geographical location, riparian vegetation, seasonal climatic conditions, elevation, and other factors (Lewis et al., 2000). Consequently, there are no generally available natural receiving water temperature data sets for stream segments that can be used because these natural levels are so site-specific.

   Without natural receiving water temperatures it is impossible to interpret the Basin Plan and Thermal Plan water quality objectives.

2. List water body segments for temperature using an alternative approach focused on beneficial use impacts and likely effects of elevated temperature on sensitive species. "The evolution of freshwater temperature criteria has advanced from the search for a single 'magic number' to the generally accepted protocol for determining mean and maximum numerical criteria based on the protection of appropriate desirable or important fish species or both" (Brungs and Jones, 1977).

   When "historic" or "natural" temperature data are not available, alternative approaches could be employed to assess temperature impacts. The approach presented in this alternative deals with comparing recent temperature monitoring data for a specific water body to the temperature

requirements of resident aquatic life. In many cases, fisheries, particularly salmonids, represent the beneficial uses most sensitive to temperature. Information on the current and historic condition and distribution of the sensitive beneficial uses (e.g., fishery resources) in the water body is necessary, as well as recent temperature data on conditions experienced by the most sensitive life stage of the aquatic life species. If temperature data is from the past (historic) when the beneficial use was fully supported are not available, information about presence/absence or abundance of sensitive aquatic life species can be used to infer past temperature conditions. Therefore, this approach assumes that a decrease in the population and distribution of sensitive aquatic life species when compared to past levels is due, at least in part, to a change in temperature conditions.

Determination of life stage temperature requirements of sensitive aquatic life species should be based on peer-reviewed literature. Similarly, evaluation of temperature data should be based on metrics reflective of the temperature requirements for sensitive aquatic life species. For example, a common metric for assessing chronic (i.e. sub-lethal) effects on salmonids, is the MWAT, the mathematical mean of multiple, equally spaced, daily temperatures over a 7-day consecutive period (Brungs and Jones, 1977). The MWAT of a particular water body can be compared to MWAT growth requirements for salmonids.

To maintain growth of aquatic organisms at rates necessary for sustaining actively growing and reproducing populations, the MWAT, in the zone normally inhabited by the species during the season, should not exceed the optimum temperature plus one-third of the range between the optimum temperature and the upper incipient lethal temperature of the species.

MWATs are derived from a range of studies that looked at sub-lethal and acute temperature thresholds, incorporating information from laboratory-based research, field observations, and risk assessment approaches. Calculated MWAT metrics for growth range from 14.3°C to 18.0°C for coho salmon, and 14.3°C to 19.0°C for steelhead trout. This approach suggests that upper thresholds for the MWAT of 14.8°C for coho and 17.0°C for steelhead will reduce growth 10 percent from the optimum. Thresholds for the MWAT of 19.0°C for both coho and steelhead will reduce growth 20 percent from optimum (Sullivan et al., 2000).

While these thresholds relate to reduced growth, temperatures at sub-lethal levels also can effectively block migration, inhibit smoltification, and create disease problems (Elliot, 1981). Further, the stressful impacts of water temperatures on salmonids are cumulative and correlate to the duration and severity of exposure. The longer the salmonid is exposed to

thermal stress, the less chance it has for long-term survival (Ligon et al., 1999).

The upper lethal limit for salmonids ranges from 27°C to 30°C (Jobling, 1981). Acute threshold values, causing death or total elimination of salmonids from a location, range from 21.0°C to 25.5°C for coho, and 21.0°C to 26.0°C for steelhead (Sullivan et al., 2000).

In streams, however, temperature is not uniform in space or time. Therefore, a single exceedance of the temperature threshold does not necessarily mean that temperature conditions are impairing salmonids, and would not necessarily result in a determination of impairment. On the other hand, consistent exceedance of these thresholds in disperse monitoring locations throughout a sub-basin and over two or more seasons likely does mean that temperature conditions are impairing salmonids, and therefore, could lead to a determination that water quality standards are exceeded.

This alternative is the preferred alternative because it provides a mechanism for addressing potential temperature problems in the absence of often-unavailable temperature background data. This alternative is based on the assumption that aquatic life beneficial uses (e.g., cold and warm water fisheries) are most sensitive to modifications to natural temperature. Other beneficial uses that may also be affected by temperature include recreation and aquaculture; other approaches for assessing temperature impairment may be more appropriate for these beneficial uses.

**Recommendation:** Alternative 2. See Policy sections 3.1.2, 4.2, and 6.1.5.9.

*Issue 5F:* ***Interpreting Data Related to Adverse Biological Response***

**Issue:** How should data related to adverse biological response be interpreted?

**Issue Description:** An organism's response to pollutants is typically assessed with toxicity tests or by observation of changes in the biological population or community. There are also studies that address the exposure and response of individual organisms to chemical stressors. For example, adverse effects may be assessed 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, or reproductive organs, etc. Some abnormalities can, however, appear in the early stages of development of more damaging pathologies that may be reversible (these are indications of exposure rather than actual adverse effects).

**Baseline:** In 2002, listings for adverse biological response were not recommended. However, in previous lists (prior to 2002), some waters were placed on the section 303(d) list for abnormal fish histology.

**Alternatives:**

1. RWQCBs should interpret adverse biological response data on a case-by-case basis. Interpreting adverse biological response in an organism is a highly complex process. Complexities involve patterns of exposure, seasonal effects, bioavailability, age, gender, prior history of exposure and physiologic conditioning of the host, and species residence in the water bodies in question. Under this alternative, general guidelines would be outlined in the Policy.

   General guidance for adverse biological response would require the comparison of endpoints to reference conditions, the identification of pollutants suspected of causing or contributing to the adverse response, and the association of pollutants with an adverse response. Endpoints for this factor would be stated in the Policy but no specific evaluation values would be proposed. The endpoints would include fish kills, reduction in growth, reduction in reproductive capacity, abnormal development, histopathological abnormalities, and other adverse conditions. Evidence that pollutants or pollution are capable of causing or contributing to the adverse condition would be the same process as described in the toxicity testing section (Issue 5C). The major factors identified include:

   *Growth Measures:* Reductions in growth can be addressed using suitable bioassay through measurements of field populations.

*Reproductive Measures:* Reproductive measures must clearly indicate reductions in viability of eggs, 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, significant differences in viability, or development of eggs between reference and test sites. Toxicity testing is also a measurement tool used to identify impairment in reproduction.

*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.

A disadvantage of this alternative is the lack of specific guidance could lead to inconsistencies among RWQCBs depending on the expertise and experience of the staff preparing the water body listing assessments.

This alternative is the preferred alternative because due to the complexity of interpreting these types of measurements, RWQCBs would be given significant flexibility to interpret adverse biological response data.

2. <u>The Policy should establish specific guidance and evaluation tools to interpret adverse biological response data and information</u>. The Policy would provide specific guidance to interpret adverse biological response data. For example, specific methods for interpreting biomarker data (Okihiro and Hinton, 1996; Malins et al., 1987), histopathology data, or growth measures (Bay and Jirik, 1993; Cooper, 1995) could be provided. A process for interpreting adverse biological response in an organism would be presented in the Policy.

   Under this alternative, the Policy guidance for adverse biological response would require that RWQCBs use specified endpoints and approaches. Endpoints for this factor would be listed in the Policy and possibly specific cutoff values would be proposed.

The major disadvantage of this alternative is RWQCB would be limited by the approaches presented and would not be able to interpret the various kinds of data and information that may be submitted. These types of data are typically water body-specific; often are not collected using standard procedures; are usually the result of research projects; and are not part of major ambient monitoring programs. The only advantage is the more specific guidance could lead to greater consistency among RWQCBs.

**Recommendation:** Alternative 1. See Policy sections 3.1.8 and 4.8.

*Issue 5G:* ***Degradation of Biological Populations or Communities***

**Issue:** How should bioassessment information be used in determining whether a water body is attaining water quality standards?

**Issue Description:** The diversity and condition of biological communities reflect overall ecological integrity (i.e., chemical, physical, and biological integrity). Therefore, bioassessments are important for evaluating ecosystem health and providing crucial water quality planning information for managing more complex water quality problems (Barbour and Hill, 2003).

The effects of different pollutants such as excess nutrients, toxic chemicals, increased temperature, and excessive sediment loading are integrated by biological communities and provide an overall measure of pollutant impact. The response of biological populations and communities to stresses of all degrees often occurs over time. Therefore, information on disturbances within the community is not always evident with episodic water chemical measurements or discrete toxicity tests. The purpose of assessing the biological condition of aquatic populations and communities is to determine how well a water body supports aquatic life.

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

The analysis of community composition provides not only 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 environment. Due to the numerous forces influencing the composition of a community or population, it is often difficult to determine whether pollution or pollutants are responsible for such changes.

Bioassessment serves four primary functions or uses:

- Screening or initial assessment of conditions;
- Characterizing the magnitude of impairment;
- Assisting in the diagnosis of causes to impairment; and
- Monitoring of temporal trends to evaluate improvements or further degradation.

**Baseline:** In 2002, the section 303(d) list based listings on data types that considered degradation of aquatic life populations or communities and required multiple lines of evidence. Each of these multiple lines of evidence generally needed the pollutant(s) that caused or contributed to the adverse condition.

**Alternatives:**

1. Do not use bioassessment as a water quality indicator. This alternative would fail to meet the state's responsibility under CWA to protect and restore the biological integrity of the state's waters. Chemical, physical, and biological integrity define the overall ecological integrity of a water body. Biological integrity is a strong indicator of ecological integrity and serves as a useful measure of a water body's environmental status. Biological systems are more variable than the chemical and physical properties that were the basis of the state's water quality regulations.

   This alternative would also be contrary to USEPA's focus on the development of sound scientific approaches to determine the health of the nations aquatic ecosystems and the stressors most closely associated with the impairment. In keeping with its responsibilities under CWA, USEPA initiated, in the late 1980's, EMAP, a long-term research effort to enable status and trend assessments of aquatic ecosystems. EMAP addresses monitoring the conditions of estuaries, streams, and lakes in selected geographic regions, as well as examining the surrounding landscapes in which these resources occur. This is the first step in USEPA's overall strategy for environmental protection and restoration and EMAP forms the basis for the research needed to establish the condition of the nation's resources.

   Traditionally, RWQCBs have measured biological conditions indirectly, through the use of chemical-specific analysis and toxicity. These measures assess the suitability of a water to support a healthy community, but do not assess the communities health itself. Assessment of the biological community measures the resident aquatic community structure and function to determine biological and ecological integrity.

2. Interpret case-by-case. Assessing the biological condition of aquatic communities is an indication of how well a water body supports aquatic life. This indicator is measured against a reference condition--the baseline against which human effects can be compared. Understanding reference conditions requires distinguishing and classifying ecological systems within and between regions. It also requires defining standards for each of those systems, that is, quantitative benchmarks corresponding to conditions with little or no human influence (Karr and Chu, 1997).

   As RWQCBs seek to develop bioassessment programs, the lack of biocriteria for specific areas within each region leads to the interpretation

of impairment on a case-by-case basis. Currently, the SWRCB and the RWQCBs have only recently begun to use bioassessment programs to assess ecological conditions and there is no one program that is currently favored in the state. Five programs exist in California that have scientifically valid methods, similar purposes and scope, and could provide the framework for the implementation of a statewide bioassessment approach. In lieu of development of a statewide program, the RWQCBs should look to these programs for assistance:

- California DFG Aquatic Bioassessment Laboratory – California Stream Bioassessment Procedure (CSBP) – the most widely used in the state, CSBP was developed for point-source assessments. CSBP has collected nearly 9,000 samples at 2,500 sites. An adaptation has been developed for non-wadeable streams and ambient water quality monitoring.
- Lahontan RWQCB Biological Assessment Program – Sierra Nevada Aquatic Research Laboratory (SNARL) Method – the Lahontan RWQCB has collected samples using SNARL protocols. Since 2000, they have evaluated benthic macroinvertebrates, periphyton, and physical attributes using SNARL, CSBP, and the River Invertebrate Prediction and Classification Scheme (RIVPACS).
- USFS – Pacific Southwest Region Bioassessment Program – this program has established reference conditions by collecting macroinvertebrates from a network of perennial and intermittent wadeable streams on Forest Service Lands throughout the state.
- USGS: National Water Quality Assessment (NAWQA) Program – this program describes the status of and trends in the quality of surface water and groundwater to provide scientific understanding of natural and human-induced factors that assess water quality. NAWQA has assessed the Sacramento Basin, the San Joaquin-Tulare Basins and the Santa Ana Basin.
- USEPA Central Valley Regional Environmental Monitoring and Assessment Program (REMAP) – focuses on assessing the biological integrity of agriculture-dominated water bodies throughout the Central Valley. USEPA is also collecting bioassessment data in California as part of the EMAP Western Surface Water pilot study, a five-year research and monitoring project to assess the ecological condition of streams and rivers throughout the Western U.S.

With the lack of a statewide bioassessment program, guidance on the use of bioassessment data for listing decisions becomes increasingly important. While this alternative would give the RWQCBs added flexibility to develop bioassessment programs, it lacks the consistency necessary to ensure that listing decisions comply with this Policy and USEPA guidance.

3. Establish consistent value(s) to trigger listing. The implementation of an effective bioassessment program requires the establishment of consistent values that trigger listings. However, while a standardized program is important for the listing process, biocriteria still needs to be appropriately tailored to the regional setting.

*Options:*

A. **Use professional judgement of qualified scientists to interpret data.** The development of biocriteria relies on the examination of raw data in the field and in the laboratory. The need for interpretation of data by qualified scientists is necessary but expert judgement alone is not an acceptable substitute for scientifically valid data. Professional judgement can be incorporated into approaches using multivariate techniques and the regional reference approach. The use of professional judgement to interpret data is most valuable once quantitative criteria for determining what constitutes exceptional, good, fair, poor and very poor water body conditions has been established. At that point, professional judgement is but one of the components used to tailor the biocriteria process to regional conditions.

B. **Express factors in terms of changes in numbers, species diversity, indices of community metrics, etc.** Direct measurements of ambient biological communities including plants, invertebrates, fish, and microbial life have been used by many states as indicators of the health of a water body. Data on the biological assemblages present in a water body:

- Provide a functional definition of biological integrity,
- Minimize problems with interpreting the natural geographic and temporal variability of data by aggregating within regions of ecological similarity,
- Use reference conditions for specific geographic areas, and
- Combine several assemblage attributes to produce a single numeric measure of biological integrity.

Water body measurements require an indicator species or community which possess particular requirements with regard to a known set of physical or chemical variables, such that changes in presence/absence, numbers, morphology, physiology, or behavior of the species or community indicate that the given physical or chemical valuables are outside its preferred limits. The ideal biological indicator should have the following characteristics (Barbour et al., 1996):

- Taxonomic soundness and easy recognition,
- Cosmopolitan distribution,

- Numerical abundance,
- Low genetic and ecological variability,
- Relatively large body size,
- Limited mobility and relatively long life history,
- Well known ecological characteristics, and
- Suitable for use in laboratory studies.

There are indexes of biological conditions, which have been extensively developed for freshwater systems, and are effective for assessing ecological conditions in a variety of settings, with many taxa, and in diverse geographic regions. They are objective, scientifically rigorous, and easy to communicate to non-technical audiences.

One system, the Index of Biological Integrity (IBI) is a synthesis of diverse biological information, which numerically depicts associations between human influence and biological attributes. It is based on a combination of tested biological attributes (metrics or indices) that are sensitive to changes in biological integrity caused by human activities. The multi-metric (a compilation of metrics) approach compares what is found at a monitoring site to what is expected using a regional baseline condition that reflect little or no human impact (Barbour et al., 1999). The IBI provides a cumulative site assessment as a single score value and is the endpoint of a multi-metric analytical approach.

Another approach, RIVPACS uses empirical models that predict the aquatic macroinvertebrate fauna expected to occur at a site in the absence of environmental stress. RIVPACS sampling strategy and end product are similar to the IBI approach. However, these approaches use fish assemblages in assessing the quality of rivers and streams. In California, it is difficult to integrate metric values for fish into one IBI score because aquatic systems are: inherently low in species richness especially in trout streams; abundant in populations of introduced fish; and altered due to pressures from fish stocking and angling pressure.

A promising approach for California is the use of a benthic macroinvertebrates index (BMI) for water resource monitoring. Benthic macroinvertebrates are ubiquitous, relatively stationary and their large species diversity provides a range of responses to environmental pressures. Individual species reside in the aquatic environment from a period of a few months to several years and are sensitive, in varying degrees to temperature, DO, sedimentation, scouring, nutrient enrichment, and chemical and organic pollution. Aquatic invertebrates also represent a significant food source for aquatic and terrestrial animals. In addition to the advantages listed above, the taxonomy of many groups and the response of many species

are well known, and data analysis methods have been developed for community level bioassessment.

The California Aquatic Bioassessment Laboratory Network (CAMLnet) has current information on the taxonomy of macroinvertebrate taxa found in California streams and lakes (www.dfg.ca.gov/cabw/cabwhome.html). It also describes the standard level of taxonomic effort that has been defined for bioassessment projects using the CSBP. Specialized references are suggested for particular taxa.

C. **Identify appropriate reference conditions within watersheds or ecoregion.** Variation is fundamental to biological communities and measures of biotic integrity based on these communities vary accordingly. Most bioassessment techniques account for variation through the use of reference sites. Reference sites can be used to characterize the range of biotic conditions expected for minimally disturbed sites. The conditions of aquatic life found at these sites help to detect both the cause and level of risk to biological integrity at similar sites in a region. Reference sites determine the overall base condition for waters of a certain type within a region. In keeping with the strategy of not degrading the resource, interim reference conditions - like the criteria they help define - are expected to be upgraded with each improvement to the water resource. Biological criteria should not be based on data derived from degraded reference sites.

In order for a bioassessment program to be meaningful and defensible, the RWQCBs should strive toward objective procedures for selecting reference sites. This could include the use of Geographic Information Systems (GIS) to allow identification and selection of "minimally-impaired" reference sites based on objective criteria.

One approach for selecting reference sites has been developed by DFG in collaboration with SNARL. The approach uses GIS to identify areas within the region that exhibit minimal impacts (target areas). Suitable stream reaches within these target areas are identified resulting in reference sites for the region of interest. The procedure consists of the following five steps:

1. Define region of interest and classes of stream types to be evaluated,
2. Identify regions with major disturbances and quantify potential impacts to different areas within the region using GIS techniques,
3. Use GIS-based impact estimates to identify least-disturbed candidate areas in the region,

4. Undertake field reconnaissance of candidate areas for selection of reference sites for sampling, and
5. Assess local conditions quantitatively to confirm high quality environments.

Most reference sites selected in bioassessment studies have been selected for comparison to local conditions and have not been selected using common criteria that would allow comparison among projects. These studies have relied almost exclusively on BPJ in the selection of reference sites. While there is legitimacy in this approach, BPJ is rarely quantified and is not repeatable. This complicates comparison with other projects. Additionally, recent USEPA analyses indicates that reference sites chosen by BPJ often do not have significantly different biological signatures from sites chosen randomly. A standardized and objective approach to selecting reference sites would improve consistency and repeatability across bioassessment studies.

4. Use bioassessment data and information if associated with water and sediment measurements. Provide guidance on values for association assessment. Bioassessments are an effective tool for evaluating ecosystem health because biological assemblages (fish, macroinvertebrates, etc.) integrate relevant chemical, physical, and biological factors in the environment. However, bioassessment by itself may not present enough information to determine attainment for a particular water body, depending on its designated uses. Relying on bioassessment alone does not allow for determination of associated causes and sources of impairments necessary to determine attainment of a beneficial use.

   Evaluation of biological data begins with selection of a reference site. Wide variability among natural surface waters prevents the establishment of a single reference site. Reference sites may be established using historical data, unimpaired habitat or empirical data. Reference site selection should take into account the level of human disturbance, stream size, stream channel type, location, and historical records of resident biota.

   RWQCBs should clearly document how reference sites are selected and used. Specific guidelines for selecting reference sites are described in Alternative 3. Guidance is also available from USEPA on selecting reference sites. Using USEPA guidance (1990), RWQCBs can select site specific, upstream downstream, near field-far field, regional, paired watershed, or ecoregional reference sites.

   *Site-specific reference conditions* are used to evaluate impacts from point discharges on waters with strong directional flow and require a comparable habitat within the same watershed. This approach is difficult to establish when significant contamination from nonpoint sources exists,

extensive habitat modification has occurred, contamination comes from multiple sites, or the impacted site is significantly different than the reference site.

*Upstream-downstream reference conditions* are used in rivers and streams where habitat characteristics are similar above and below the point of discharge. This approach may be cost effective when bioassessment of the upstream reference condition reflects the attainable condition of the impacted site. However, assessment of several upstream sites may be needed to describe the natural variability of the reference biota.

*Near field-far field reference conditions*, effective for establishing reference sites in unique water bodies, measure habitat characteristics and the gradient of impairment. This approach may provide an effective method to establish biological criteria for estuaries, large lakes, or wetlands.

*Regional reference conditions* are based on the assumption that surface waters integrate the character of the land they drain. Reference sites, therefore, would incorporate ecological features, such as soil type, vegetation, land-surface form, climate and land use that directly or indirectly relate to water quality.

*Paired watershed reference conditions* are established by identifying similar unimpaired water bodies that are comparable to the type and habitat of impaired water. This method is used in the Rapid Bioassessment Protocols (Barbour et al., 1999).

*Ecoregional reference conditions* identify water bodies of similar type in regions of ecological similarity. Reference sites should be as minimally disturbed as possible, yet represent similar habitat type and be representative of the region.

Once reference sites are selected, bioassessment data should be used in conjunction with water and sediment measurements, physical habitat data, and other water quality data to support conclusions about the status of the water body. These methods should be used together to support an integrated water quality assessment, each providing an independent evaluation of nonattainment of a designated use. Bioassessment, water and sediment assessments, and habitat data provide different and complementary types of information about the source and extent of impairment.

Properly developed sampling methods, combined with the use of metrics and reference conditions, provides a direct measure of the ecological condition of a water body. The determination of impairment to beneficial

uses relies on the strength of the biological survey, as well as on the availability of quantitative data-intensive physical and chemical monitoring at all test sites and reference sites. This data is critical to the refinement of bioassessment models because it allows for the identification of physio-chemical factors that have the ability to influence natural community variation. The interpretation and assessment of toxicity measurements and sedimentation are discussed more thoroughly in Issues 5C and 5D respectively.

RWQCBs should describe the habitat they are sampling and why it was chosen. Sampling considerations should include adherence to strict QC procedures to provide consistency and avoid sampling error. RWQCBs should also document the index period (time of year and duration) when it will sample the condition of the biological community, or specify that it would sample year-round. Index periods should be established for a particular season, time of the day, or other window of opportunity when signals are determined to be strong and reliable. Further, only results from similar index periods should be compared.

**Bioassessment Guidelines**

To accurately assess degradation of populations and communities, RWQCBs should identify water bodies and ecoregions of interest and collect data from representative samples of water bodies in the target population (e.g., EMAP).

RWQCBs should clearly document how the natural variability of its biological data is determined. Classification of water bodies may be based on water body type (e.g., rivers, streams, lakes, wetlands, estuaries), watershed drainage size, ecological regions, elevation, temperature, and other physical features of the landscape and/or water body.

RWQCBs should also document how reference sites are selected and used. A reference condition, an empirical model of expectations that may include knowledge of historical conditions, or a model extrapolated from ecological principles can be derived from reference sites. A reference site may be natural, minimally impaired (somewhat natural), or best available (altered system). Actual sites that represent best attainable conditions of a water body should be used. Where reference sites are not available (e.g., for large ecosystems such as rivers, estuaries, nearshore coastal areas, and in significantly altered systems such as urban centers and cropland areas), a disturbance gradient may be constructed to extrapolate to an appropriate reference condition (Karr and Chu, 1997).

RWQCBs should verify the current conditions of candidate reference sites. A candidate site should be eliminated if conditions preclude its ability to serve as a reference for high-quality water.

RWQCBs should document both the assemblages used as indicators and the level of taxonomy used to assess them. Biological indicators can be separated into four principal assemblages that are used for assessing water quality standards attainment/impairment decisions: benthic macroinvertebrates, fish, algae, and aquatic macrophytes.

*Benthic macroinvertebrates* - Macroinvertebrate community structure generally is a function of past conditions in the specific water body. Genus/species taxonomic identification provides the most representative information on ecological relationships and best resolution in sensitivity to impairment. A representative of each taxon in the macroinvertebrate for each major basin, ecoregion, site class, or other appropriate study unit can serve as a basin record and reference for checking identification as well as providing a data quality check.

*Fish* - Bioassessments using a fish assemblage requires that all fish species (and size classes), not just game fish, be collected. Fish are good indicators of long-term effects and broad habitat conditions because they are relatively long-lived, mobile and integrate various features of environmental quality, such as food and habitat availability (Simon and Lyons, 1995). The objective of a fish assemblage is to collect a representative sample of all species (except rare species) in the assemblage and provide a measure of the relative abundance of species in the assemblage. All fish should be identified to species level.

*Periphyton or phytoplankton* - Algae are primary producers and responsive indicators of environmental change. The periphyton assemblage serves as a good biological indicator in streams and shallow areas because of its naturally high number of species and rapid response to exposure and recovery. Additionally, this assemblage integrates physical and chemical disturbances to a stream reach. Algae should be identified to the species level in rivers and wadeable streams. Identifying diatom genera in assemblages can provide valuable characterizations of biotic integrity and environmental conditions. For assessing lakes, phytoplankton assemblages should be sampled and counted and cells should be identified to the order or genus level.

*Aquatic macrophytes* - Aquatic macrophytes include vascular plants (grasses and forbs) and may be emergent or submergent. Vascular aquatic macrophytes are extensive primary producers and provide valuable habitat for fish and waterfowl. Important in estuaries and wetlands, macrophytes are identified to species level or categorized as emergent, submergent, or floating leaf for purposes of assessment.

There are three basic macroinvertebrate habitat types commonly used to sample aquatic organisms. They are artificial substrate, multihabitat, and single habitat. The following considerations should be met when selecting which one to sample: (1) adherence to strict QC procedures to provide consistency and avoid sampling error, (2) reliance in choosing a single habitat type based on its availability and dominance as a productive organism habitat (e.g., cobble in streams, kelp beds in coastal areas, or mud in estuaries), (3) preference for a multihabitat approach in systems with diverse habitat, and (4) use of artificial substrates, which leads to sampling habitat that is natural for the system(s) under study (e.g., rock baskets in cobble streams or lakes, or substrates to represent woody debris in streams). The RWQCBs should describe which habitat type it is sampling and why it was chosen.

Bioassessments are most useful when the sample is representative of the site examined and the assemblage measured; the data are an accurate reflection of that sample; and the methods distinguish natural and measurement variability (i.e., "noise") from a true environmental effect (i.e., "signal").

This alternative represents the preferred alternative because bioassessment of natural communities directly assesses the status of a water body relative to the primary goal of the CWA. General guidance is needed because of the diversity of measurements and analyses needed to interpret bioassessment data. Association of bioassessment data with water or sediment concentrations of pollutants is necessary to show that the population or community changes observed are potentially caused by pollutants.

**Recommendation:** Alternative 4. See Policy sections 3.1.9, 4.9, and 6.1.5.8.

*Issue 5H:* ***Trends in Water Quality***

**Issue:** How should trends in water quality (Antidegradation Policy and threatened waters) be used?

**Issue Description:** Waters that currently meet standards but show a declining trend in water quality may not meet antidegradation requirements and could be considered for inclusion on the section 303(d) list. Antidegradation is a primary component of water quality standards.

State Antidegradation Policy calls for maintenance of water quality where it exceeds existing water quality standards unless degradation will provide maximum benefit to the public, not unreasonably affect existing/potential beneficial uses, and not diminish quality below existing water quality objectives.

Federal regulation also calls for the identification of threatened waters as part of the section 303(d) listing process (40 CFR 130.2(j)).

**Baseline:** In 2002, all section 303(d) listing proposals were based upon data and information that showed water quality objectives were exceeded. No data and information used showed trends in water quality that did not also indicate standards were exceeded.

**Alternatives:**

1. Provide no guidance in the section 303(d) process on the use of the antidegradation component of standards or for threatened waters. Under this alternative, RWQCBs would be given significant latitude in deciding what constitutes a violation of the antidegradation portion of water quality standards or if threatened waters should be identified on the list. For each circumstance, RWQCBs would decide which waters to list after considering the available data and information. The Policy would not provide guidance on the analysis of data and information for the antidegradation portion of water quality standards or for threatened waters. Each RWQCB would address trends in water quality, threatened waters, and antidegradation in their own manner. This alternative was used for section 303(d) listing decisions before 2002.

   This alternative may foster inconsistent interpretation of antidegradation requirements because each RWQCB would develop its own set of decision rules. Existing practices would continue and it is likely that many waters that show declining trends in water quality would not be considered for the section 303(d) list.

2. Provide general guidance on trends in water quality. The goal of many monitoring programs is to identify changes or declining trends in water quality over time. If trends in pollutant concentrations are declining to

levels that may eventually not meet water quality objectives, it is possible that the antidegradation provisions of water quality standards are not met or that water might be threatened. Consequently, numeric, pollutant-specific water quality objectives need not be exceeded to satisfy this listing factor.

Data and information to properly substantiate the decline of water quality requires the application of unique trend analysis approaches to account for such factors as seasonal or weekly systematic variations, and auto-correlation in the data due to interventions or sampling procedural changes. Such approaches currently exist and are accepted for documenting trends in water quality (USEPA, 2000a). Although there are some trend data already available from some long-term monitoring programs the data may be statistically difficult to analyze and interpret because of problems with the characteristics of the data mentioned above (Gilbert, 1987). The RWQCBs should take into consideration the following factors in specifying statistical approaches used to evaluate the declining trend in water quality measurements:

**Changes in analytical procedures**

If analytical procedures are changed during the implementation of a long-term monitoring program, changes in the trend may be due to these changes alone and not due to the underlying factors that influence the pollutant or condition data. These problems can be reduced through side-by-side comparisons of the methods (Gilbert, 1987). Changes in analytical detection can also have a large effect on the trend. If detection limits are lowered and censored data are used in the trend analysis, this change could induce an artificial downward trend (Smith and McCann, 2000).

**Seasonal changes**

Many water quality parameters change seasonally making it difficult to identify trends. To characterize seasonal changes, data should be available for several years and, depending on the circumstances, more than two seasons should be available.

**Correlated data**

When analyzing trend data using statistical procedures, it is important that measurements be independent. In trend analysis, data collected at closely spaced sites or over relatively short periods of time can be positively correlated and not independent.

**Baseline conditions**

The significance of trends is compared to a time or series of measurements early in the monitoring effort to establish baseline conditions. If less accurate or precise data are used during the early stages of the monitoring

effort, it may induce an artificial downward trend merely because of the analytical methods used (Smith and McCann, 2000).

Specific guidance on trend analysis that applies to the variety of circumstances encountered cannot be provided. General guidance for assessing trends in water quality include:

1. Using data collected for a minimum of three years [data covering several years are needed to address systematic variation such as seasonality (USEPA, 2000a)];
2. Establishing specific baseline conditions;
3. Specifying statistical approaches used to evaluate the declining trend in water quality measurements;
4. Specifying the influence of seasonal effects, inter-annual effects, changes in monitoring methods, changes in analysis of samples, and other factors deemed appropriate;
5. Determining the occurrence of adverse biological response, degradation of biological populations and communities, or toxicity; and
6. Assess whether the declining trend in water quality is expected to not meet water quality standards by the next listing cycle.

Waters should be placed on the section 303(d) list if the declining trend in water quality is substantiated (steps 1 through 4 above) and impacts are observed (step 5). It should also be acknowledged in the Policy introduction that waters should be listed where water quality standards are not expected to be met by the next listing cycle (currently two years).

**Relationship to Antidegradation Requirements**

Federal antidegradation policy applies to situations where existing water quality may be changed. These situations include: establishment or revision of water quality objectives, changes in water quality objective implementation procedures, permit and waste discharge requirement decisions, some cleanup and abatement orders, remedial action plans, waivers or exceptions from Plans, and water right decisions. Where the antidegradation policy applies, it does not absolutely prohibit changes in water quality. The application of the policy depends on the conditions existing in water bodies. The antidegradation policy (40 CFR 131.12) lays out a three-tiered approach for the protection of water quality.

"Tier I" (40 CFR 131.12 (a)(1)) of antidegradation maintains and protects existing uses and the water quality necessary to protect these uses. "Tier II" (section 131.12(a)(2)) protects the water quality in waters whose quality is better than that necessary to protect "fishable/swimmable" uses of the waterbody. Outstanding national resource waters (ONRWs) are

provided a high level of protection under the antidegradation policy ("Tier III").

The focus of the Listing Policy provisions related to trends is focused on determining compliance with Tier I or Tier III. In general, States must assure protection of beneficial uses, including aquatic life. Reductions in water quality (declining trends) should not be allowed if this change would result in serious harm to any species found naturally in the water. Water quality must be maintained at levels that result in no mortality or significant growth or reproductive impact of resident species (Attwater, 1987). If numeric water quality standards are met but there is a declining trend (the prohibited change in water quality) and beneficial uses are impacted, the antidegradation portion of standards is not met.

Tier II waters are not addressed under the Listing Policy because (1) no action or activity is being proposed that would require a finding that the lowered water quality is necessary to accommodate important economic or social development in the area in which the waters are located, (2) beneficial uses are not impacted, and (3) numeric water quality objectives are achieved.

This alternative represents the preferred alternative because trends in water quality should be used to assess compliance with the antidegradation portion of standards and to address threatened waters. General guidance should be used because very specific guidance might not be applicable to the wide range of trend data that may be encountered.

**Recommendation:** Alternative 2. See Policy sections 1, 3.1.10, and 4.10.

## *Issue 6: Statistical Evaluation of Numeric Water Quality Data*

**Issue:** Should statistical procedures be used to evaluate numeric water quality information for section 303(d) listing and delisting decision-making?

**Issue Description:** Decisions to list or delist a water body should be based on accurate, representative, and verifiable information and on up-to-date conditions in the water bodies in question. However, water quality conditions can rarely be known at all times and at all water body locations. If the section 303(d) process is to be consistent, a methodology is needed to assess the validity of the water quality data. Information submitted to RWQCBs and SWRCB is often qualitative (i.e., verbal, anecdotal, photographic, or otherwise non-numeric). When quantitative data is submitted (i.e., samples of water column chemistry, bacterial colony counts, concentrations of pollutants in sediment, and chemical concentration in fish tissue, etc.), it often needs to be appropriately summarized and assessed to reach accurate listing decisions.

To help resolve these concerns, scientists commonly rely on careful sampling methodologies and statistical test procedures to help ensure that decisions made, based on inferences from sampled data, are as error-free as possible. Proper statistical procedure is intended to help answer the question: Does a water quality sample accurately reflect actual conditions in the water body?

Statistics helps raise confidence in decisions that are based on limited information. Statistical tools can assist in the handling and processing of numeric information that might otherwise be confusing, or at times contradictory, leading to clear, meaningful, and defensible conclusions about actual conditions in the water body.

Section 303(d) listing decisions can be made with or without reliance on statistical assessments of sampled data. However, the lack of statistical assessment on numeric water quality data could affect the confidence in and reliability of section 303(d) listing decisions.

**Relationship between water quality standards and statistics**

Concern has been raised that statistical analysis of water quality data will result in an inappropriate revision of existing water quality objectives or criteria. This concern was addressed by USEPA in its Consolidated Assessment and Listing Methodology (CALM) guidance (USEPA, 2002a). The following briefly describes the relationship between existing water quality standards and statistical analysis of data to assess compliance with standards.

Water quality criteria and objectives apply to water segments in their entirety—to every portion of a water body. USEPA has described these types of criteria as "ideal standards" (USEPA, 2002a). Ideal standards include USEPA acute and chronic chemical criteria or criteria set as maximum levels not to be exceeded. Ideal standards rarely address variation or uncertainty; therefore assessment of attainment implies that available monitoring data provides a perfect understanding of chemical concentration throughout the population (i.e., at all points in the water segment and at all times).

Water quality monitoring programs are not capable of monitoring all points in a water segment and at all times. Consequently, monitoring programs collect samples in water segments to determine attainment with water quality standards. Sampling water segments requires that scientists estimate the characteristics of water segments based on the characteristics observed in the water samples. Unfortunately, sample characteristics are not always identical to characteristics in the entire water body. Additionally, sampling introduces inherent bias from the sampler. For these reasons, sampling introduces variability, uncertainty, and the potential for error.

Statistical analysis provides the means to produce a quantifiable level of confidence that a water body achieves or does not achieve a water quality standard. Statistical tests assess with known certainty whether ideal standards are attained or not attained. With respect to the section 303(d) list, the end product of statistical testing is the number of samples, representative of the water body being sampled, that exceed the water quality standard out of all samples available.

Water quality standards themselves are not changed by statistical analysis. Statistics test the validity of the sample and provides the numerical means to verify compliance based on imperfect and randomly variable sampling data. Further, the use of statistics, as described in the proposed Policy, is to be used only for the purpose of developing the section 303(d) list. If standards were changed by the use of statistical analysis then the standards would be different for all purposes (i.e., development of effluent limits, enforcement, etc.). The use of statistics to assist in the development of the section 303(d) list does not change the calculation of effluent limits derived from water quality objectives or criteria nor does section 303(d) statistical analysis change the level of enforcement of water quality standards.

If a State's listing methodology is inconsistent with existing water quality standards, USEPA is compelled by CWA to disapprove the State-submitted section 303(d) list and make its own listing decision. A challenge to one state's listing process based on statistical analysis has

been found to neither formally nor in effect establish new or modified existing water quality standards or policies generally affecting those water quality standards (Florida Public Interest Group et al. vs. USEPA et al., 2003).

**Baseline:** During prior section 303(d) listing/delisting activities, RWQCBs gathered and received numeric information but little or no statistical validation of data was employed by any RWQCB in making recommendations to the SWRCB.

**Alternatives:**

1. Do not require that information gathered or submitted in support of section 303(d) listing/delisting activities be evaluated with statistical procedures. This alternative provides the RWQCBs the greatest flexibility, possibly leading to listing/delisting recommendations lacking statistical or other verification. If statistics were used without guidance from the Policy, statistical methodology could vary significantly from region-to-region. RWQCBs might choose to forego statistical analysis.

   The advantage to this alternative is that it gives the RWQCBs the least regulatory constraints and would not increase the RWQCBs workload. RWQCB staff could rely on BPJ in reaching conclusions based on numeric information.

   A disadvantage to this alternative is the chance that water bodies may be listed or delisted erroneously increases. At the very least, it would be impossible to predict listing decisions with a given dataset and to understand and quantify decision error. Inconsistencies in section 303(d) list decision-making would continue among the RWQCBs, and SWRCB would have difficulty justifying and defending final listing/delisting decisions.

2. Require that information gathered or submitted in support of section 303(d) listing/delisting activities be evaluated with statistical procedures. This alternative would require that the RWQCBs base section 303(d) recommendations on valid statistical procedures for analysis of numeric water quality data. An appropriate statistical procedure would be presented in the Policy and proposed for use in section 303(d) listing recommendations. Appropriate scientific/statistical methodologies would be followed and guidelines recommended for establishing hypotheses to be tested, sampling design, numeric analyses, and statistical testing.

   This alternative is the preferred alternative because this alternative would increase confidence in section 303(d) decision making, allow quantification in the level of assurance (i.e., that decisions are correct), increase decision predictability, and follow standard scientific protocols

for decision-making based on numeric information. The disadvantage of this alternative is that it would require additional effort by RWQCB and SWRCB staff in evaluating information.

**Recommendation:** Alternative 2. See Policy sections 3 and 4.

The following sub-issues 6A though 6E describe various considerations and provide recommendations necessary to develop a consistent standardized set of tools and principles that can be used across the Regions to evaluate numeric data. Each of the sub-issues assumes the recommendation of this issue.

*Issue 6A:* ***Selection of Hypotheses to Test***

**Issue:** Which preliminary hypothesis should be tested in order to determine whether a water body should be placed on the section 303(d) list? What hypothesis should be tested to remove the water body from the list?

**Issue Description:** Hypothesis testing evaluates individual hypotheses about the population (i.e., water body or segment) and eliminates those that do not pass statistical muster, until one hypothesis appears to satisfy the facts (based on sampling data) and, therefore, can not be rejected. In statistics and in science in general, likely hypotheses are never proven; they are simply not rejected and stand until, possibly another hypothesis takes its place.

Hypothesis testing begins by selecting a *null hypothesis* ($H_0$). The null hypothesis assumes that the testable statement (based on sampling data) will be "no different" from (or less than or equal to) some particular value or range of values. If the null hypothesis cannot be rejected based on statistical tests performed on sample data, information about the population as a whole can be inferred with a certain degree of confidence. If, on the other hand, the null hypothesis is rejected (i.e., found likely to be false), then an *alternative* or *alternate hypothesis* ($H_a$) must be considered.

More complete and technical descriptions of statistics and hypothesis testing are presented in USEPA (2000a, 2000b) and CALM (USEPA, 2002a).

In analyzing many experimental and field sampling situations, a number of null and alternative hypotheses may be possible. However, for section 303(d) listing and delisting, only two general premises need to be considered:

1. The water body in question achieves water quality standards.
2. The water body does not achieve water quality standards. [2]

The critical question for section 303(d) listing activities is which form of the two hypotheses should be used as the null hypothesis?

[2] More precise forms of these two alternative hypotheses are: $\theta \leq k$, and $\theta > k$, where $\theta$ represents a (population) pollutant parameter of concern (e.g., [dissolved copper]) and k is an applicable water quality criterion (for those criteria that are upper boundaries).

**Considering Errors in Hypothesis Testing**

The choice of null hypothesis is important because the form of the initial assumption to be tested determines which of two types of statistical error can be most easily controlled. One type of error takes place when a water body is incorrectly listed (or delisted); the other, when a water is erroneously not listed (or not delisted).

Decision error may occur when an incorrect conclusion is reached about the total population (i.e., water body or segment) because the collected sample data, by chance, has been misleading or unreliable. For example, when sampled data for a particular water body is analyzed to determine if beneficial uses are impaired, the assumption of the initial (null) hypothesis to be tested is: The water body is meeting water quality standards. If this hypothesis is indeed correct (i.e., the water body is not impacted) and the statistical analysis leads to that conclusion, then a correct decision to not reject the null hypothesis will be made. Therefore, beneficial uses are not impaired and the water body will not be recommended for placement on the section 303(d) list.

On the other hand, the samples, by chance, can indicate a greater degree of impairment in the particular samples than actually occurs across the water body as a whole. In that case, the samples would not represent the true population and, an erroneous conclusion would be made that the water segment as a whole does not meet water quality standards. Following proper statistical procedures, the null hypothesis would be rejected and the water would mistakenly be recommended for placement on the section 303(d) list. This is an example of a *Type I error*, incorrectly rejecting a true null hypothesis (Figure 14).

However, if the null hypothesis is false (i.e., the water is impacted) an error can still be made if the non-representative sample data, by chance, suggests that the water body is not polluted although as a whole it really is. This is called a *Type II error* (failing to reject an untrue null hypothesis).

In similar fashion, if the null hypothesis states the water body is not meeting water quality standards (i.e., it is assumed from the start to be polluted), unreliable data can again lead to either a Type I or Type II error (refer again to Figure 14). In those cases, the form of the starting premise (null hypothesis) is the opposite of what it was in the first example; therefore, the precise forms of the Types I and II error will likewise be reversed.

| Decision | Reality | |
|---|---|---|
| | **$H_0$ is True** | **$H_0$ is False** |
| Reject $H_0$ | **Type I (false positive) Error** | **Correct Decision** |
| Do not reject $H_0$ | **Correct Decision** | **Type II (false negative) Error** |

FIGURE 14: THE TWO TYPES OF STATISTICAL ERROR

**Importance of the Form of the Null Hypothesis**

The null hypothesis, $H_0$, represents an assumption that has been put forward, either because it is believed to be true or because it is to be used as a basis for argument, but has not been proved. Once data have been analyzed in an attempt to reject a null hypothesis, the null hypothesis is rejected only if the evidence against it is sufficiently strong. The alternative hypothesis, $H_a$, on the other hand, is a statement of what a statistical hypothesis test is set up to establish.

If it is concluded that the null hypothesis cannot be rejected, it does not mean that the null hypothesis is true, it only suggests that there is not sufficient evidence against $H_0$ in favor of $H_a$.

The form of the null hypothesis is important for at least two reasons, relating to the two types of error. The first reason is ability to limit, and hence control, Type I error. Most basic statistical tests only allow direct control (i.e., limitation) over Type I error rates. The form of the Type I error depends directly on the form of the null hypothesis.

Statistical tests are designed *a priori* to allow the maximum Type I error to be directly chosen, and hence controlled. For example, if a

Type I error rate is desired no more than 10 percent of the time (i.e., sampling data are correct 90 percent of the time), the statistical test calculations can be directly manipulated to achieve that goal (or at least approach it as mathematically close as a particular sample size will allow).

Type II error rates, on the other hand, cannot be so easily controlled within most statistical tests. Type II errors are lowered (controlled) most effectively by increasing sample size, increasing the size of the effect, or decreasing the overall range/distribution of sample values. Fortunately, when only two opposing hypotheses are being considered, Type I and Type II errors change places depending on which hypothesis is chosen to be the null hypothesis.

**Baseline:** No hypothesis testing or choice of null hypothesis was performed by the RWQCBs on previous section 303(d)-related data.

**Alternatives:**

1. <u>The form of the null hypothesis is: the water segment meets water quality standards</u>. To place waters on the section 303(d) list, the form of the null hypothesis and alternate hypothesis would be:

   $H_0$: The water segment meets water quality standards.
   $H_a$: The water segment does <u>not</u> meet water quality standards.

   To remove waters from the section 303(d) list, the two hypotheses would be reversed:

   $H_0$: The water segment does not meet water quality standards.
   $H_a$: The water segment does meet water quality standards.

   For listing, if $H_0$ is rejected then the evidence is considered to be sufficiently strong to say the water body does not meet water quality standards. Only waters where it is demonstrated that standards are not met would be placed on the section 303(d) list. For this alternative, a Type I error would be to erroneously list a "clean" water body. A Type II error would be to fail to list a water segment with a real water quality problem. The water segments placed on the section 303(d) list would be those water bodies where there is sufficient information to reject the null hypothesis and accept the alternate hypothesis.

   With most statistical tests, this form of null hypothesis would result in greater control over the potential (Type I) error of inadvertently listing a water segment that should not be listed because there is not a real water quality problem. With this form of null hypothesis, the error of failing to identify and list a truly

polluted water body is a Type II error. Direct control of Type II error is difficult to achieve unless the amount of evidence is increased (i.e., more samples taken), Type I errors are increased, the effect size (or critical exceedance rate) is increased, or pollution levels are lowered (USEPA, 2002a). A disadvantage of this null hypothesis is that there may be reduced incentives to increase sample sizes because more data may indicate that water quality standards are not being met and the water should be listed.

To mitigate which error should be controlled, statistical errors could be balanced so the tests performed would control both types of statistical error (Smith et al., 2001; Commenter 51). Taking a balanced error approach would protect against the error of incorrectly adding water bodies to the section 303(d) list and would protect against the unnecessary expenditure of funds developing TMDLs when the water segment does not have a water quality problem. At the same time, an error balancing approach would guard against missing real water quality problems that might go undetected.

With an error balancing approach, direct control of Type II error would be addressed by taking into account the amount of evidence available and the effect size (USEPA, 2002a). If errors are balanced in this way, this alternative may increase incentives to increase sample sizes because the collection of more data may increase the possibility that waters would be removed from the list.

This alternative is the preferred alternative because it would give SWRCB and the RWQCBs the greatest control over the error of incorrectly adding water bodies to the section 303(d) list and, therefore, helps protect against the unnecessary expenditure of funds developing TMDLs when the water segment does not have a water quality problem.

2. The form of the null hypothesis is: The water segment does not meet water quality standards. To place waters on the section 303(d) list, the form of the null and alternate hypothesis would be:

   $H_0$: The water segment does not meet water quality standards.
   $H_a$: The water segment meets water quality standards.

   To remove waters from the section 303(d) list, the hypotheses would be:

$H_0$: The water segment does not meet water quality standards.
$H_a$: The water segment meets water quality standards.

For listing, if $H_0$ is rejected then the evidence is sufficiently strong to say the water body meets water quality standards. The section 303(d) list would include all the waters where $H_0$ is not rejected. Using this form of the null hypothesis, a Type I error would be failing to list a polluted water body. A Type II error would be incorrectly listing a non-polluted water body.

Under this alternative, the RWQCBs and SWRCB would again have direct control over Type I error; but in this case, Type I error would be the likelihood of failing to list a water body that should be identified as impacted. As a result, this alternative is conservative in the sense that the baseline condition (the water body does not meet water quality standards) becomes the de facto decision when there is insufficient evidence to refute it (USEPA, 2000b). Consequently, while waters that do not meet standards would be placed on the section 303(d) list, the potential to place waters on the list with inconclusive data would be great. If the null hypothesis is rejected, the accepted alternate hypothesis represents those waters that meet water quality standards.

This alternative gives the SWRCB and the RWQCBs the greatest control over the error of incorrectly missing water segments that should be on the section 303(d) list. Using this form of the null hypothesis controls the error of not identifying real water quality problems that can have impacts on aquatic life or human health. In addition, this alternative may encourage additional monitoring (USEPA, 2003b).

A disadvantage of this alternative is that TMDLs would likely be required for waters where they are not needed. However, if statistical errors are balanced, as described in Alternative 1, these problems would be mitigated and the difference between Alternative 1 and this alternative would be reduced (Smith et al., 2001).

**Recommendation:** Alternatives 1. See Policy sections 3 and 4.

*Issue 6B:* ***Choice of Statistical Tests for the Evaluation of Water Quality Data***

**Issue:** Based on the need to use statistical analysis to help develop the section 303(d) list and selection of an initial null hypothesis to anchor those analyses, what statistical test(s) should be used to evaluate water quality sample data?

**Issue Description:** A number of statistical tests can be used to evaluate water quality sample data and assess compliance with water quality standards. All of these tests have their strengths and weaknesses. For the purpose of assessment of standards attainment a statistical test used to analyze water quality data should have as many of the following desirable traits as possible:

- Accurate with relatively small sample sizes.
- Easy to calculate.
- Easy to understand and interpret.
- Relevant and applicable to data from different types of distributions.
- Accurately handles the characteristics of water quality data. In particular, deals successfully with magnitude, frequency, and spatial and temporal variations in water quality values.
- Applicable to water quality objectives, water quality criteria, and the array of evaluation guidelines that may be available.

Descriptions of statistical concepts that may assist in understanding statistical analysis of data have been summarized by USEPA (2000a, 2000b, and 2002a).

**Baseline:** In previous section 303(d) listing processes, RWQCBs performed little or no statistical or quantitative analyses on water quality data. In the development of the 2002 section 303(d) list, most RWQCBs and SWRCB used the USEPA raw score approach.

**Alternatives:** Ten alternatives are presented in this issue paper. For convenience, brief summaries of the statistical tests are presented in Table 13. The table includes the statistical test, the test's major assumptions, major limitations, and reference.

TABLE 13: COMPARISON OF STATISTICAL AND QUANTITATIVE TESTS AVAILABLE FOR SECTION 303(D) ANALYSES

| Statistical Test | Assumptions | Disadvantages | Reference |
|---|---|---|---|
| 1. USEPA "Raw Score" Method | Random sampling<br>Independent sampling | High Type I error | USEPA, 1997c |
| 2. One Sample Student's t-test for the Mean | Random sample<br>Independence of data values<br>Data approximately normally distributed | Greatly influenced by outliers<br>Difficulty using "less-than" data (i.e., values below the detection limit) | USEPA, 2000a; USEPA, 2002a |
| 3. Wilcoxon Signed Rank (One-Sample) Test for the Mean | Random sample<br>Independence of data values<br>Data symmetric continuous distribution | Repeated data values produce misleading result | USEPA, 2000a; USEPA, 2002a |
| 4. The Chen Test (Modified One-Sample t-test for the Mean) | Random sample<br>Independence of data values<br>Data are from a skewed data set | Difficulty using "less-than" values | USEPA, 2000a; USEPA, 2002a |
| 5. One-sample Proportion Test | Random sample<br>Independence of data values | Difficult to use with small sample sizes | USEPA, 2000a |
| 6. Percent Lower Confidence Limits | Random sample<br>Independence of data values<br>Data approximately normally distributed or lognormally distributed | Influenced by outliers<br>Difficulty using "less-than" data<br>Not widely used | Gibbons, 2001 |
| 7. Exact Binomial Test (Fixed Significance Level) | Random sample<br>Independence of data values<br>Data is dichotomous (only two possible answers)<br>Exceedance probability remains constant<br>Population of samples is infinite | Does not consider absolute data magnitude<br>High Type II error ($N < 20$)<br>Loss of information (raw values changed to nominal ["yes"/"no"] information) | USEPA, 2002a; Lin et al., 2000 |
| 8. Exact Binomial Test (Balanced Alpha and Beta Errors)—Acceptance Sampling by Attributes | Same as for the Exact Binomial Test (Fixed Significance Level) | Does not consider absolute data magnitude<br>Error rates can be balanced at any desired level<br>Loss of information (raw values changed to nominal ["yes"/"no"] information) | USEPA, 2002a; Smith et al., 2002; Gibra, 1973 |

| Statistical Test | Assumptions | Disadvantages | Reference |
|---|---|---|---|
| 9. Bayesian Version of Binomial Test; Bayesian Test using a normal distribution | Same as for Exact Binomial Test<br>Same as for other parametric tests assuming the normal distribution | Prior information about likely violation rates required.<br>Difficult/complex calculations | Smith et al., 2001; Ye and Smith, 2002 |
| 10. Exact Hypergeometric Test | Random sample<br>Independence of data values<br>Data is dichotomous<br>Exceedance probability remains constant<br>Population of samples is finite | Does not consider absolute data magnitude<br>Limited to use when samples are made from finite populations | USEPA, 2002a |

1. Use of the USEPA "Raw Score" Method. This procedure involves evaluation of data collected from a water segment for constituents of concern and comparing results against applicable criteria. The test statistic is the number of sample results that are greater than an applicable criterion in some critical percentage of the samples (USEPA, 1997c). This critical exceedance rate has traditionally been established based on USEPA guidance [e.g., 10 percent exceedance rate for conventional pollutants (USEPA, 1997c); <25 percent depending on the pollutant (SWRCB, 2003a)]. Under this procedure, if more than the critical percentage of samples exceeds the standard, the water body is deemed not to meet water quality standards for that pollutant and the water body in question is placed or remains on the section 303(d) list.

   This is a rigid and absolute test: any exceedance above the critical exceedance percentage is cause for listing, whether values come from a small or large sample. The approach also does not consider the absolute magnitude of the measurements being assessed. Since sample sizes are rarely multiples of ten, actual sample ratios must be rounded off.

   The disadvantages of this type of test is that the associated Type I error rate is high in comparison with certain other types of tests (e.g., the exact binomial; see Issue 6D). As Figure 15 shows, with the cut-off exceedance rate set at ten percent, the Raw Score Approach results in no less than a 20 percent Type I error rate (Smith et al., 2001). Usually the rates are much higher (e.g., to 60%) and these error rates are not reduced by larger sample sizes. If Type I error is of concern this test results in unacceptably high false positive error rates.

   The advantages of this approach are that it is very simple to calculate and understand; the chance of making a Type II (false negative) error is

significantly lower than for some other tests (Figure 16). The lower Type II error is at the expense of high Type I error (listing when a problem does not exist). Using this test, it is less likely to fail to reject a false null hypothesis.

The Raw Score Approach does not explicitly manage error rates and it has been suggested that the approach be replaced with other statistical approaches (Smith et al., 2001). USEPA does not recommend this approach in the CALM Guidance (USEPA, 2002a) but does recommend its use in limited circumstances in guidance for developing the 2004 section 303(d) list (USEPA, 2003b).

2. One-Sample t-Test. Student's t-Test is a parametric test with the primary assumptions being random, independent sampling and approximate normality of the data (USEPA, 2000a). It is frequently used to compare means from two samples. However, a variation may be used to compare a mean from one sample to a set criterion. In this case, the mean (or arithmetic "average") of sample values is compared to a regulatory threshold value. If the sample mean were equal to or below the critical value, an action (e.g., listing) would not take place. If the mean were found to be above the action level, the water body would be listed.

   Sample data are used to calculate the sample mean and standard deviation. A "t" statistic is then calculated and compared to a tabular value for the correct sample size. The tabular results tell whether or not to reject the null hypothesis (i.e., that as a whole the sample is significantly different—below or above—a critical value).

   This test and its results are well understood and relatively easy to calculate and interpret. It is "robust" against moderate deviations from normality. As for most statistical tests, larger sample sizes improve this test's reliability and like other tests related mathematically to the mean, variance, and standard deviation, this test is sensitive to outlier values.

   Because the mean is greatly influenced by outliers, this may not always be a reliable statistic. All alternatives dealing with the mean have similar disadvantages, related to limitations of dealing with a measure of central tendency. All measures of central tendency may not be informative of the range and distribution of the sample. These estimators (sample statistics) are helpful primarily when the sample distribution is symmetrical and not subject to significant outliers.

   Also, the t-test does not deal reliably with sample values below the detection limit. Although the test operates reasonably well with non-normal data, as for all parametric tests the normality of the sample data should be assessed. Confirming assumptions of this test would add another step to the section 303(d) analytical process and require increased

workloads for RWQCBs. Although recommended by USEPA, it is unknown if any state uses this statistical test in the section 303(d) listing and delisting processes.

3. One-Sample Wilcoxon Signed Rank Test. Using this nonparametric test, raw data values are transformed into *ranks* and can be used to test hypotheses about the mean or median of a population (USEPA, 2000a, 2002a). The sample data are not assumed to be from a normal distribution. To use this test, sample data are assumed to have been collected randomly from a symmetric continuous population of values. A detailed explanation of the test and an example calculation using the method is presented by USEPA (2000a, 2002a). Although recommended by USEPA, it is unknown if any state uses this statistical test in the section 303(d) listing and delisting processes.

   Symmetry is an important assumption, and should be satisfied for this test to work properly. If sample values do not give a symmetrical frequency distribution, which may happen frequently with water quality data, then this test may be inappropriate. The t-Test is more resistant to inaccuracies due to deviations from its assumptions then is this nonparametric test.

   Reliability of the test is reduced if there are ties in the results or if there are values below quantitation.

4. Chen Test. This is a derivation of the t-Test designed to compare the sample mean against a critical value when data is "skewed;" i.e., most values are small but a few large outliers are contained in the sample (USEPA, 2000a). The null hypothesis should be that the sample mean is less than or equal to the critical value. The alternative hypothesis is then that the sample mean is greater than the critical value. A detailed explanation of the test and an example calculation using the method is presented by USEPA (2000a, 2002a). No state uses this statistical test in the section 303(d) listing and delisting processes.

   This test assumes a "right-hand" skewed sample distribution (with a long, right "tail") and randomly sampled values. Skewness can be calculated to confirm that this test is applicable.

   If sampled water quality data is skewed, this test is more reliable and/or appropriate than other tests of the sample mean discussed above. Under the proper conditions, it is not particularly Type I or Type II error prone.

   Confirming "skewness" in non-obvious cases would require additional data analysis. If the data is not skewed, then other tests are more appropriate. Similar to the t-Test, the Chen test has problems dealing with non-detected sample findings.

5. One-sample Proportion Test (Z-test). This test addresses proportions or percentiles above or below a critical value (USEPA, 2000a) and is used to test either the hypothesis that the proportion of sample values is equal to or less than some critical proportion, or that it is greater than that critical value. A detailed explanation of the test and an example calculation using the method is presented by USEPA (2000a, 2002a). It is unknown if any state uses this statistical test in the section 303(d) listing and delisting processes.

   The Z-test assumes randomly collected sample data. It is equivalent to the Sign Test for the median when proportions are equal to 50 percent. This test is valid for data from any underlying distribution. The only assumption is for random sampling. This test remains accurate even when non-erroneous outliers are present.

   The major disadvantage is that the test cannot be performed easily using small sample sizes. In order to perform this test easily, both sample size times the proportion of non-exceedances and sample size times the proportion of exceedances must be greater than or equal to five. For example, if the critical exceedance rate is ten percent, sample size must be greater than 50. For smaller sample populations, calculations are complex.

   In general, calculations for this test are more complicated than the exact binomial test.

6. Percent Lower Confidence Limit on the Percentile of the Pollutant Concentration. A statistical approach has been proposed to identify waters that do not meet standards using the percent lower confidence limit on an upper percentile of the pollutant concentration to determine if the water quality standard is exceeded (Gibbons, 2001). Calculations of confidence intervals allows creation, based on sample data, of an interval that either does or does not encompass some critical value (i.e., the pertinent water quality standard). The results allow workers to be confident that the true (water segment) exceedance probability falls in an interval calculated from the sample data. From these results, investigators can determine whether to list or not list a water body.

   If performed correctly, the results should be identical to those from hypothesis testing. Lower one-sided confidence limit testing is the same as testing the null hypothesis that a water body meets water quality standards. The approach proposed by Gibbons (2001) could be used to derive normal, lognormal, and nonparametric lower confidence limits. As with other tests, the tests are sensitive to distribution, independence, and randomness assumptions.

Advantages of the method include: (1) appropriate for a variety of different concentration distributions (i.e., normal, lognormal, nonparametric), (2) directly incorporates the magnitude of the measured concentrations in the test of the hypothesis that a percentage of the true concentration distribution exceeds the standard, and (3) explicit statistical power characteristics that describe the probability of detecting a true exceedance, conditional on the number of samples, the concentration distribution, and the magnitude of the exceedance.

This nonparametric approach is used by the State of Nebraska for listing decisions and the parametric tests are used for setting priorities on water segments (Kansas Department of Health and Environment, 2002).

7. Exact Binomial Test (Fixed Significance Level). The Exact Binomial Test is intended to be used for analyzing *dichotomous data*, which is appropriate for assessing compliance with water quality standards (USEPA, 2002a; Lin et al., 2000; Smith et al., 2001). For binomial analysis of data related to section 303(d) listings, raw numeric data must be transformed into nominal ("named") information; specifically "yes" the data point attains the water quality objective or criterion or "no" it does not. A detailed explanation of the test and an example calculation using the method is presented by USEPA (2000b, 2002a).

**Procedure for Listing with a Fixed Significance Level**

The exact binomial test is based on a default assumption that the true, but unknown, exceedance rate, $r$, is less than or equal to the regulatory exceedance rate, $r_1$. The tested one-sided hypotheses are the null hypothesis, $H_o$: $r \leq r_1$, versus the alternate hypothesis, $H_a$: $r > r_1$.

To find the minimum number of measured exceedances to place waters on the section 303(d) list (*klist*), let *klist* = 0 initially. Then calculate $\alpha$ (for a discussion of alpha and beta, see Issue 6D) from the probability ($P$) of the cumulative binomial distribution:

$$\alpha = P(k \geq klist \mid r_1, N) = \sum_{k=klist}^{N} \left( \frac{N!}{k!(N-k)!} \right) r_1^{\,k} (1-r_1)^{(N-k)} \qquad (1)$$

Where $\alpha$ is Type I error (probability of making false positive errors),
$k$ is the number of exceedances in a sample,
*klist* is minimum number of exceedances to list, and
$N$ is the total number of samples.

The cumulative binomial distribution in Equation (1) can also be calculated using the incomplete beta function (Abramowitz and Stegun, 1972) or the Excel® function BINOMDIST() that returns the binomial probabilities as follows:

$$\alpha = I(r_1, klist, N - klist + 1)$$

$$= \text{BINOMDIST}(N\text{-}klist, N, 1\text{-}r_1, \text{TRUE})$$

The incomplete beta (I) and Excel® functions are provided (here and elsewhere in this issue paper) so these values may be confirmed using readily available programs. The incomplete beta and BINOMDIST() functions are used to calculate the cumulative binomial distribution.

If $\alpha$ is greater than the desired significance level then add one to *klist* and repeat until $\alpha$ is less than or equal to the desired significance level. Consequently, *klist* is a function of three input values: $N$, $r_1$, and the significance level.

Under the null hypothesis, the expected number (i.e., the average value) of exceedances is the product $r_1 N$. If observed exceedance $k$ equals or exceeds *klist*, the null hypothesis is rejected. The logical outcome of rejecting the null hypothesis is that the water body is not meeting water quality standards and should be placed on the section 303(d) list.

**Procedure for Delisting with a Fixed Significance Level**

A "reversed" null hypothesis is used for delisting a water body. The default assumption is that the true, but unknown, exceedance rate, $r_1$, is greater than or equal to the regulatory exceedance rate, $H_o$: $r \geq r_1$, versus the alternate hypothesis, $H_a$: $r < r_1$.

To find the maximum number of measured exceedances to remove a water from the section 303(d) list (*kdelist*), let *kdelist* = 0 initially. Then calculate $\alpha$ from the probability of the cumulative binomial distribution:

$$\alpha = P(k \leq kdelist \mid r_1, N) = \sum_{k=0}^{kdelist} \left( \frac{N!}{k!(N-k)!} \right) r_1^{\,k} (1-r_1)^{(N-k)}$$

$$= 1 - \sum_{k=kdelist+1}^{N} \left( \frac{N!}{k!(N-k)!} \right) r_1^{\,k} (1-r_1)^{(N-k)} \qquad (2)$$

$$= 1 - I(r_1, kdelist + 1, N - (kdelist + 1) + 1) = 1 - I(r_1, kdelist + 1, N - kdelist)$$

$$= \text{BINOMDIST}(kdelist, N, r_1, \text{TRUE})$$

If $\alpha$ is less than the desired significance level then add one to *kdelist* and repeat until $\alpha$ is less than or equal to the desired significance level. The null hypothesis is rejected if $k \leq kdelist$, and the water body is considered to meet water quality standards and removed from the section 303(d) list.

Note that for delisting with small sample sizes, $\alpha$ may be larger than the desired significance level even when $kdelist = 0$. The minimum sample size required for delisting is equivalent to the sample size required for an upper one-sided non-parametric tolerance limit (Owen, 1962):

$$N = \frac{\ln(\alpha)}{\ln(1 - r_1)} \qquad (3)$$

In practice, $N$ is rounded up to the nearest integer. For example, using a nominal significance level of 0.1 and an exceedance rate of 0.1 the minimum sample size required is ln(0.1)/ln(1-0.1) = 21.9. Rounded up, a minimum of 22 samples would be required for delisting.

Another Excel® function CRITBINOM() can be used to calculate *klist* or *kdelist* if the significance level is fixed. This procedure is described more fully in the draft FED (SWRCB, 2003c).

This statistical procedure is relatively quick and easy, especially because it is readily available in EXCEL® software programs. The binomial test provides a relatively low chance of committing a Type I error (rejecting a true null hypothesis) (Figure 15). Since section 303(d) listing issues can be boiled down to "measurements do or do not meet water quality standards", the use of the binomial test, intended for dichotomous information, seems appropriate. Many states have used this test, including Arizona (Arizona DEP, 2000), Florida (Florida DEP, 2002), Nebraska (Nebraska DEQ, 2001), Texas (TNRCC, 2002), and Washington (Washington Department of Ecology, 2002).

This test allows the user the flexibility of choosing (1) the critical exceedance rate, (2) the desired statistical "confidence" (Type I error rate), and (3) the minimum sample size allowed. The binomial test has been described as a modest improvement beyond USEPA's raw score method (Shabman and Smith, 2000).

In binomial testing, specific and sometimes critical information concerned with the absolute magnitude of sample values is not addressed in the test. This could be addressed somewhat in establishing priority for TMDL development by interpreting measurement magnitude as a percentage

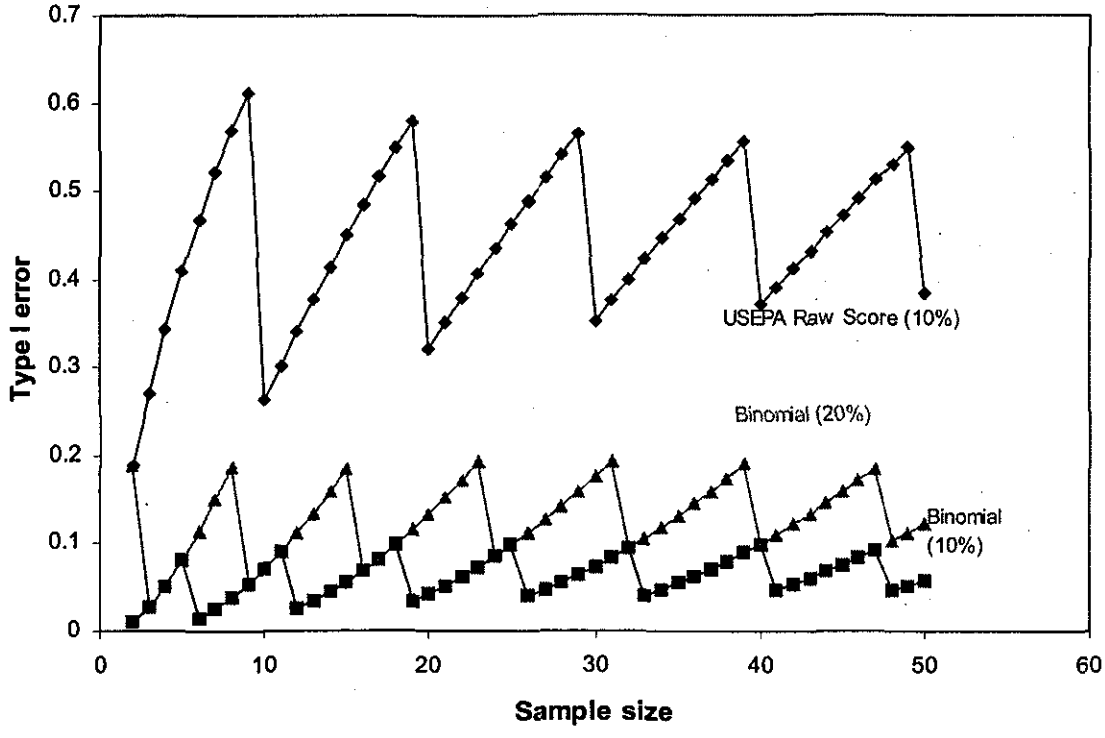



FIGURE 15: TYPE I ERROR RATES FOR EXACT BINOMIAL TEST (WITH 10% AND 20% TYPE I ERROR RATES AND 10% EXCEEDANCE FREQUENCY) AND THE USEPA RAW SCORE METHOD

above the standard. Another way to address magnitude is to use an alternative procedure for listing and delisting using a situation-specific weight of evidence approach.

The chance of making a Type II error (i.e., not rejecting a false null hypothesis) is greater using the binomial test than for some other procedures, especially with samples sizes less than 20 (Figure 16). In nonparametric statistical procedures in general, there is little control over Type II error rates (USEPA, 2002a). Error rates using this fixed level of confidence is analyzed further in Issue 6D, Alternative 2).

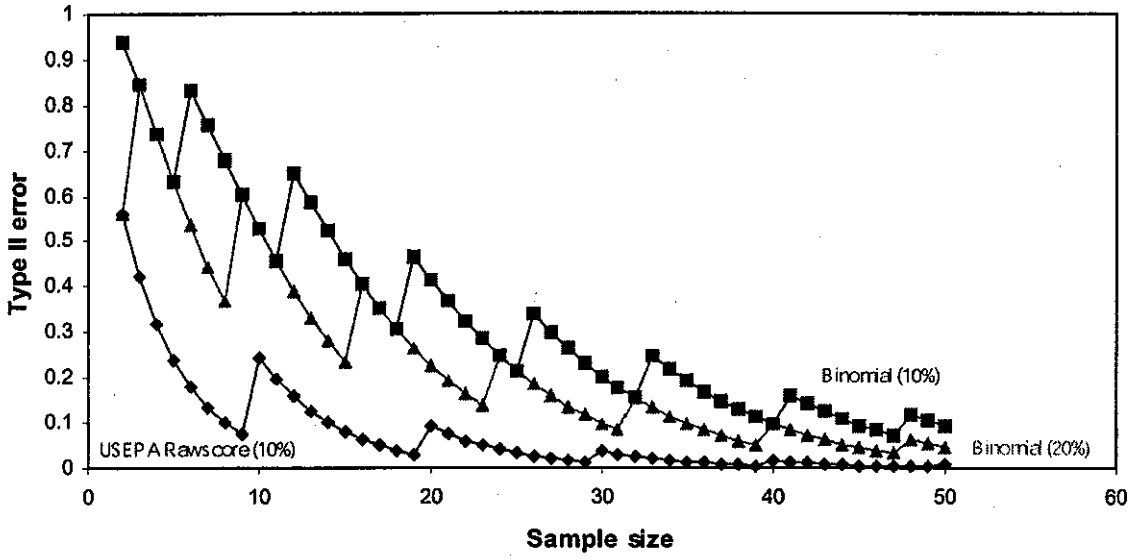



FIGURE 16: TYPE II ERROR RATES FOR EXACT BINOMIAL TEST (WITH 10% AND 20% TYPE I ERROR RATES AND 10% EXCEEDANCE FREQUENCY) AND THE USEPA RAW SCORE METHOD

8. Exact Binomial Test (Balanced Alpha and Beta Errors)—Acceptance Sampling by Attributes. The exact binomial test as described in the previous alternative, like most statistical hypothesis testing procedures, will control the maximum $\alpha$ rate at a value below the nominal significance level for most sample sizes. In contrast, the magnitude of $\beta$ (beta) depends on several factors, including $\alpha$, the population variance, the effect size, and sample size. Generally, $\alpha$ varies inversely with $\beta$, and control of $\beta$ is traditionally sought through the appropriate selection of sample size (Gibra, 1973) or through the use of a more powerful statistical test (Helsel and Hirsch, 2002).

This alternative looks at the possibility of balancing alpha and beta errors. One way to balance errors is to use *acceptance sampling by attributes*: i.e., random samples are evaluated to be either above or below the applicable water quality standard using the binomial test (Gibra 1973). A water body is listed if the number of exceedances $k$ in $N$ samples equals or exceeds a critical value *klist*. Likewise, a water body is delisted if $k \leq$ *kdelist* in a sample of $N$. This process is called a *single acceptance sampling plan* since the decision is based on a single sample of size $N$ (Gibra, 1973).

**Procedure for Listing**

For listing water bodies, the probability of rejecting the null hypothesis is calculated using the probability of the cumulative binomial distribution and selected values of $r$ (i.e., alternate exceedance rates) within the interval [0,1]:

$$P(reject\ H_0) = P(k \geq klist \mid klist, N)$$

$$= \sum_{k=klist}^{N} \left( \frac{N!}{k!(N-k)!} \right) r^k (1-r)^{(N-k)} \qquad (4)$$

$$= \mathrm{I}(r, klist, N - klist + 1)$$

$$= \mathrm{BINOMDIST}(N\text{-}klist, N, 1\text{-}r, \mathrm{TRUE})$$

This probability equals $\alpha$ when the null hypothesis is true and power ($1 - \beta$) when the null hypothesis is false. Under the standard hypothesis, $\alpha$ is the probability of incorrectly listing a clean water body while $\beta$ is the probability of incorrectly failing to list a contaminated water body.

The probability of *not rejecting* the standard null hypothesis is the complement of Equation (4):

$$P(not\ reject\ H_0) = 1 - P(reject\ H_0) = P(k \leq klist - 1 \mid klist, N)$$

$$= \sum_{k=0}^{klist-1} \left( \frac{N!}{k!(N-k)!} \right) r^k (1-r)^{(N-k)} \qquad (5)$$

$$= 1 - \mathrm{I}(r, klist, N - klist + 1)$$

$$= \mathrm{BINOMDIST}(klist\text{-}1, N, r, \mathrm{TRUE})$$

This probability equals the confidence coefficient ($1-\alpha$) when the null hypothesis is true and $\beta$ when the null hypothesis is false.

Using the example of $N = 25$, Figure 17 illustrates these probabilities as a function of alternate exceedance rates for the standard null hypothesis. This graph simultaneously depicts alpha or power (via Equation 4) and confidence or beta (via Equation 5). The Figure shows the theoretical probability of rejecting the null hypothesis on the vertical axis versus $r$ on the horizontal axis is known as a power curve. The mathematical complement of a power curve is an operating characteristics (OC) curve.

An OC curve is a power curve flipped along the horizontal axis by subtracting the power curve probability from unity.

**Procedure for Delisting**

For delisting water bodies, the probability of rejecting the reverse null hypothesis is calculated using the probability of the cumulative binomial distribution and selected values of $r$ within the interval [0,1]:

$$P(reject\ H_0) = P(k \le kdelist \mid kdelist, N)$$

$$= \sum_{k=0}^{kdelist} \left( \frac{N!}{k!(N-k)!} \right) r^k (1-r)^{(N-k)}$$

$$= 1 - \mathrm{I}(r, kdelist+1, N-kdelist) \qquad (6)$$

$$= \mathrm{BINOMDIST}(kdelist, N, r, \mathrm{TRUE})$$

Again, this probability equals $\alpha$ when the null hypothesis is true and power (i.e., 1 - $\beta$) when the null hypothesis is false. However, under the reverse hypothesis **the nature of the errors are reversed**: $\alpha$ is now the probability of incorrectly failing to list(delisting) a water body that does not meet standards while $\beta$ is the probability of incorrectly listing (not delisting) a water body that does meet standards.

The probability of *not rejecting* the reverse null hypothesis is the complement of Equation 6:

$$P(not\ reject\ H_0) = 1 - P(reject\ H_0) = P(k \ge kdelist+1 \mid kdelist, N)$$

$$= \sum_{k=kdelist+1}^{N} \left( \frac{N!}{k!(N-k)!} \right) r^k (1-r)^{(N-k)}$$

$$= \mathrm{I}(r, kdelist+1, N-kdelist) \qquad (7)$$

$$= \mathrm{BINOMDIST}(N\text{-}kdelist\text{-}1, N, 1\text{-}r, \mathrm{TRUE})$$

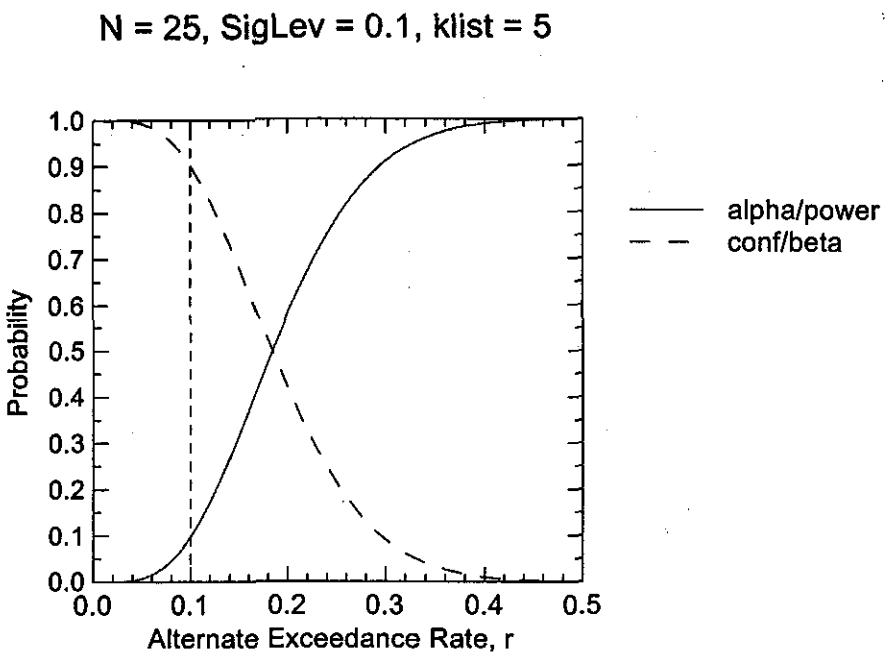



FIGURE 17: PROBABILITIES OF REJECTING (SOLID LINE) AND NOT REJECTING (DASHED LINE) THE STANDARD NULL HYPOTHESIS HO: $R < R_1 = 0.1$ WHEN USING THE BINOMIAL MODEL.

Alpha error is the solid line to the left of the vertical dashed line; power is the line to the right. Beta error is the solid line to the right of the vertical dashed line; confidence is the line to the left. This graph assumes a sample size of 25, a significance level of 0.10, and klist = 5.

This probability is confidence (1-α) when the null hypothesis is true and β when the null hypothesis is false.

Again, using the example of $N = 25$, Figure 18 illustrates these probabilities as a function of alternate exceedance rates for the standard null hypothesis.

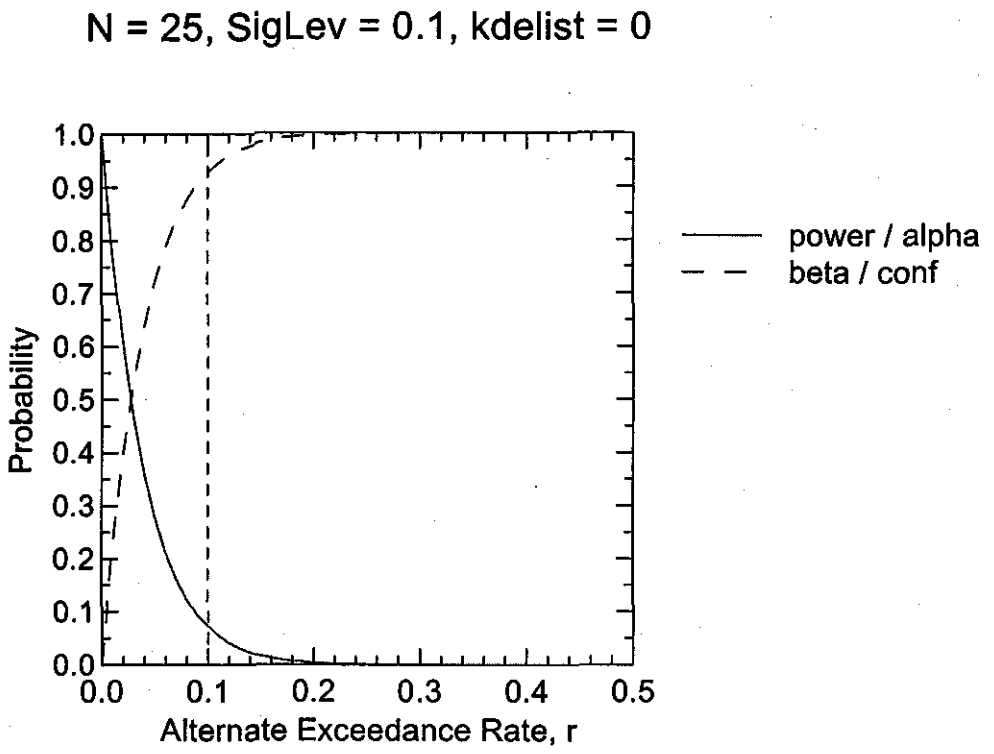



FIGURE 18: PROBABILITIES OF REJECTING (SOLID LINE) AND NOT REJECTING (DASHED LINE) THE REVERSE NULL HYPOTHESIS HO: $R > R_1 = 0.1$ WHEN USING THE BINOMIAL MODEL.

Alpha error is the solid line to the right of the vertical dashed line; power is the line to the left. Beta error is the dashed line to the left of the vertical dashed line; confidence is the line to the right. This graph assumes a sample size of 25, a significance level of 0.10, and kdelist = 0.

**Balancing Errors**

Alternatives to controlling only the $\alpha$ rate are possible (Lehmann, 1958). Mapstone (1995) argued against adhering to a fixed and arbitrary $\alpha$, advocating instead for the consideration of economic, environmental, social, and political consequences of both $\alpha$ and $\beta$ decision-making errors. In the absence of further information, Mapstone recommended that decision errors should be weighted equally, i.e., $\alpha = \beta$. In addition, he recommended that decision-makers define a level of impact essential to detect – an effect size. Furthermore, Mapstone suggested that the effect size is perhaps the most critical aspect of environmental impact decision-

making and is a biological (or chemical, physical, aesthetic, economic, etc.) decision, not simply a statistical decision. This issue is addressed in Issue 6C.

The effect size is variously called the *gray region* within the Data Quality Objectives (DQO) process (Millard and Neerchal, 2001) or the *indifferent zone* (Gibra, 1973) within the acceptance sampling process. For section 303(d) listing and delisting, the effect size represents the range of true exceedance rates where the consequences of decision errors are relatively minor.

USEPA (2002a) applied the error balancing approach of Smith et al. (2001) to the section 303(d) listing process. To balance errors, *klist* and *kdelist* are determined in a manner different than described in the previous alternative (No. 7) (Saiz, 2004).

*Balanced Error Approach for Listing*

Figure 19 is a magnification of the lower portion of Figure 17. Examination of Figure 19 reveals that an alternate exceedance rate value $r_2$ exists such that $\alpha = \beta$. This can be envisioned as a horizontal line passing through the $\alpha$ curve and the $\beta$ curve with vertical lines indicating $r_1$ and $r_2$. In fact, an infinite number of alternate exceedance rate pairs ($r_1$, $r_2$) exist that will balance $\alpha$ and $\beta$ at varying levels for a given $N$ and *klist*. As the balanced error level decreases the effect size ($r_2 - r_1$) increases since $r_1$ must decrease and $r_2$ must increase. Holding $r_1$ or $r_2$ constant will affect the magnitude of $\alpha$ and $\beta$ and the degree to which these errors can be balanced.

The approach taken by USEPA (2002a) for listing is to first define $N$, $r_1$, and $r_2$. Next, *klist* is determined iteratively as the value that minimizes the absolute difference between $\alpha$ and $\beta$. The minimized quantity $|\alpha - \beta|$ can be expressed using Equation (6) for $\alpha$ and Equation (7) for $\beta$:

$$|\alpha - \beta| = | \, I(r_1, klist, N - klist + 1) - [1 - I(r_2, klist, N - klist + 1)]| \quad (8)$$

where $r_1 < r_2 < 1$. An equivalent procedure is to first define $N$, $r_1$, and the effect size ($r_2 - r_1$).

This minimization calculation is analogous to the minimum squared deviation technique used in statistical curve fitting of data. Errors will balance perfectly when the minimized quantity is zero. However, because of the discrete nature of the binomial probability distribution only approximate balancing of $\alpha$ and $\beta$ is possible, especially with smaller sample sizes.

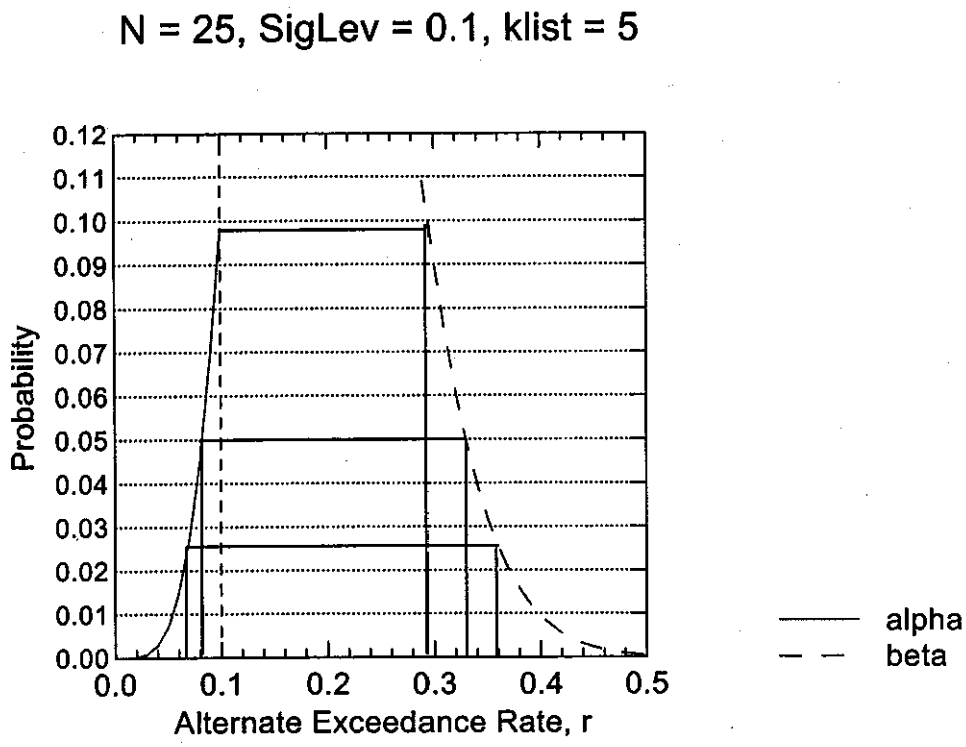



FIGURE 19: VISUAL REPRESENTATION OF EFFECT SIZE ($\alpha = \beta$)

Lowering the balanced error level (vertical lines) increases the effect size (horizontal lines). Three possible exceedance rate pair ($r_1$,$r_2$) realizations are shown. This graph assumes a sample size of 25, a significance level of 0.10, and *klist* = 5.

*Balanced Error Approach for Delisting*

For delisting, the USEPA (2002a) approach is to again define $N$, $r_1$, and $r_2$, but this time $r_2$ is a value less than $r_1$. *kdelist* is determined as the $k$ value that minimizes the absolute difference between $\alpha$ and $\beta$. The minimized quantity $|\alpha - \beta|$ can be expressed using Equation (4) for $\alpha$ and Equation (5) for $\beta$:

$$|\alpha - \beta| = |\,[1 - I(r_1, kdelist+1, N-kdelist)] - I(r_2, kdelist+1, N-kdelist)| \quad (9)$$

where $r_2 < r_1 < 1$.

The balanced error approach is useful because it considers both types of decision-making errors, $\alpha$ and $\beta$, rather than only $\alpha$ when analyzing data.

Another objective is to maintain these balanced error rates at or below an acceptable magnitude. A pre-defined maximum acceptable error for both $\alpha$ and $\beta$ will allow the determination of acceptable sample sizes to use for listing and delisting. This issue is addressed in Issue 6D.

As discussed in Alternative 7, specific and sometimes critical information concerned with the absolute magnitude of sample values is not addressed in the binomial test. This could be addressed by allowing a situation-specific weight of evidence approach if the magnitude of measurement needs to be considered.

At present, no other state uses this approach for listing or delisting.

This alternative is the preferred alternative because the exact binomial test is intended to be used for *dichotomous data*, which is appropriate for assessing compliance with water quality standards; by balancing errors, the economic, environmental, social, and political consequences of both $\alpha$ and $\beta$ decision-making errors are more adequately considered.

9. Bayesian Procedures for Parametric or Nonparametric Statistical Tests. This procedure is more sophisticated than the previously discussed tests. In the Exact Binomial Test, for example, the chance of exceeding the water quality standard is treated as fixed and the data are regarded as random. The Bayesian procedure treats the probability of exceeding a standard as a random variable with an associated distribution (Smith et al., 2001). For section 303(d) listing purposes, some form of prior information about the water body and its levels of pollutants would be required in order to choose the initial form of the distribution, called the *prior distribution*. Once new data are obtained, the prior distribution is updated, and the available information is used to compute a resulting distribution of likely standard exceedances (Ye and Smith, 2002).

   The Bayesian Procedure may require relatively sophisticated analysis and statistical understanding to calculate the test statistics manually.

   This procedure may work well for small sample sizes. It provides flexibility when previous information about the situation being studied is available. Using the parametric test, this model takes magnitude into account and controls much more than, for example, the USEPA raw score and exact binomial procedures. Type I and Type II error rates are intermediate between those for binomial (lowest for Type I; highest for Type II) and USEPA raw score (highest for Type I; lowest for Type II) procedures for samples sizes to 50 (Ye and Smith, 2002). Likewise, if more than one data point is significantly above an objective, with the remaining data well below the objective, the water body may still be recommended for listing by the Bayesian procedure.

This procedure has not been used for listing decisions. Apparently, no other states have yet adopted this procedure. One problem is that prior information is required that may not be available. In some instances it may require data from a normally distributed population.

10. Hypergeometric Test. The hypergeometric test is equivalent to the binomial test except that samples are assumed to be from a finite population and samples are not replaced (Sokal and Rohlf, 1995). Like the exact binomial test, this statistical model is also appropriate for binary results (e.g., either "yes" or "no"). This test has been suggested for use in comparing sample data to standards if standards are assessed on the exceedant day basis, like the USEPA acute and chronic criteria (USEPA, 2002a). It is unknown if any state uses this statistical test in the section 303(d) listing and delisting processes.

    Assumptions of the exact hypergeometric test, as for the exact binomial

    test, are that the sample data are binary (only two outcomes possible), the chance of an exceedance remains constant, and sampling is independent and random.

    This procedure is most appropriate for sampling *with replacement* from a population of finite size but if a small number of samples are taken from large populations, these populations can be considered essentially infinite (Sokal and Rohlf, 1995). As is almost always the case, water quality data are sampled from a continuous, *infinite* population of values (from a lake, river segment, etc.). As the sample size increases, the hypergeometric model approximates the binomial model (Sokal and Rohlf, 1995). As a result, for the most part, the exact binomial test appears to be more appropriate for evaluating water quality sample data.

**Recommendation**: Alternative 8. See Policy sections 3, 4, and 6.1.5.8.

Given the range of data sets that will be reviewed and the types of data that have been reviewed in previous section 303(d) list processes, acceptance sampling by attributes (the exact binomial test and error balancing) should be used as the base analysis of data.

The use of acceptance sampling by attributes is assumed in the selection of critical exceedance rate (Issue 6C), confidence and power levels (Issue 6D), and minimum sample size (Issue 6E).

*Issue 6C:* ***Critical Rate of Exceedances of Water Quality Standards***

**Issue:** What is the "critical rate of exceedance" of a water quality standard in each sample that would trigger the listing of a water body on the section 303(d) list?

**Issue Description:** In establishing a statistical approach for assessing if water quality standards are exceeded it is important to establish the level or levels of standards exceedance that are acceptable or unacceptable. This *critical exceedance rate* (*r*) is the estimate of the actual proportion of samples that exceed an applicable water quality criterion ("the proportion of exceedances"). This variable may range from zero (0 percent), i.e., any exceedance is justification for listing the water body, to one (100 percent). Rates from less than 1 percent to as high as 25 percent are discussed in Table 14.

An *r* value can also be used as an indication of the persuasiveness of the number of exceedances in a sample population. If the number of exceedances is greater than *r*, it increases confidence that the water quality standard is exceeded and that the exceedance is not due to uncontrolled sampling or analytical errors. Since errors vary from one sample to another, the critical exceedance rate is only an indirect representation of that uncertainty.

According to USEPA (2002a), sources of uncertainty include: (1) natural variation in the population; (2) temporal and spatial variability; (3) measurement error; and (4) laboratory (analytical) error. With these sources of uncertainty possible, a critical exceedance rate of greater than zero is indicated. If a critical exceedance rate cannot be chosen, it is virtually impossible to use any statistical approach.

Implicit in selecting *r* is also the selection of a meaningful effect size. Mapstone (1995) recommended that decision-makers define a level of impact essential to detect – an effect size. Furthermore, Mapstone suggested that the effect size is perhaps the most critical aspect of environmental impact decision-making and is a biological (or chemical, physical, aesthetic, economic, etc.) decision, not simply a statistical decision. For section 303(d) listing and delisting, the effect size represents the range of true exceedance rates where the consequences of decision errors are considered relatively minor.

**Baseline:** Previously, RWQCBs used *r* to judge when a water body was not meeting water quality standards. However, this process was implemented without the use of statistical analysis. Instead,

RWQCBs used *r* values from 10 to as high as 95 percent. This resulted in region-to-region inconsistencies in the listing of water bodies.

TABLE 14: CRITICAL EXCEEDANCE RATES PROPOSED BY USEPA

| Critical Exceedance Rate | Source | Notes |
|---|---|---|
| ≤1-in-3 years | USEPA, 1997c | fully supports beneficial uses<br>for acute criteria |
| 0.09%<br>(1 out of 1,095) | USEPA, 2002a | using hypergeometric distribution<br>equivalent to a 1-in-3 year exceedance frequency<br>for acute criteria |
| 0.36%<br>(1 out of 274) | USEPA, 2002a | using hypergeometric distribution<br>equivalent to a 1-in-3 year exceedance frequency (4-day averages)<br>for chronic criteria |
| >1-in-3 years<br>to <10% | USEPA, 1997c | partially supports beneficial uses<br>for acute criteria |
| 5% (plus a 15% effect size) | USEPA, 2002a | for toxicant criteria |
| <10% | USEPA, 1997c;<br>USEPA, 2002a | for bacteria criteria |
| <10% | USEPA, 1997c;<br>USEPA, 2002a | fully supports beneficial uses<br>for conventional pollutants |
| 10% | USEPA, 2003 | for chronic criteria<br>for acute criteria (if justified)<br>for conventional pollutants (if justified)<br>using either binomial or "raw score" tests |
| >10% | USEPA, 1997c | for acute criteria<br>no support of beneficial uses<br>measurement error should be accounted for |
| >10% (plus a 15% effect size) | USEPA, 2002a | for conventional pollutants |
| >10% to <25% | USEPA, 1997c<br>USEPA, 2002a | partially supports beneficial uses<br>for conventional pollutants |
| >25% | USEPA, 1997c;<br>USEPA, 2002a | for conventional pollutants<br>does not support beneficial uses |

**Alternatives:**

1. Provide no guidance on the choice of critical exceedance rate to the RWQCBs. Under this alternative, the RWQCBs would continue to use various *r* values in their analyses of sample data to develop the section 303(d) list. Values would vary region-by-region, and could even vary decision-by-decision within a single region.

   The possibility of uncertainty affecting analyses of sampled information varies widely. This alternative provides the maximum level of flexibility to RWQCBs for matching *r* with likely levels of statistical uncertainty.

   Under this alternative, *r* may not always match a perceived or anticipated overall level of possible error in gathering, analyzing, and reporting sample data. Region-by-region listing or delisting inconsistencies would not be addressed under this alternative.

2. Test water quality sample data against a single *r* of 25 percent. Under this alternative, a 25 percent value would be used in statistical analysis of sample data. Therefore, a ratio of exceedances close to 25 percent or more would have to be observed in samples to conclude the water body was failing to meet water quality standards. USEPA has used the 25 percent critical exceedance rate for conventional pollutants (Table 14) as an indication that beneficial uses are not supported (USEPA, 1997c).

   High exceedance rates would most likely be observed in cases where very large errors in collection and analysis of data are possible or very large natural variability is found. Unfortunately, exact knowledge of sample and laboratory error is rarely known on an individual sample basis.

   Many states use this exceedance rate to determine if water bodies are not supporting beneficial uses for conventional pollutants (Table 15).

3. Use a single *r* of 15 percent. Under this alternative, it would be assumed that the variability and error associated with sampling and analysis of data would sum to a sample exceedance rate of 15 percent. Therefore, at least 15 percent of samples observed would exceed the applicable criterion before considering whether the water body is not meeting standards and should be listed. USEPA (2002a) has recommended a 15 percent effect size when analyzing chemical data. At least one state uses 15 percent in analyzing data for section 303(d) purposes (Table 15).

TABLE 15: CRITICAL EXCEEDANCE RATES PREVIOUSLY USED BY SEVERAL STATES

| Critical Exceedance Rate | State | Reference |
|---|---|---|
| USEPA (1997b) guidance | Alabama | Alabama Department of Environmental Management, 2002 |
| 10%—bacteria<br>4%—bacteria, marine beaches from April 1 through October 31<br>25% or less depending on the conventional or toxic pollutant | California | SWRCB, 2003a |
| 85$^{th}$ percentile—chronic chemical standards<br>50$^{th}$ percentile—iron<br>15$^{th}$ percentile—DO, pH | Colorado | Colorado Water Quality Control Division, 2001 |
| 10%—water quality criteria | Florida | Florida Department of Environmental Protection, 2002 |
| 11%—conventional pollutants | Georgia | Georgia Environmental Protection Division, 1998; as quoted by Community Watershed Project |
| 10%—Numeric and narrative water quality standards | Idaho | Idaho Department of Environmental Quality, 2003 |
| 10%—chronic standards; bacteria; chloride; sulfate; parameters used to assess irrigation and livestock watering, food procurement<br>2 exceedances in 30-36 samples—acute standards<br>0%—nitrate drinking water standard<br>50%—other drinking water parameters | Kansas | Kansas Department of Health and Environment, 2002 |
| 10% pH | Maryland | Maryland Department of the Environment, 2003 |
| 2 exceedances in 3 year period—Toxicity-based standards | Minnesota | Minnesota Pollution Control Agency, 2004 |

| Critical Exceedance Rate | State | Reference |
|---|---|---|
| ≤10%--Conventional pollutants<br>≤10%--Fecal coliform | | |
| 10% of measurements for acute and chronic standards; 25% exceedance of acute standards; 1-50% exceedance of chronic standards<br>11% of measurements for conventional pollutants;<br>50% exceedance of standard | Montana | Montana Department of Environmental Quality, 2002 |
| >10%—fecal coliform<br>11%—water quality criteria<br>>10%—Agricultural water supply beneficial use | Nebraska | Nebraska Department of Environmental Quality, 2001 |
| >10%—bacteria, clarity, phosphorus, chlorophyll-a<br>>10%—drinking water assessments | New York | New York State Department of Environmental Conservation, 2002 |
| 11%—DO, pH<br>10%—heavy metals, priority pollutants, chlorine, ammonia<br>25%—turbidity, total phosphorus, total nitrogen, chlorophyll-a | North Carolina | South Carolina Department of Health and Environmental Control, 2002 |
| 10%—bacteria, DO, pH<br>Minimum of 2 exceedances—toxics | Oregon | Oregon Department of Environmental Quality, 2003 |
| 10%—conventional pollutants, metals and organics (acute and chronic criteria<br>25%—bacteria (single sample criterion) | Texas | Texas Natural Resource Conservation Commission, 2002 |
| 11%—conventional pollutants<br>2 exceedances in 3-year period—toxics | Virginia | Virginia Department of Environmental Quality, 2002 |
| No more than one exceedance--Drinking water<br>Exceed only once or was not exceeded in < 10% of the samples if the criterion was exceeded at least two times—aquatic life<br>Exceeded in > 40% of the samples -- Chronic criteria<br>More than one violation -- Acute criteria | Utah | Utah Department of Environmental Quality, 2004 |
| 2 or more exceedances in a 3-year period—toxics | Washington | Washington Department of Ecology, 2002 |

| Critical Exceedance Rate | State | Reference |
|---|---|---|
| 10% or exceeds geometric mean—bacteria<br>One 7-day average exceeds standard—DO, temperature<br>10%—dissolved gas, pH, nitrogen, phosphorus, turbidity, hardness | | |

4. Use a single *r* of 10 percent. Past USEPA guidance (USEPA, 1997c; USEPA, 2002a) recommends making non-attainment decisions for conventional pollutants where more than 10 percent of samples exceed applicable water quality standards. This guidance provides a simple "rule of thumb" to evaluate data sets of limited size for assessment purposes, to account for measurement error, and the potential that small data sets may not be fully representative of receiving water conditions.

   This *r* has traditionally been applied nationally (Table 15) in previous listing cycles, most notably with the USEPA "raw score" methodology. Other states using a statistical approach (often the exact binomial test) use the 10 percent critical value (e.g., Florida DEP, 2002).

5. Use separate *r* values, as recommended in the CALM Guidance (USEPA, 2002a), for toxic pollutants and another one for conventional pollutants in order to balance decision errors. The Policy would specify a separate ranges of exceedance frequencies for toxic pollutants and conventional pollutants.

   In order to avoid conflicting exceedance frequencies for listing and delisting, the *r* values should be selected carefully. It is possible, and undesirable, to assign $r_1$ and $r_2$ values that would result in conflicting decision rules for listing and delisting. Under such starting values, a set of observed exceedances will exist that simultaneously result in a decision to list under the standard null hypothesis and a decision to delist under the reverse null hypothesis for a given *N*.

   For example, given $N = 25$ and for listing $r_1 = 0.10$ and $r_2 = 0.25$, but for delisting $r_1 = 0.40$ and $r_2 = 0.25$. Using the balanced error approach leads to *klist* = 5 or more exceedances and *kdelist* = 6 or less exceedances. A water body listed with 5 or 6 exceedances in a

sample of 25 could be simultaneously listed and delisted. Generally, the balanced error approach should result in a *kdelist* value that is at least one exceedance less than *klist*.

To avoid this problem, the following relationship should be established: $r_1$ (listing) = $r_2$ (delisting) and $r_2$ (listing) = $r_1$ (delisting). In this case, the $r_1$ and $r_2$ starting values results in the equality of the minimized error quantities. Equating these quantities means that *kdelist* will always be one less than *klist*. Thus, $\alpha$ for listing becomes exactly equal to $\beta$ for delisting and vise-versa. This reversal and equality of errors for listing and delisting is desirable because conflicting decisions based on which null hypothesis is chosen (standard versus reversed) will then be eliminated. The CALM Guidance (2002a) applied the error balancing approach (Smith et al., 2001) to the section 303(d) listing process noting that balanced decision error rates are less affected by switching the null and alternative hypothesis.

**Estimating Critical Exceedance Frequencies and Effect Size**

Water quality standards exceedances can be influenced by natural variability (including sample frame selection, sampling unit definition, and numbers of samples), measurement error (including sample collection, sample handling, and analysis), and not due to a real violation of the standard. Natural variability can be substantial but is rarely explicitly known. Measurement error is more readily quantified when well-run monitoring programs set limits on the amount of acceptable measurement error. Typical allowable variation for the measurement of conventional parameters, metals, and organic chemicals range from 10 to 50 percent (e.g., Puckett, 2002; Stephenson et al., 1994), 40 percent for toxicity measurements (Stephenson et al., 1994), and up to three orders of magnitude for bacteria measurements (Puckett, 2002). These types of potential measurement errors introduce doubt into the decision to list waters.

While it cannot be precisely known how much error is included in the decision to list, the decision becomes unclear when the *r* values and effect size approach acceptable measurement error. Consequently, with a small number of samples exceeding standards, at some point the decision to list becomes "too close to call." As the *r* value (the gray area where the decision may be too close to call) decreases, fewer sample exceedances are required to place waters on the list. Conversely, for delisting, as *r* decreases, the number of samples that show standards are met increases.

The *r* values should only be used in statistical analysis after an assessment is made of whether each measurement attains or does not attain water quality standards. The water quality standard's averaging period (if any) should be addressed in this preliminary step of determining if a single sample measurement exceeds the water quality objective or criterion (Issue 4A). The *r* values and effect size should only be applied to determine the number of samples needed to place waters on the section 303(d) list. This value should *never* be used to assess if the standard is met a percentage *of the time* because the *r* value assesses only the strength of the decision to list or delist based on the sample population (i.e., grab samples) available.

It has been questioned whether a set *r* (say 10 percent) can be used to interpret water quality objectives expressed as: "the instantaneous concentration of the pollutant shall not be greater than ___ µg/L, at any time." These types of standards pose several challenges in assessing waters to be placed on the section 303(d) list. It is reasonable to not treat every single sample as representing the true ambient condition of the water segment because an individual sample is not a definitive assessment of whether the water segment is attaining applicable water quality standards. It is necessary to account for natural or sampling variability in the assessment because (1) error is introduced into the analysis of samples or (2) short-term or sporadic excursions of the water quality standard in some samples does not reflect the best assessment of the true condition of the water segment (USEPA, 2003e).

In general, aquatic organisms can tolerate higher concentrations of pollutants for short periods than they can for complete life cycles (USEPA, 1991f). It is debatable whether short-term and sporadic excursions from the water quality standard can occur without resulting in nonattainment of the water quality standard. At least one USEPA Region has stated:

> "[US]EPA's best information at this time is that the extent to which such a 'true' exceedance could occur without impairing designated uses depends on the nature and toxicity of the pollutant and on the extent to which the pollutant is naturally variable in the environment without impairing designated uses." (USEPA, 2003e)

In most Basin Plans, natural or controllable sources of pollution are recognized as contributing to the variability of some pollutants in the State's waters. All major federal, State, and local

monitoring programs in California recognize the variability inherent in sampling and analysis of samples. Attainment assessments for "not to be exceeded" standards do not recognize such variation and uncertainty. Consequently, perfect assessment of attainment for a "not to be exceeded" standard assumes a monitoring effort that continually measures the water quality objective at all points in the water segment. No monitoring efforts measure all points at all times; actual monitoring involves sampling the water segment and estimating the characteristics of the entire water segment based on the characteristics of the sample. Therefore, water quality objectives set as "not to be exceeded" maxima should be subject to statistical analysis that accounts for variability. Statistical analysis does not allow for a single sample to determine if water quality standards are attained.

In these "not to exceed" cases, the *r* value is only used to quantify the strength or persuasiveness of the data used to interpret this type of standard. The *r* value should *not* be used to justify allowing the standard to be exceeded some percentage *of the time*, as this would be an inappropriate interpretation of the water quality objective.

For conventional pollutants (pH, temperature, dissolved oxygen, etc.), CALM Guidance (USEPA, 2002a; Table 4-3 in the reference) recommends a statistical guideline of acceptable exceedance frequency of 10 percent (on average) and unacceptable exceedance frequency of 25 percent in any given sample. This approach includes a specification of maximum effect size of 15 percent. Effect size is the maximum magnitude of exceedance frequency that would be tolerated. USEPA (1997c) recommends listing for bacteria at a 10 percent exceedance frequency.

If this recommendation were used in listing decisions, waters with less than 10 percent exceedance would not be listed while waters with exceedance frequency above 25 percent would always be placed on the section 303(d) list. Waters that fall between these two values would sometimes be listed. As described by USEPA (2002a), the use of the exact binomial test with a population exceedance rate of 25 percent (which includes a 15 percent effect size) "indicates severe problems and represents the minimum violation (rate) we would almost always want to detect" (Smith et al., 2001). This interpretation is consistent with CWA section 305(b) guidance (USEPA, 1997c) and is in the low range for expected measurement error.

Chronic water quality criteria (as presented in the CTR) are always expressed as average concentrations over at least several days and

are expressed with exceedance frequencies over three-year periods on the average. USEPA's chronic water quality criteria for toxics in freshwater environments are expressed as 4-day averages. On the other extreme, USEPA's human health water quality criteria for carcinogens are calculated based on a 70-year lifetime exposure period. As stated in the CTR, the allowable frequency of exceedance is one time in a three-year period on the average.

For toxics (including acute and chronic criteria for toxic pollutants, etc.), CALM Guidance (USEPA, 2002a; in table 4-3 of the reference) recommends a statistical guideline of acceptable exceedance frequency of 5 percent (on average) and unacceptable exceedance frequency of 20 percent in any given sample. This approach again includes a maximum effect size of 15 percent. If this recommendation were used in listing decisions, waters with less than 5 percent exceedance for these parameters would not be listed while waters with exceedance frequency above 20 percent would always be placed on the section 303(d) list. Waters that fall between these two values would sometimes be listed. This interpretation is at the lower end of the allowable measurement error of major monitoring programs.

This alternative represents the preferred alternative because the range of values, in the absence of site-specific values, is pragmatic, balanced, fair, and within the limits of the water quality regulatory process. Based on the monitoring efforts implemented in California (e.g., NPDES, SWAMP, USEPA, etc.), the data sets available (SWRCB, 2003a), past practices of the SWRCB and many RWQCBs, and the consequence of a section 303(d) listing; the 5 percent-20 percent and 10 percent-25 percent *r* values are reasonable in the absence of a site-specific values.

At present, no other state has implemented these specific exceedance frequencies for placing waters on the section 303(d) list.

6. Use a single *r* value of less than 5 percent. Under this alternative, the critical maximum limit of exceedances seen in any sample would be less than five percent. Several states use very low exceedance rates for toxic chemicals (Table 15). The justification for these low exceedance rates is discussed by USEPA (2002a) in the CALM guidance. Generally, very low exceedance frequencies are justified by the requirement that USEPA acute and chronic water quality criteria only allow for a one-in-three year exceedance frequency. To work within this frequency, states typically assume

there is no variability in sampling or analysis and, therefore, do not use statistical analysis.

To distinguish very rare occurrences of standard exceedances with statistical tests requires very large sample sizes because the exceedance frequency is so small. USEPA has estimated that over 900 samples in a three-year period are needed to assess if these standards are attained (USEPA, 2002a). The difficulty associated with the once-in-three-years assessments occurs because the standard as presented in the guidance allows only one extremely rare event (e.g., one exceedant day out of 1,095 days for acute criteria or one exceedant period out of 274 four-day periods for chronic criteria), but no more. With these types of critical exceedance frequencies false negative (Type II) error are very high unless sample size requirements are increased.

If modestly-sized data sets are to be used to assess compliance with USEPA acute and chronic criteria and variability of measurements are to be considered in the assessments, then the attainment assessments become similar in practice to determinations of compliance with "not to be exceeded" standards discussed in Alternative 4. USEPA has acknowledged that a higher critical exceedance frequency can be used for acute and chronic criteria (USEPA, 2003b; USEPA, 2002a) and for "not to exceed" standards if justified.

**Recommendation:** Alternative 5. See Policy sections 3 and 4. The form of the testable hypotheses becomes:

1. For Listing Toxics:
   $H_o$: $p \leq 0.05$
   $H_a$ : $p > 0.20$
2. For Delisting Toxics
   $H_o$: $p \geq 0.20$
   $H_a$ : $p < 0.05$
3. For Conventional Pollutants and Bacteria
   $H_o$: $p \leq 0.10$
   $H_a$ : $p > 0.25$
4. For Delisting Conventional Pollutants and Bacteria
   $H_o$: $p \geq 0.25$
   $H_a$ : $p < 0.10$

Where p is the estimate of the true proportion of samples that exceed the numeric water quality standard. The proportion of samples exceeding the standard is the number of samples exceeding divided by the total number of samples.

**Issue 6D:** **Selection of Statistical Confidence and Power Levels**

**Issue:** When a statistical test is used to evaluate numeric sample data, what minimum level of statistical confidence and power should be selected for section 303(d) list decision-making?

**Issue Description:** Statistical hypothesis testing is primarily about choosing between likely hypotheses that lead to better decision-making. A good deal of statistical theory is devoted to quantifying the reliability of such decisions. An appropriate statistical test or value can be used to choose the hypothesis that best fits the observed facts and to increase confidence in the findings. Statistical confidence is the probability of not committing a Type I error (listing when we should not). The power of a hypothesis test is the probability of not committing a Type II error (not listing when we should).

For the purposes of analyzing statistical confidence and power, the null hypothesis is: water quality standards are met (as recommended in Issue 6A). The alternative hypothesis is, then, water quality standards are not met. Decisions on whether the water body should be listed depend on which hypothesis, the null or alternative, is "rejected" at a certain level of confidence and power.

In statistics, the likelihood of making false-positive errors is assigned a shorthand symbol $\alpha$. Alpha values range from zero (or 0%) to one (or 100%) chance of making a Type I error. The converse of alpha, the non-error rate, is defined as one minus alpha (or $1 - \alpha$), and ranges from a one (100%) to zero (0%) chance of not making a Type I error. This non-error rate gives the *confidence* in the test results. The greater the confidence in a statistical test result (i.e., the lower the $\alpha$ value), the more likely that a Type I error (rejection of a true null hypothesis) will not be made.

Similarly, the likelihood of making false-negative errors is assigned a shorthand symbol $\beta$. Beta values range from zero (or 0%) to one (or 100%) chance of making a Type II error. The converse of beta, the non-error rate, is defined as one minus beta (or $1 - \beta$), and ranges from a one (100%) to zero (0%) chance of not making a Type II error. This non-error rate gives the *power* of the test results. The greater the power in a statistical test (i.e., the lower the $\beta$ value), the more likely that a Type II error (acceptance of a false null hypothesis) will not be made. When other variables,

such as sample size and critical exceedance rate are held stable, decreasing $\alpha$ increases $\beta$, and vice versa.

Confidence levels have no direct bearing on Type II error, the error of failing to reject an untrue null hypothesis. A confidence of 99 percent, for example, helps ensure that approximately 99 times out of 100 a true null hypothesis will not be judged falsely. However, setting such a high confidence level in test calculations does not prevent, and may actually promote, a higher error rate of judging a false null hypothesis to be true (Type II error).

Type I and Type II errors are both undesirable. However, a policy that provides a moderately high degree of confidence can be adopted for both listing and delisting decisions. Further discussion of control of Type II error is addressed in the determination of recommended form of the null hypothesis (Issue 6A), choice of the statistical test (Issue 6B), critical exceedance rate (Issue 6C), and sample size (Issue 6E).

**Baseline:** Previously, the RWQCBs and the SWRCB did not select or determine a level of statistical confidence in section 303(d) listing decisions.

**Alternatives:**

1. Provide no guidance on the choice of statistical confidence or power to the RWQCBs. Under this alternative, RWQCBs would be able to choose whatever confidence level (and Type I error rate) or power level (and Type II error rate) which seem appropriate. Confidence and power might vary from one decision to the next, or from region-to-region.

   This alternative would grant the RWQCBs great flexibility in section 303(d) list decision-making and would allow establishment of confidence levels depending on the circumstances of each listing decision. However, to make decisions based on statistical tests without bias, confidence and power levels should be determined before tests are performed.

   Assuming that the RWQCBs use the same statistical procedure to analyze sample data, this alternative could result in inconsistent listing decisions (e.g., the same number of exceedances in two samples of the same size could result in listing in one region and no listing in another region).

2. Use any confidence level less than ninety percent (i.e., $[1-\alpha] <= 0.90$). Under this alternative a confidence level of less than or equal to 90 percent would be used by RWQCBs and power

(Type II error) would not be controlled. This less certain confidence level (e.g., 75 to 90 percent) could be used for placing waters on the section 303(d) list. Emerging and more subtle problems (e.g., problems characterized by fewer exceedances) are more likely to be identified with a lower confidence level (Williamson, 2001). However, the risk is an increase in Type I errors, i.e., waters will be identified more frequently as exceeding standards when in fact they may not be exceeding standards. Additional monitoring or confirmation of the problem before a TMDL is developed would help identify and eliminate such mistakes. The State of Florida uses an 80 percent confidence level for placement of waters on its Planning List (i.e., those waters where additional monitoring is needed before the decision to place waters on the section 303(d) list can be made).

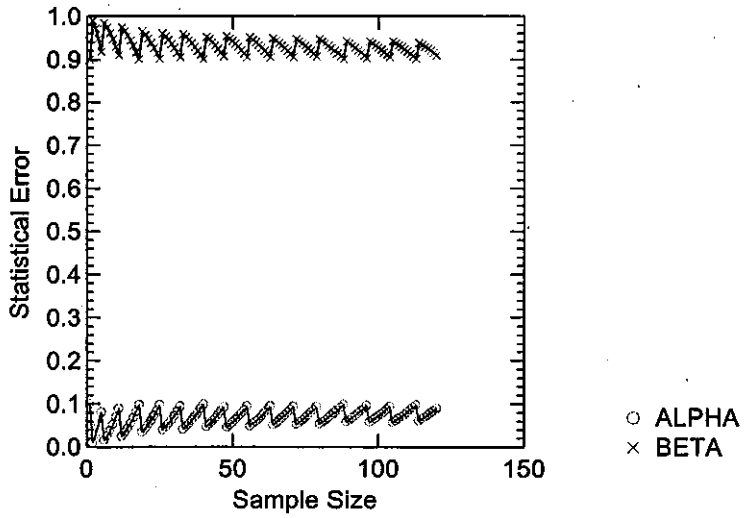
Scientists and decision-makers normally look for a high degree of confidence (i.e., a low $\alpha$) in order to reject a null hypothesis. Any statistical conclusion that has a confidence level of less than 90 percent is considered not acceptable by most statisticians (Lin et al., 2000). Many states have selected 90 percent confidence for placement and removal of waters from the section 303(d) list (e.g., Arizona DEQ, 2000; Florida DEP, 2002; Texas, 2002; and Washington DEP 2002).

As used in the draft Listing Policy (SWRCB, 2003c), the binomial test effectively controls $\alpha$, but not $\beta$. Figure 20 shows maximal statistical error rates associated with the draft Listing Policy for sample sizes up to 120. Type I error ($\alpha$) is controlled at levels less than or equal to 0.10 for all sample sizes shown. The $\beta$ error rate, however, is consistently greater than 0.90. In addition, larger sample sizes do not appreciably lower maximal $\beta$ rates. Rates for $\beta$ of 0.2 or less are generally desirable but are not achieved using this conventional hypothesis testing approach.

The top graph of Figure 20 emphasizes that when deciding not to list a water body (i.e., accepting the null hypothesis of $H_o$: $r \leq 0.1$) there is a high probability ($\beta > 0.90$) of "missing" a water body that should, in fact, be listed. This decision error is greatest when the true alternate exceedance rate is very close to, but greater than, the hypothesized exceedance rate of $r = 0.10$.

In contrast, the lower graph of Figure 20 emphasizes that when deciding to keep the water body on the section 303(d) list (i.e., accepting the null hypotheses of $H_o$: $r \geq 0.1$) there is a high probability ($\beta > 0.90$) of incorrectly failing to remove a water body from the section 303(d) list. Again, this decision error is greatest

LIST WHEN $H_0$: $R \leq 0.10$ IS REJECTED




DELIST WHEN $H_0$: $R > 0.10$ IS REJECTED

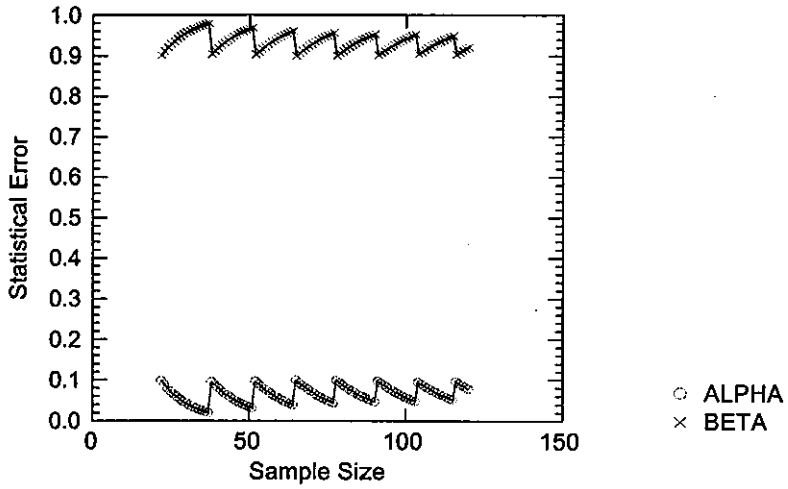



FIGURE 20: STATISTICAL DECISION-MAKING ERROR RATES FOR EXCEEDANCE FREQUENCIES USED IN THE DRAFT SWRCB POLICY (DECEMBER 2, 2003 VERSION).

when the true exceedance rate is very close to, but less than, the hypothesized exceedance rate of $r = 0.10$.

This alternative would allow section 303(d) decision making to proceed with greater than a one-in-ten chance of making a Type I error. In scientific research, confidence levels of at least 90, 95, or even 99 percent (i.e., $\alpha \leq 0.10$, 0.05, or 0.01) are traditionally desirable. Using this alternative, the probability of missing real water quality problems is great.

3. Balance confidence level at 80 percent (i.e., $[1 - \alpha] = 0.80$) and power at 0.80 (i.e., $[1 - \beta] = 0.80$. The 80 percent confidence and 80 percent power levels are recommended under this alternative in order to balance the two types of errors (Types I and II) when sample sizes are expected to be relatively small (e.g., <30).

   The binomial test, like most statistical hypothesis testing procedures, will control the maximum $\alpha$ rate at a value below the nominal significance level for most sample sizes. In contrast, the magnitude of $\beta$ depends on several factors, including $\alpha$, the population variance, the effect size, and sample size. Generally, $\alpha$ varies inversely with $\beta$, and control of $\beta$ is traditionally sought through the appropriate selection of sample size (Gibra, 1973) or through the use of a more powerful statistical test (Helsel and Hirsch, 2002).

   Alternatives to controlling only the $\alpha$ rate are possible. Mapstone (1995) argued against adhering to a fixed and arbitrary $\alpha$, advocating instead for the consideration of economic, environmental, social, and political consequences of both $\alpha$ and $\beta$ decision-making errors. In the absence of further information, Mapstone recommended that decision errors should be weighted equally, i.e., $\alpha = \beta$.

   If errors are made in the section 303(d) process, they could be very costly. For example, if a TMDL is developed and implemented and the originally identified problem does not exist, the costs could run into the millions of dollars to address a non-problem. Conversely, if a real water quality problem is missed, the unidentified problem could have devastating impacts on beneficial uses of water unchecked by actions to control the problem. The loss of a beneficial use could also cost millions of dollars.

   Each of these errors may be avoided by assessing the water quality situation more completely. In other words, if monitoring data were available to better assess water quality conditions then Type I and

Type II errors could be minimized. The cost of minimizing these errors is the cost of performing the monitoring. The costs for monitoring many parameters addressed by the Listing Policy are presented in Table 16. Depending on the parameter and the number of exceedances, monitoring costs range from approximately $4,000 to nearly $89,000 per site to meet the minimum requirements for listing under the provisions of the Policy.

The balanced error approach considers both types of decision-making errors, $\alpha$ and $\beta$, rather than only $\alpha$. Another objective is to maintain these balanced error rates at or below an acceptable magnitude. Although USEPA (2002a) suggested that a moderate acceptable magnitude for balancing errors is 15 percent, the choice of values for $\alpha$ and $\beta$ rates is a policy decision (Millard and Neerchal, 2001). Nevertheless, a pre-defined maximum acceptable error for both $\alpha$ and $\beta$ will allow the determination of acceptable sample sizes to use for listing and delisting.

Appropriate sample sizes required to achieve desired error rates are illustrated in Figures 21 and 22. If the effect size is 15 percent and both $\alpha$ and $\beta$ rates at or below 0.20 then 21 samples for toxics (Figure 21) and 26 samples for conventional pollutants (Figure 22) are needed. If the CALM Guidance-recommended balance errors of 0.15 are used, then 29 samples for toxics and 33 samples for conventional pollutants are needed. At the lower $\alpha$ and $\beta$, monitoring costs would be approximately 27 percent to 38 percent greater.

Use of the higher error rate (20 percent) is appropriate because the basis for the listing will be reviewed and corroborated by subsequent analyses performed in the course of developing the TMDL (SWRCB, 2004). In this situation, higher error rates are acceptable because the listing only initiates the planning process that may lead to implementation of more expensive management measures (Hahn and Meeker, 1991).

Figure 23 directly compares the selected balanced error sampling plans with the December 2003 Listing Policy (Alternative 2). By using the balanced error approach both $\alpha$ and $\beta$ decrease appreciably with increasing sample size ($N$). Lowered $\alpha$ and $\beta$ rates using the balanced error approach contrast sharply with the higher $\beta$ error rates expected when using the traditional statistical tests such as the binomial test.

TABLE 16: ESTIMATED COSTS OF WATER SAMPLING AND ANALYSIS USING 20 PERCENT ALPHA AND BETA

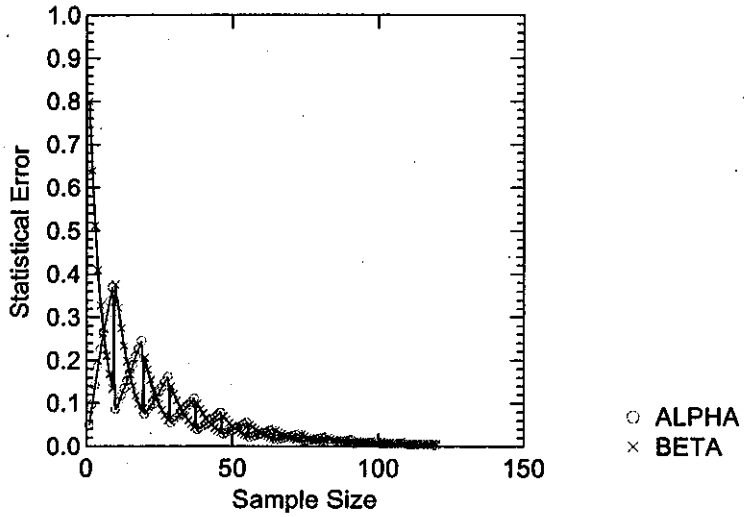
| Sample Type | Low Cost per Sample | High Cost per Sample | 3 samples (Low Range) | 21 samples (Low range) | 3 samples (High Range) | 21 samples (High Range) | 5 samples (Low Range) | 26 samples (Low range) | 5 samples (High Range) | 26 samples (High range) |
|---|---|---|---|---|---|---|---|---|---|---|
| **Conventional Pollutants and Nutrients** ortho-Phosphate, nitrate + nitrite, chloride; sulfate; nitrate (separate); nitrite (separate); ammonia; total P; TKP; chorophyll-a; alkalinity; TSS; TDS; hardness; TOC; DOC; DO; pH; temperature; con-ductivity; turbidity | $1,636 | $2,068 | * | * | * | * | $8,180 | $42,536 | $10,340 | $53,768 |
| Total/Fecal coliform bacteria | $1,186 | $1,918 | | | | | $5,930 | $30,836 | $9,590 | $49,868 |
| Enterococcus bacteria | $1,096 | $1,738 | | | | | $5,480 | $28,496 | $8,690 | $45,188 |
| Cryptosporidum/ Giardia | $1,306 | $1,738 | | | | | $6,530 | $33,956 | $8,690 | $45,188 |
| Enteric viruses | $1,456 | $1,918 | | | | | $7,280 | $31,538 | $9,590 | $49,868 |
| Coliform in shellfish | $1,000 | $1,276 | | | | | $5,000 | $26,000 | $6,380 | $33,176 |
| **Water Chemistry** | | | | | | | | | | |
| Metals w/WQ parameters | $1,364 | $2,026 | $4,092 | $28,644 | $6,078 | $42,546 | | | | |
| Organic w/WQ parameters | $1,722 | $2,371 | $5,166 | $36,162 | $7,113 | $49,791 | | | | |
| **Tissue chemistry** | | | | | | | | | | |
| Metals w/WQ parameters | $1,354 | $2,609 | $4,062 | $28,434 | $7,827 | $54,789 | | | | |
| Organic w/WQ parameters | $1,992 | $2,990 | $5,976 | $41,832 | $8,970 | $62,790 | | | | |
| **Sediment chemistry** | | | | | | | | | | |
| Metals w/WQ parameters | $1,241 | $1,795 | $3,723 | $26,061 | $5,385 | $37,695 | | | | |

| Sample Type | Low Cost per Sample | High Cost per Sample | 3 samples (Low Range) | 21 samples (Low range) | 3 samples (High Range) | 21 samples (High Range) | 5 samples (Low Range) | 26 samples (Low range) | 5 samples (High Range) | 26 samples (High range) |
|---|---|---|---|---|---|---|---|---|---|---|
| Organic w/WQ parameters | $1,992 | $2,990 | $5,976 | $41,832 | $8,970 | $62,790 | | | | |
| **Toxicity Tests** | | | | | | | | | | |
| *Water* | | | | | | | | | | |
| Saltwater w/WQ parameters 1 species to 3 species | $1,931 | $3,904 | $5,793 | $40,551 | $11,712 | $81,984 | | | | |
| Freshwater w/WQ parameters 1 species to 3 species | $2,130 | $4,235 | $6,390 | $44,730 | $12,705 | $88,935 | | | | |
| *Sediment-water interface* | | | | | | | | | | |
| Saltwater w/WQ parameters 1 species | $2,096 | $2,481 | $6,288 | $44,016 | $7,443 | $52,101 | | | | |
| *Sediment* | | | | | | | | | | |
| Freshwater w/WQ parameters, sediment grain size 1 species, Low (Acute), High (Chronic) | $2,388 | $3,031 | $7,164 | $50,148 | $9,093 | $63,651 | | | | |
| Saltwater w/WQ parameters and sediment grain size, 1 species, Low (survival test), High (survival and growth test) | $2,400 | $4,088 | $7,200 | $50,400 | $12,264 | $85,848 | | | | |

* Costs for conventional pollutants alone could be less than reported because fewer exceedances are required.

1. WQ Parameters include: DO; pH; temperature; conductivity; turbidity
2. Each sample type includes: sampling ranging from $788 (low) -$988 (high) per sample, chemical analysis or testing cost; water quality parameter and identification of pollutant when stated. For all bacteria and virus measurements five replicate samples are included for each sample.
3. Twenty percent of the cost for each sample type was added to cover the cost of data quality assurance.
4. Estimated costs per sample were based on the November 2000 Report to Legislature (SWRCB, 2000b) and SWAMP costs (SWRCB, 2003b).
5. Three and five samples are the absolute minimum number of samples needed to support a listing.

*List when $H_o$: $r \leq 0.05$ is rejected*




*Delist when $H_o$: $r \geq 0.20$ is rejected*

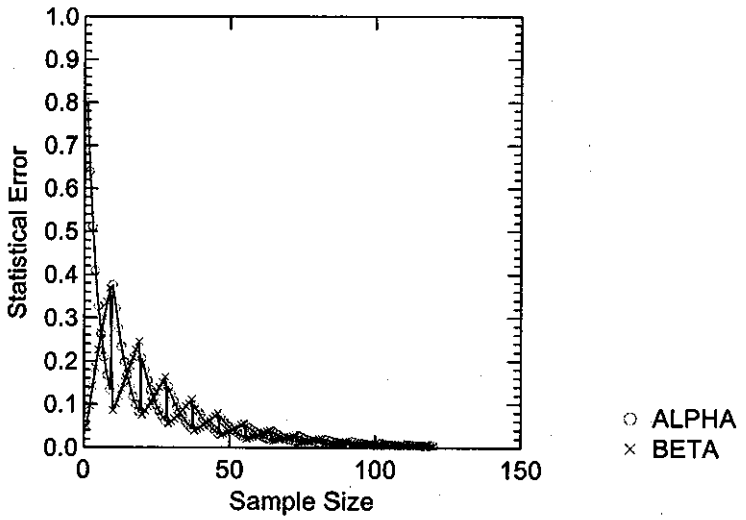
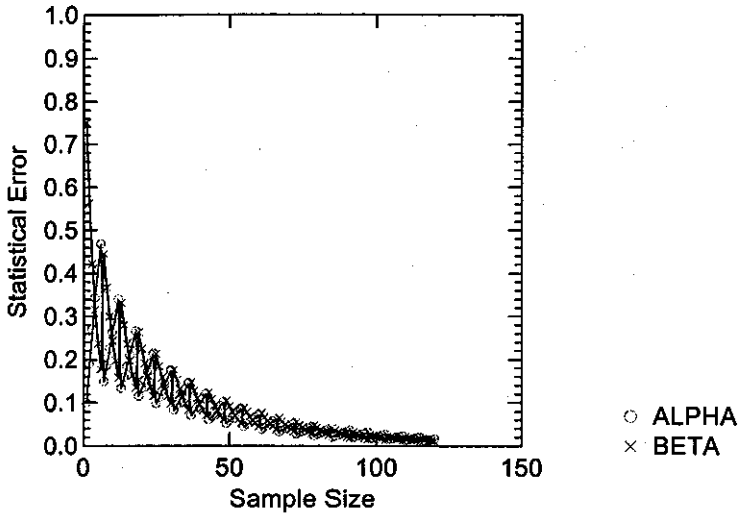



FIGURE 21: BALANCED ERROR RATES ASSOCIATED WITH THE SAMPLING PLAN FOR $R_1$ = 5 PERCENT AND $R_2$ = 20 PERCENT WITH EFFECT SIZE = 15 PERCENT.

LIST WHEN $H_0$: $R \leq 0.10$ IS REJECTED




DELIST WHEN $H_0$: $R \geq 0.25$ IS REJECTED

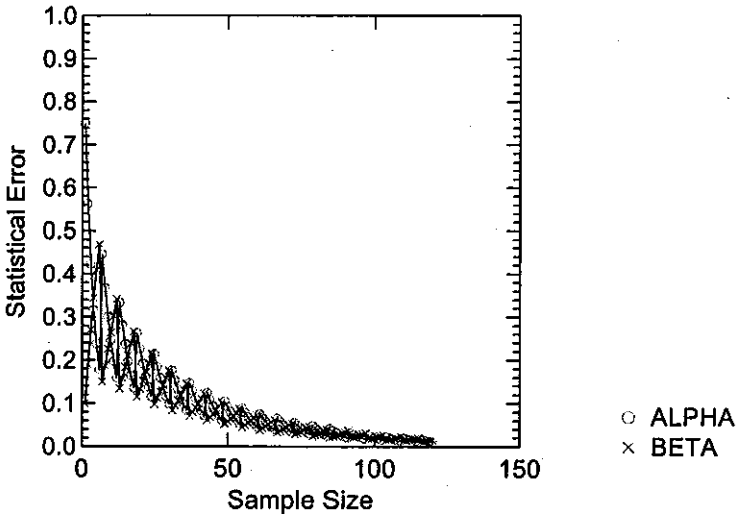
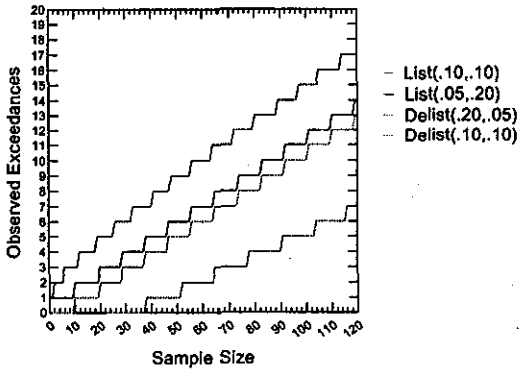



FIGURE 22: BALANCED ERROR RATES ASSOCIATED WITH THE SAMPLING PLAN FOR $R_1$ = 10 PERCENT AND $R_2$ = 25 PERCENT WITH EFFECT SIZE = 15 PERCENT.

ALTERNATIVE 2 VS. ALTERNATIVE 3



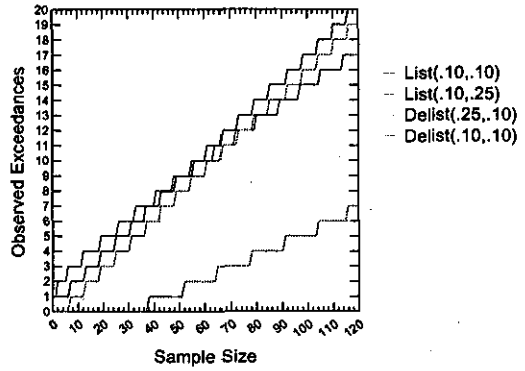




FIGURE 23: COMPARISON OF DECEMBER 2003 VERSION OF LISTING POLICY VERSUS BALANCED ERROR SAMPLING PLANS. NOTATION USED IS LIST($R_1$, $R_2$) OR DELIST($R_1$, $R_2$).

With sample sizes under 60 the balanced error plans require fewer exceedances to list a water body and allow more exceedances when delisting a water body. When sample size is greater than 60, a greater number of exceedances are needed to place a water on the section 303(d) list. This greater number of allowable exceedances may be an incentive for additional monitoring.

This alternative is the preferred alternative because the error are sufficiently low to identify water quality problems while at the same time balancing the potential costs of monitoring to identify real water quality problems. The error balancing approach is an equitable way to decide whether a water body should be listed or delisted – as long as a sufficient number of samples are collected to keep the error rates below 20 percent. Listing when sample size is below the recommended sample size is discussed in Issue 6E.

4. A confidence level greater than ninety percent (i.e., $[1 - \alpha] > 0.90$).
Scientists and decision-makers normally look for a high degree of confidence (i.e., a low $\alpha$) in order to reject a null hypothesis.

This alternative decreases the likelihood of making a Type I error (e.g., to 5%, 1%, etc.). Many scientific, medical, or social researchers demand these levels of confidence for their investigations.

Using a larger value raises the statistical bar, making it harder for data to be judged adequate. Because accurate water quality data are difficult to collect in great numbers, these standards may be too high. Also, as confidence is increased, power ($1 - \beta$; the rate of not making a Type II error) increases (if sample size is held constant). All of the limitations described in Alternative 2 when just Type I error is controlled applies to this alternative.

**Recommendation:** Alternative 3. See Policy sections 3 and 4.

*Issue 6E:* ***Minimum Sample Size***

**Issue:** What minimum sample size is required for section 303(d) listing and delisting?

**Issue Description:** If critical exceedance rate, effect size, Type I error, Type II error, and variance are held constant, the sample size has a large effect on expected errors. *Minimum* sample size allowed is critical to decision-makers because this value is an effective way to help control errors associated with making decisions based on sampled data.

**Baseline:** RWQCBs used minimum sample sizes ranging from one to ten samples.

**Alternatives:**

1. Provide no guidance in the choice of the sample size in the binomial distribution model. This alternative would grant RWQCBs the greatest flexibility in making section 303(d) list recommendations. The RWQCBs could choose to use the widest range of data sets submitted by public and agency sources. Information from resource-strapped data contributors would not necessarily be excluded.

   However, region-by-region listing methodology inconsistencies would not be addressed under this alternative. If very small sample sizes are used, error rates even if balanced, could be very high (i.e., greater than 20 percent).

2. Set a minimum sample size to control error rates at a specified level. USEPA guidance (2002a) identifies acceptable Type II error at 20 percent or less. Assuming a Type I error of 0.2 and a Type II error level of 0.2 (20 percent), the minimum sample size to place waters on the section 303(d) list would be set at 21 for toxics and 26 for conventional pollutants (Figures 21 and 22). Smaller sampling sizes could be used with this Type II error but the critical exceedance rate would have to be increased (USEPA, 2002a). For example, acceptable Type II error for a sample population of 10 requires a critical exceedance rate of at least 40 percent.

   Using a minimum sample size (such as 21 samples) would exclude numerous data sets used in previous listing cycles and would not be consistent with recent USEPA guidance (USEPA, 2003b). However, such a relatively large sample size could result in the data taking on a normal distribution. Investigators could then analyze the data with parametric statistical tests that may offer advantages over the somewhat less powerful binomial test.

3. Require a minimum sample size of 20 for measurements of chemicals in water and 10 for measurements of sediment, tissue, water toxicity, and

bacteria. For delisting, use minimum sample size dictated by critical exceedance rate and confidence level used in the statistical test. Smaller sample sizes are more prone to yield erroneous decisions to list (USEPA, 2003b). Even so, several states require the use of 10 or 20 samples to support listing decisions. Florida (Florida DEP, 2002), for example, requires at least 20 samples before a water segment is considered for placement on the section 303(d) list. Other states, such as Nebraska (2001) or Montana (2002) allows smaller sample sizes if the measurements integrate biological response or chemical concentration. While smaller sample sizes have a higher potential for error, this may be acceptable because the measurements are either integrative of environmental effect or exposure (toxicity or sediments), or the potential is higher that the measurement (tissue or bacteria) is indicative of potential human health impact.

Selection of a relatively small minimum sample size would allow RWQCBs to accept and use a larger number of data sets submitted for evaluation. Citizen monitoring groups and others with limited sampling budgets could still contribute information to section 303(d) listing efforts.

4. Do not require an absolute minimum number of samples. Use the number of samples that exceed water quality standards without regard to sample size. Under this alternative, SWRCB would allow smaller sample sizes to be used if the frequency of sample exceedances is large, i.e., the number of exceedances is equal to or greater than the minimum number of samples identified using the balanced error approach with the exact binomial test (please refer to Issues 6A through 6D).

   One of the balanced error sampling plans (listing using 5 percent and 20 percent) requires 21 or more samples to keep both error types below 20 percent. Using this approach, three exceedances in 21 is the minimum exceedance needed to list a water body. If a decision rule is established to list if three or more exceedances are observed for any sample size less than 21, independent of the statistical sampling plan as recommended in Issue 6D, the $\alpha$ levels are always low and there is a small chance of incorrectly listing a clean water body (Figure 24).

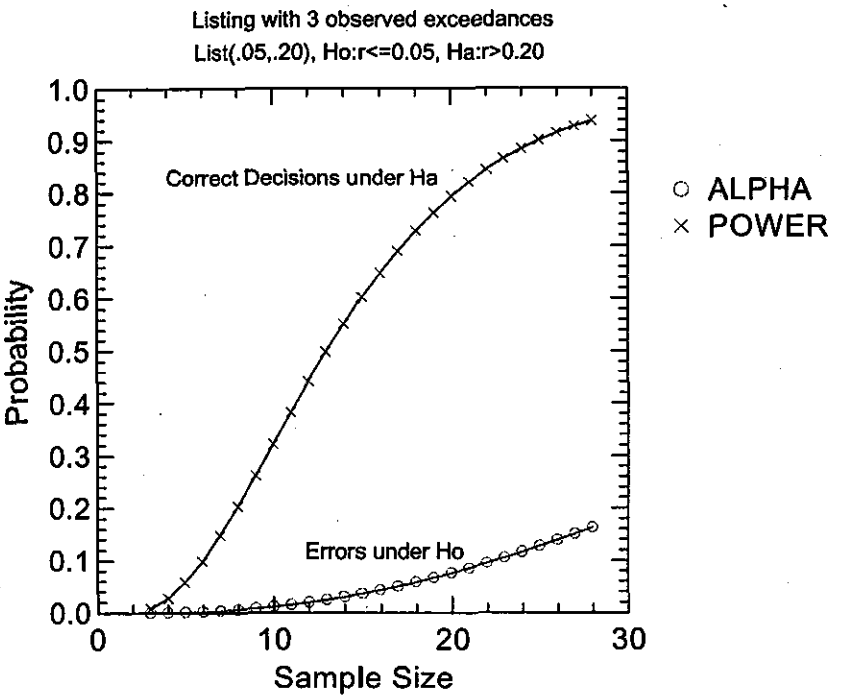



FIGURE 24: LISTING WITH THREE EXCEEDANCES

The burden of proof is greater when using this rule, as compared to the balanced statistical sampling plan (as discussed in the previous issue papers). With smaller sample sizes, α levels are always low and there is a small chance of incorrectly listing a clean water body. However, β errors are high with these smaller sample sizes and there is a large chance of failing to list water bodies that are not meeting water quality standards.

The β errors comes from having small sample sizes that contain 0, 1, or 2 exceedances, when we do not list with the decision rule (i.e., do not reject the null of $r \leq 0.05$). If listing occurs with three or more exceedances, a β error cannot be committed because the null hypothesis is always rejected. Therefore, with three or more exceedances in sample sizes between 3 and 20, inclusive, the only possible outcomes are α errors or a correct decision (i.e., power = 1- β). The correct decision rate depends on the alternative hypothesis proposed, in this case $H_a$: $r > 0.20$. For listing with three or more exceedances with $N = 3$ to 20, α errors are low, but power increases from 0.8 percent to 80 percent with increasing sample size.

The same relationship holds for the balanced error approach using 10 percent and 25 percent. The decision rule would be to list if five or more exceedances were observed in sample sizes between 5 and 25.

Using this approach, small sample populations are not excluded because the frequency of the observed excursions are high enough to support reliable attainment determination as long as the samples are spatially and temporally representative.

If these minimum sample sizes and minimum exceedance rates are used, it is likely that the number of decisions to list would be less than in 2002 (Figure 25). This alternative satisfies USEPA guidance (USEPA, 2003b) requiring that rigid sample sizes not be used and that small data sets be included in deciding to place waters on the section 303(d) list.

**Recommendation:** Alternative 4. See Policy sections 3 and 4.

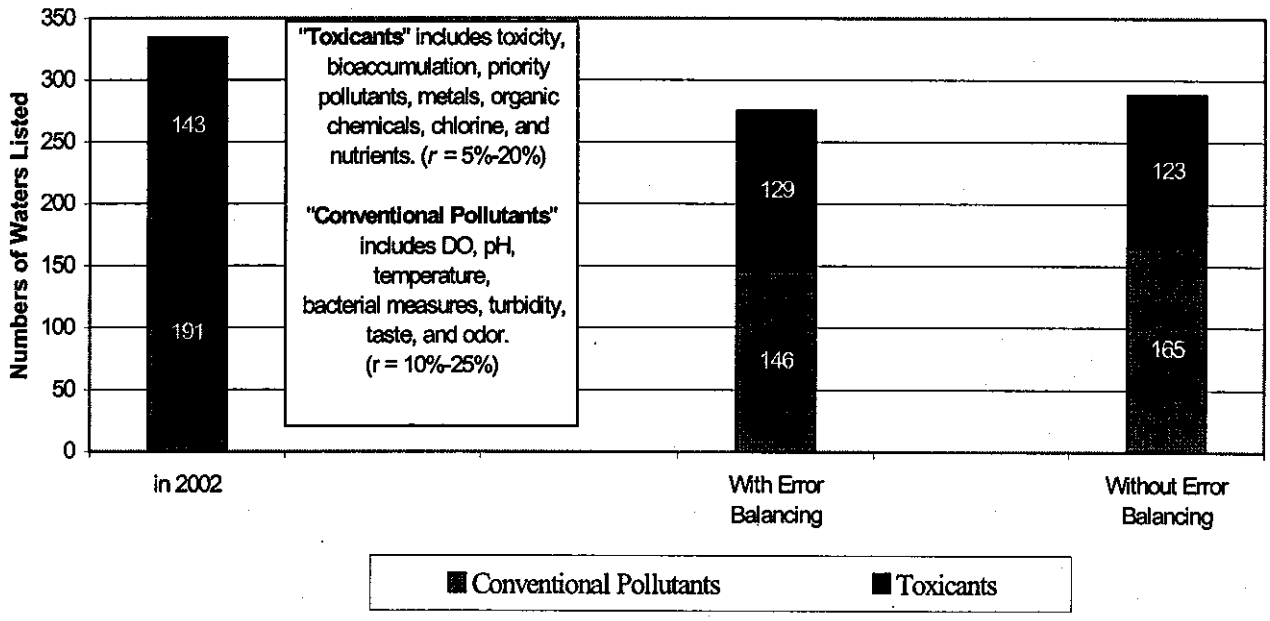



FIGURE 25: GRAPHICAL COMPARISON OF THE NUMBER OF DECISIONS TO PLACE WATERS ON THE SECTION 303(D) LIST.

Figure 25 was developed from the data and information analyzed during the development of the 2002 section 303(d) list (SWRCB, 2003a). The figure was develop using the following assumptions:

1. The "error balancing" bar incorporates the recommendations presented in Issues 6B, 6C, 6D, and 6E.
2. The "no balancing" bar represents the recommended approach in the draft FED (SWRCB, 2003c) and Issue 6D, Alternative 2.

3. Sometimes the same data set is compared to multiple evaluation guidelines.

Figure 25 illustrates that 275 out of 334 listing decisions using acceptance sampling by attributes would support decisions to list. This suggests a possible 17.7 percent reduction in numbers of decisions to list waters as compared to the 2002 listing process.

*Issue 6F:* ***Quantitation of Chemical Measurements***

**Issue:** How should data measurements below the quantitation limit for the chemical measurement be interpreted?

**Issue Description:** One of the most difficult problems in the analysis of water quality data is the incorporation of measurements below analytical detection (nondetects) into statistical analysis. Water quality data often include observed measurements that are below or less than the quantitation limit (QL) of the analytical instruments. Measurements below the QL lies somewhere between zero and the detection limit. For some constituents, established water quality objectives or criteria lies below the QL.

**Baseline:** In 2002, the RWQCBs used several methods to evaluate nondetect data.

**Alternatives:**

1. Provide no guidance for interpreting data below the QL. The RWQCB would be given significant flexibility under this alternative. Guidelines would establish in the Policy for interpreting data below the QL. However, one of the goals of the Policy is to establish consistent guidelines for interpreting data. If guidelines were not established, different methods would likely be used statewide to analyze data that falls below the QL.

2. Provide general guidance to interpret values below the QL. Under this alternative, the Policy would present general guidance on interpreting analytical data that are below the QL. In order to obtain consistency statewide, general guidelines should be established.

   The following general guidelines could be used for interpreting data below the QL. If the exact binomial test is used with data below detection, it is not necessary to quantify the value. For detection levels below the water quality objective should always be judged as meeting water quality standards and the nominal value used would not be affected by the magnitude of the measurement. For measurements below quantitation and above the water quality objective, it cannot be determined if standards are attained and therefore a fundamental assumption of the binomial test is violated (i.e., there would be more than two outcomes). These measurements should not be evaluated using this test. The concepts for this approach are presented in Figures 26 and 27.

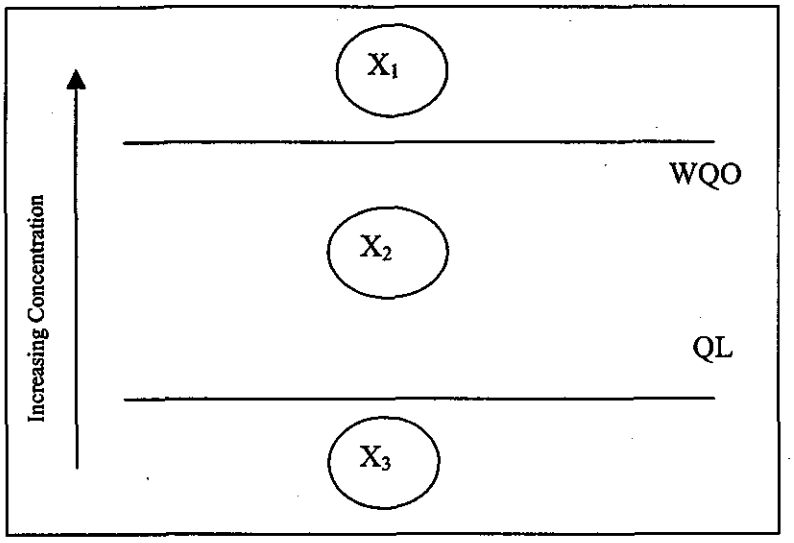



FIGURE 26: INTERPRETING DATA WHEN MEASUREMENTS ARE LESS THAN OR EQUAL TO THE QUANTITATION LIMIT (QL) AND THE WATER QUALITY OBJECTIVE IS GREATER THAN THE QL.

In Figure 26, $X_1$, $X_2$ and $X_3$ should be interpreted in the following manner (consistent with Gibbons and Coleman, 2001).

$X_1$: This value should be used in the analysis if the measured value is greater than the water quality objective and QL. If the data point is greater than the QL, the data can be quantitatively analyzed with suitable precision and accuracy. Additionally, if the data point is above the water quality objective, the water quality objective has been clearly exceeded. Therefore, the data point presents a valid assessment of the sample.

$X_2$ : This value would meet the water quality objective if the measured value is below the water quality objective and above the QL; there is a higher level of confidence that the measured value is the true value. If the data point lies above the QL, the data point is considered valid to use in assessments. However, since the value is below the water quality objective, it is not exceeded and the standard is met.

$X_3$: This value would meet the water quality objective because the data are less than or equal to the QL and the water quality objective is greater than the QL.

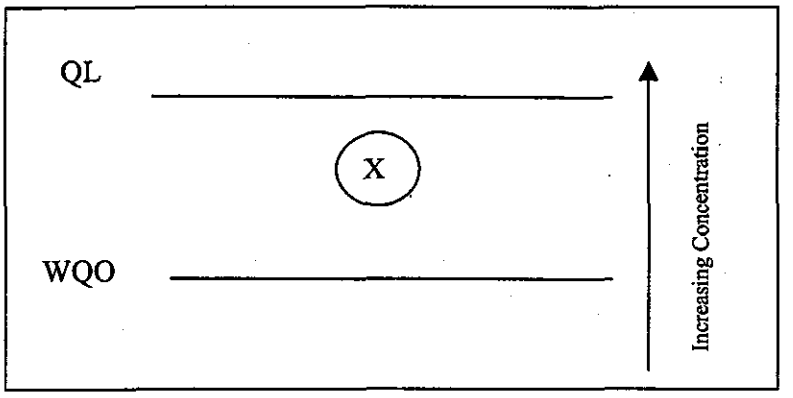



FIGURE 27: INTERPRETING DATA WHEN MEASUREMENTS ARE LESS THAN OR EQUAL TO THE QL AND THE WATER QUALITY OBJECTIVE IS LESS THAN THE QL.

In the circumstance presented in Figure 27, X should be interpreted in the following manner (consistent with Gibbons and Coleman, 2001). When the sample value is less than the QL but is greater than the water quality objective, the results should not be used in the statistical analysis. If the data value falls below the QL it is only an estimate of the true value. Therefore, it is unknown whether the estimated data value exceeded the water quality objective.

This alternative is the preferred alternative because it provides a consistent method for the incorporation of measurements below analytical detection (nondetects) into statistical analysis.

3. Use USEPA general guidance to interpret non-detects. USEPA (1998d) presents some general guidelines to evaluate data that include values below the detection limit (Table 17). However, there is no general procedure that is applicable in all cases.

TABLE 17: USEPA GUIDANCE ON INTERPRETATION OF MEASUREMENTS BELOW DETECTION

| Percentage of Non-detects | Statistical Analysis Methods |
|---|---|
| < 15% | Replace non-detects with detection limit divided by 2, detection limit, or a very small number |
| 15% - 50% | Trimmed mean, Cohen's adjustment, Winsorized mean and standard deviation. |
| >50% - 90% | Use tests for proportions |

The suggested procedures depend on the amount of data below the detection limit. For relatively small amounts of data below detection limits, replacing the non-detects with a small number or half the detection limit (DL/2) and proceeding with the analysis may be satisfactory. For moderate amounts of data below the detection limit, a more detailed adjustment (e.g., Cohen's adjustment, trimmed mean, Winsorized mean and standard deviation) is appropriate.

Cohen's method provides adjusted estimates of the sample mean and standard deviation that accounts for data below the detection limit. The adjusted mean are based on the statistical technique of maximum likelihood estimation of the mean and variance so that non detects that are below the detection limit but may not be zero are accounted for. Trimming discards the data in the tails of a data set, in order to develop an unbiased estimate of the population mean. For environmental data, nondetects usually occur in the left tail of the data, therefore, trimming can adjust the data set to account for nondetects when estimating a mean. Winsorizing replaces data in the tails of the data set with the next most extreme data value. In situations where relatively large amounts of data are below the detection limit, one needs only to consider whether the chemical was detected; the detection limit is subjective. The Test of Proportions is suggested if more than 50 percent of the data are below the detection limit but at least 10 percent of the observations are quantified. Therefore, if the parameter of interest is a mean, consider switching the parameter of interest to some percentile greater than the percent of data below the detection limit.

This alternative allows for flexibility in interpreting data below the QL. This could lead to inconsistencies in dealing with nondetect data and also potential misinterpretation of the data and inappropriate decision making because many statistical tests are influenced greatly by the number of measurements below detection.

**Recommendation:** Alternative 2. See Policy section 6.1.5.5.

## *Issue 7: Policy Implementation*

In order to implement the provisions of the California Listing Factors, California Delisting Factors, and statistical analysis, several issues must be addressed in order for the process to be transparent and the listing approach consistent. These factors include:

A. Evaluation of existing listings

B. Defining existing readily available data and information

C. Soliciting data and information and approval of the list

D. Documentation of data and information

E. Data quality requirements

F. Spatial and temporal representation

G. Data age requirements

H. Determining water body segmentation

I. Natural sources of pollutants

Issues related to these topics are presented in Issues 7A through 7I.

*Issue 7A:* ***Review of the Existing Section 303(d) List***

**Issue:** What steps should the SWRCB and RWQCBs take to implement the Policy?

**Issue Description:** The Policy will ultimately define the factors to place and remove waters from the section 303(d) list. There are more than 1,800 water segment and pollutant combinations on the 2002 section 303(d) list that were included prior to the Policy's implementation. The State should review waters currently on the section 303(d) list for consistency with the Policy. However, the resources available to complete this task will limit the review of all listings before the next section 303(d) list is due.

**Baseline:** Since the inception of the California section 303(d) list, the SWRCB has used previous lists as the basis for the development of the biennial section 303(d) list. The 2002 section 303(d) list was no exception. The 1998 section 303(d) list formed the basis for the 2002 list submittal.

The SWRCB in 1998 and USEPA in 1999 approved the 1998 amendments to the list. At that time, the SWRCB and USEPA evaluated all the existing and readily available water quality-related data and information to make the listing decisions. For many of the listed water bodies, the SWRCB and RWQCBs did not receive new data or information. Therefore upon consideration of the 2002 list, the SWRCB had no new evidence with which to reexamine the 1998 section 303(d) list conclusions. In the absence of evidence that called the 1998 listing decisions into question, decisions based on the previous record, were included on the list.

**Alternatives:**

1. Incorporate a requirement to revise the existing section 303(d) list so it is consistent with the Listing/Delisting Policy. Under this alternative, the Policy would be applied to all existing listings of water segment-pollutant combinations on the 2002 section 303(d) list. If completed in one listing cycle, this alternative would be a monumental task. However, it is unlikely the SWRCB and RWQCBs would be able to complete this task within the next two years. There are not enough staff resources available to complete the extensive data and information review that would be required. To reduce the impact of a reevaluation, it would be necessary to divide the re-analysis into several parts, completed over a number of listing cycles.

   Listings that have yet to be reassessed would be carried forward on to the new section 303(d) list until all the reassessments are complete. After all waters have been reassessed, the updated version of the list would be used

as the basis for subsequent lists. Future reassessment of waters should only be completed if new data and information become available.

This alternative would be staff resource intensive and could cause a delay in development of TMDLs.

2. Do not require that the entire section 303(d) list be reviewed. Only change the existing list if new data and information are available and indicate a change is needed. This alternative represents the baseline process. The advantage of this alternative is that the list could be reviewed within existing resources with minimal impacts on staff. The major disadvantage is that inconsistencies with the Policy would remain on the section 303(d) list until new information is available. Under this alternative, it cannot be determined when the State will completely reevaluate the section 303(d) list because of uncertainties in developing new data and information.

   In order to improve consistency in the re-evaluation of the section 303(d) list, the Policy could include a process for interested parties to request the reassessment when new information or a new data evaluation is available. Using the guidance provided in the Policy, an interested party would make a request to the appropriate RWQCB to reassess a listing. The interested party would describe the reason that the listing is inappropriate, provide evidence that the data and information for the original listing is inadequate, and provide the data and information necessary for the RWQCB to conduct the reassessment.

   This alternative would have minimal impact on RWQCB staff resources.

3. Reevaluate existing listings on the section 303(d) list as resources allow with no requirement for new data and information. (Combination of Alternatives 1 and 2). Water segments and pollutants on the section 303(d) list could be reevaluated, as resources allow, if the listing was based on faulty data or if data and information indicates that the waters would not meet listing or delisting requirements of the Listing Policy.

   An interested party would be able to request an existing listing be reassessed (whether new data are available or not) under the provisions of the Policy. To reduce the workload involved in evaluating the existing listings the request for reevaluation would include an assessment of all the readily available and existing data and information. In requesting the reevaluation, the interested party would be required to describe the reason(s) the listing is inappropriate, state the reason the Policy would lead to a different outcome, and provide the data and information necessary to enable the RWQCB and SWRCB to conduct the review.

The most recently completed section 303(d) list would form the basis for any subsequent lists.

The steps to complete a reevaluation would be:

- Evaluation of all readily available data and information to assess a water segment.
- In performing the reassessment the RWQCBs or SWRCB would use the California Delisting Factors to assess each water segment-pollutant combination.

This alternative is the preferred alternative because with the limited resources available, this alternative presents the most feasible means of reevaluating existing listings.

4. Do not state in the Listing Policy when or if existing listings are to be reevaluated. Under this alternative the Listing Policy would be silent on whether existing listings would be reevaluated. The advantage of this alternative is that RWQCB and SWRCB may not be impacted by requests for evaluation of previously listed waters. A disadvantage is that if the Policy is silent on this point and makes no provision for reviewing historical listings, RWQCBs may or may not view it as obligated or authorized to conduct such a review. This interpretation may lead to the continued development of TMDLs that may not be necessary. This last point may be mitigated by requiring a full reevaluation of listings as the first step in TMDL development.

**Recommendation:** Alternative 3. See Policy section 4.

*Issue 7B:* ***Defining Existing Readily Available Data and Information***

**Issue:** How should the SWRCB define existing readily available data and information?

**Issue Description:** Federal regulation requires the SWRCB and RWQCBs to assemble and consider all existing readily available data and information that will be useful in determining whether water quality standards are being met (40 CFR 130.7). To date, each RWQCB has used its judgement in identifying which data and information to use in its listing process.

The RWQCBs and SWRCB in the process of evaluating whether water quality standards are being met have traditionally relied on data and reports documenting specific environmental characteristics pertaining to the physical, chemical and biological conditions of each RWQCBs water bodies and watershed systems. The data and information reviewed has consisted of submittals as a result of the RWQCBs and SWRCB solicitation, selected data possessed by the RWQCBs and the SWRCB, and other sources.

**Baseline:** During the 2002 section 303(d) listing process, the RWQCB and SWRCB solicited all data and information from state and federal agencies and from the public to support updates of the section 303(d) list.

**Alternatives:**

1. Only specify the possible sources of data and information; do not specify the major types of data. Sources of existing and readily available information could include all data and information from federal, state, regional and local agencies, institutions, environmental and volunteer groups, private and public organizations, watershed groups, regulated dischargers, and private individuals. Data from SWAMP as well as other statewide ambient monitoring programs implementing appropriate QAPPs could also be used.

   The advantage of this alternative is that the RWQCBs and SWRCB are not burdened with evaluating reports that may not yield any new or unassessed data and information. The disadvantage is there may be inconsistencies in the amounts and types of information used in the listing process.

2. Specify the types of data and information that will be solicited by the SWRCB and RWQCBs. Under this alternative the RWQCBs would be required to review a set number of data and information sources. These sources of readily available data and information could include all data and information, preferably on paper or in electronic form, and from all available sources but at a minimum include:

- The most recent CWA section 303(d) list;
- The most recent CWA section 305(b) report;
- The most recent drinking water source assessments;
- Municipal Separate Storm Sewer System (MS4) monitoring reports;
- Information on water quality problems in documents prepared to satisfy Superfund and Resource Conservation and Recovery Act requirements;
- Data and information regarding fish and shellfish advisories, beach postings and closures, or other water quality-based restrictions;
- Reports regarding fish kills, cancers, lesions or tumors;
- Dilution calculations, trend analyses, or predictive models for assessing the physical, chemical, or biological condition of streams, rivers, lakes, reservoirs, estuaries, coastal lagoons, or the ocean.
- Water quality data and information from SWAMP or any other ambient monitoring programs;
- Data and information documenting water quality problems; and
- Existing and readily available water quality data and information reported by regional, local, state and federal agencies (including discharger-monitoring reports); citizen monitoring groups; academic institutions; and the public. Federal agencies would be actively solicited. These agencies could include: U.S. Department of Agriculture, NOAA, and U.S. Fish and Wildlife Service.

The disadvantage of this alternative is that RWQCBs and the SWRCB would be required to review reports that may not yield any new or unassessed data and information.

This alternative represents the preferred alternative because inconsistencies or questions about the amounts and types of information used in the listing process would be reduced.

**Recommendation:** Alternative 2. See Policy section 6.1.1.

*Issue 7C:* ***Process for Soliciting Data and Information and Approval of the List***

**Issue:** How should the SWRCB and the RWQCBs solicit readily available data and information and approve the CWA section 303(d) list?

**Issue Description:** Assembling all existing and readily available data and information is central in developing and revising the section 303(d) list. The RWQCBs have access to a number of sources of data. However, many federal, state, and local agencies, as well as the interested public, may have data and information that could be useful in developing the section 303(d) list. In the past, each listing cycle was initiated by the RWQCBs by soliciting interested parties for any readily available data and information regarding the water quality conditions in the surface waters of each region. This has been traditionally accomplished through public notices and local newspaper ads and letters from the RWQCBs to interested parties.

After existing data and information have been evaluated the approval process is initiated. Through a series of public hearings, each RWQCB assembles and approves a recommended section 303(d) list for submittal to the SWRCB. Subsequently, the SWRCB carries out a final review of the candidate regional lists and assembles a statewide list for final approval and submittal to USEPA. The final approval of the statewide list is accomplished through several public hearings, workshops and a board meeting where the final statewide CWA section 303(d) list is approved.

**Baseline:** For the 1998 section 303(d) list, SWRCB and the RWQCBs staff prepared guidance for the water quality assessment update for reviewing new monitoring information, soliciting information from state and federal agencies, and inviting the public to participate. RWQCBs' staff used the guidelines as the basis for the 1998 listing and delisting of water bodies, prioritizing and scheduling TMDLs, and public noticing procedures.

The development of the 2002 section 303(d) list was initiated by the RWQCBs request for readily available data and information in March 2001. After review of the data and information gathered, each RWQCB compiled their own list of water quality limited segment recommendations for submittal to the SWRCB. Each RWQCB submitted staff reports and lists to SWRCB, along with copies of public submittals, data and information, and documents referenced in the submittal. All documents were made available in the administrative record for public comment.

In May 2002, the SWRCB initiated a second data and information solicitation. The SWRCB staff reviewed the RWQCBs recommendations and developed fact sheets for each proposal to add water bodies, delete water bodies, and/or change the section 303(d) list. The 1998

section 303(d) list served as the basis for the 2002 section 303(d) list. Listings from 1998 were not reviewed or evaluated, nor were fact sheets developed unless new data was submitted.

Beyond the general information solicitation, state and federal agencies such as DFG, DHS, the National Marine Fishery Service (NMFS), and USGS were solicited for any new information. The SWRCB held three public hearings, a workshop, and Board meeting.

**Alternatives:**

1. Only the RWQCBs should solicit readily available data and information and manage the approval process for section 303(d) listing recommendations. The RWQCBs would initiate the listing process by soliciting all readily available information. The data and information request would cover all new and current information regarding water quality conditions of a water body or watershed, within the boundary of a particular region, since the last listing. The readily available data and information would consist of any data and/or written reports documenting specific environmental characteristics pertaining to the physical, chemical, and biological conditions of the region's water bodies and watershed systems. This would be the only data and information solicitation during the listing process.

   For the approval process, each RWQCB would develop a section 303(d) list and be responsible for holding public hearings to consider each proposed water body. After receiving testimony, each RWQCB would develop responses to all comments on the lists from the public and approve recommendations for each list. After, each RWQCB has approved their lists; they would submit them to the SWRCB. The SWRCB would assemble and approve the final section 303(d) list without review or change to any RWQCB recommendation. Once the final section 303(d) list has been approved by the SWRCB, the section 303(d) list would be submitted to USEPA for approval.

   Under this alternative, the RWQCBs will hold primary responsibility in making water body-pollutant recommendations pertaining to the section 303(d) list. This procedure has been conducted in the past and has lead to many inconsistencies in interpreting the data statewide.

2 Only the SWRCB should solicit readily available data and information for listing recommendations for transmittal to the RWQCBs and manage the list approval process. The SWRCB would initiate the listing process by soliciting all readily available data and information by following the procedures outlined in Alternative 1. Once the data was received, it would be sent to the RWQCBs. The major disadvantage of this alternative would be that much data and information available to the RWQCBs would not be

available to the SWRCB and, therefore, would not be included in the administrative record.

Once the RWQCBs received the data and information sent by the SWRCB, fact sheets would be assembled with the pertinent information for each potential water body-pollutant combination. All RWQCB-prepared fact sheets would be subsequently sent to the SWRCB for review and evaluation. The SWRCB would make recommendations for each water body-pollutant combination and assemble the statewide lists. The SWRCB would hold public hearings and workshops to hear testimony from the public. Written responses to public comments would be addressed by the SWRCB. The SWRCB would approve the list and submit the section 303(d) list to USEPA for approval.

Under this alternative, the RWQCBs would be limited in their participation in the section 303(d) listing process. The RWQCBs would only participate in assembling fact sheets and not participate in the recommendation process. Input from the RWQCBs is critical in the listing recommendation process, because they are the experts in their regions in regards to the condition of their water bodies. Without the RWQCBs expertise, the likelihood of making an inappropriate decision could be potentially high.

3. Both the SWRCB and RWQCBs would issue a combined data and information solicitation and manage the approval process. Under this alternative, both the SWRCB and RWQCBs would initiate the listing process by simultaneously actively soliciting all readily available data and assessment information on the quality of the surface waters of the state.

   In general, readily available data and information should include information from any interested party, including but not limited to: private citizens; public agencies; State and federal governmental agencies; non-profit organizations; and businesses possessing data and information regarding the quality of a region's waters. The solicitation would focus on absolutely all data and information that might be available. The Boards may place emphasis on recent data and information generated since the last listing. Readily available data and information would consist of any data and information in electronic and/or written reports documenting specific environmental characteristics pertaining to the physical, chemical and biological conditions of a region's water bodies and watershed systems.

   This alternative provides the best combination of regional and statewide data solicitation. Each RWQCB would focus on locating data and information for its region without the burden of soliciting information

from agencies that may be statewide in scope. Data from state and federal agencies would be more efficiently solicited by the SWRCB.

Information solicited should contain the following:

- The name of the person or organization providing the information;
- The name of the person certifying the completeness and accuracy of the data and information and a statement describing the standards exceedance;
- Mailing address, telephone numbers, and email address of a contact person for the information provided;
- A paper copy and an electronic copy of all information provided. The submittal must specify the software used to format the information and provide definitions for any codes or abbreviations used;
- Bibliographic citations for all information provided; and
- If computer model outputs are included in the information, provide bibliographic citations and specify any calibration and quality assurance information available for the model(s) used.

Data solicited should contain the following:

- Data in electronic form, in spreadsheet, database, or ASCII formats. The submittal should use the SWAMP data format and should define any codes or abbreviations used in the database.
- Metadata for the field data, i.e., when measurements were taken, locations, number of samples, detection limits, and other relevant factors.
- Metadata for any GIS data must be included. The metadata must detail all the parameters of the projection, including datum.
- A copy of the quality assurance procedures.
- A paper copy of the data.
- Data from citizen volunteer water quality monitoring efforts require the name of the group and indication of any training in water quality assessment completed by members of the group. Data submitted by citizen monitoring groups should meet the data quality assurance procedures as detailed in section 6.1.4.
- For photographic documentation, adhere to the guidelines detailed in section 6.1.4.

The RWQCBs would evaluate all readily available data and information. They would assemble fact sheets with the pertinent information for each potential water body-pollutant combination. Public hearings would be held by RWQCBs to consider each proposed listing decision. The RWQCBs would provide written response to comments. The RWQCB would approve all recommendations for the section 303(d) list. Each RWQCB

would submit to the SWRCB, all fact sheets along with a copy of the supportive documentation (e.g., data and information) for the recommendation, and all documentation and response to comments presented during the hearing process.

The SWRCB would review each RWQCBs water body fact sheet and recommendation to ensure that the Policy guidelines were followed. After review of the fact sheets and documentation, the SWRCB would add their recommendation to each water body fact sheet for the section 303(d) list. The section 303(d) list would then be made available to the public for review and comment. The SWRCB would hold workshops to consider all testimony presented by the public. The SWRCB would provide written responses to comments from the public and approve the list at a SWRCB meeting. Subsequent to SWRCB approval, the section 303(d) list would be submitted to USEPA for approval as required by the CWA. The supporting water body fact sheets would also be sent to USEPA as documentation of the recommendations for the section 303(d) list.

RWQCBs should consider the listing recommendations at workshops or hearings. This would provide an opportunity for the public to give comments on decisions and the RWQCB the opportunity to respond to those comments. This would allow RWQCBs to address contentious issues before they reach the SWRCB. A second review of each RWQCB fact sheet recommendation by the SWRCB would provide consistency in the listing recommendations statewide.

This alternative is the preferred alternative because it would allow for more consistency in the development of the section 303(d) list.

**Recommendation:** Alternative 3. See Policy section 6.1.2.1.

*Issue 7D:* ***Documentation of Data and Information***

**Issue:** How should data and information be documented?

**Issue Description:** Evaluation of data and information for the listing of waters on the section 303(d) list is often complex. For listing decisions to be transparent, the assessment of data and information should be documented using a consistent format that allows the RWQCBs, SWRCB, and the public to understand the reasons for the proposed listings.

Documentation of proposed listings has varied widely. Some RWQCBs prepare fact sheets that support each listing proposal, while other RWQCBs summarize the rationale for listing in staff reports. The information provided to the SWRCB from the RWQCBs has varied considerably in content and format.

**Baseline:** For the 2002 303(d) list, SWRCB staff developed fact sheets for each water body and pollutant recommended by the RWQCBs for the section 303(d) list. All pertinent information needed to make the listing decision was outlined on each fact sheet.

**Alternatives:**

1. Each RWQCB should be allowed to document their recommendations in a manner that they choose. This alternative represents the status quo. RWQCB staff assembles the analysis of data and information in a manner that best informs each RWQCB of the recommendations for placement on the section 303(d) list. One advantage of this approach is that each RWQCB could tailor the documentation of their recommendations to the staff resources that are currently available. This approach would also likely result in no or minimal changes in RWQCB workload. The major disadvantage is that it would be difficult for the SWRCB staff to assemble the needed information in a consistent manner.

2. Use a standard format for the documentation of data and information. Under this alternative RWQCB would be required to submit summaries of the data and information used to support recommendations for the listing and delisting of waters in the categories recommended for the section 303(d) list. Depending on the amount of documentation, the development of fact sheets for each water segment and pollutant may increase the workload of the RWQCB and SWRCB staff. To minimize potential impacts on staff resources, fact sheets should only be prepared in circumstances where data and information are available. If the data show that standards are met, individual water body fact sheets could be used to summarize data for the many pollutants that meet standards.

   The fact sheets should contain the following summary information:

A. Region
B. Type of water body (bay and harbors, coastal shoreline, estuary, lake/reservoir, ocean, rivers/stream, saline lake, tidal wetlands, freshwater wetland)
C. Name of water body segment (including Calwater watershed)
D. Pollutant or type of pollution that appears to be responsible for standards exceedance
E. Medium (water, sediment, tissue, habitat, etc.)
F. Water quality standards (copy applicable water quality standard, objective, or criterion from appropriate plan or regulation) including:
   1. Beneficial use affected
   2. Numeric water quality objective/water quality criteria plus metric single value threshold, mean, median, etc.) or narrative water quality objective plus guideline(s) used to interpret attainment or non-attainment
   3. Antidegradation considerations (if applicable to situation)
   4. Any other provision of the standard used
G. Brief Watershed Description (e.g., land use, precipitation patterns, or other factors considered in the assessment)
H. Summary of data and or information
   1. Spatial representation, area that beneficial use is affected or determined to be supported, including a map, any site specific information, and reference condition.
   2. Temporal representation
   3. Age of data and or information
   4. Effect of seasonality and events/conditions that might influence data and/or information evaluation (e.g., storms, flow conditions, laboratory data qualifiers, etc.)
   5. Number of samples or observations
   6. Number of samples or observations exceeding guideline or standard
   7. Source of or reference for data and/or information
I. For numeric data include:
   1. Quality assurance assessment
J. For non-numeric data include:
   1. Types of observations
   2. Perspective on magnitude of problem
   3. Numeric indices derived from qualitative data
K. Potential source of pollutant or pollution (the source category should be identified as specifically as possible)
L. Program(s) addressing the problem, if known and any conditions of the enforceable program list met
M. Data evaluation as required by sections 3 or 4 of the Policy
N. Recommendation
O. TMDL schedule (developed only for the section 303(d) list as required by section 5 of the Policy).

This alternative is the preferred alternative because it provides a means to adequately document the data quality, guideline selection, and data quantity processes required by the Policy.

**Recommendation:** Alternative 2. See Policy section 6.1.2.2.

*Issue 7E:* ***Data Quality Requirements***

**Issue:** What data quality should be required?

**Issue Description:** A wide range of data has been used for section 303(d) listing and delisting of water bodies. Knowing the quality of data is essential in determining the strength of the recommendation to list a water body.

The quality of the data used in the development of the section 303(d) list should be of sufficient high quality to determine water quality standards attainment. Quantitative data are of little use unless accompanied by descriptions of sample collection, the analytical methods used, Quality Control (QC) protocols, and the degree to which data quality requirements are met.

Quality Assurance (QA) is an integrated system of management activities involving planning, implementation, documentation, assessment, reporting, and quality improvement to ensure that a process, item, or service is of the type and quality needed and expected. QA consists of two separate but interrelated activities: QC and quality assessment. QC refers to the technical activities employed to ensure that the data collected are adequate, given the monitoring objectives to be tested. Quality Assessment activities are implemented to quantify the effectiveness of the QC procedures. QC is the overall system of technical procedures that measure the attributes and performance of a process, item, or service against defined standards.

To ensure that high quality data is produced in monitoring efforts, provisions are described in a Quality Assurance Project Plan (QAPP). A QAPP describes in comprehensive detail the necessary QA, QC, and other technical activities that must be implemented to ensure that the results of the work performed satisfy the stated performance criteria.

**Baseline:** In previous section 303(d) listing cycles, a large array of information and data were accepted. The quality of the data and information used was generally unknown. In 2002, if the RWQCB provided information on the quality of the data, it was recorded in the fact sheet.

**Alternatives:**

1. Use all data of any quality or of unknown quality to make decisions to list/delist waters. Data from major monitoring programs in California are considered to be of adequate quality. These major programs include SWAMP, the Southern California Bight Projects managed by SCCWRP, USEPA EMAP, SFEI-RMP, and the BPTCP. These monitoring programs/organizations follow and adhere to an established QA program.

However, there are many organizations, both private and public, that have monitoring programs, but the RWQCBs may not be familiar with the quality of their data. Data and information available from organizations and/or parties that did not submit data in previous listing cycles must also be considered. If all data and information are used to make listing decisions, the quality of the data needs to be determined to confidently make a judgement as to whether an impairment truly exists. These unknowns and/or concerns can be clarified with the development of data quality guidelines.

Data without rigorous QC can be useful in combination with high quality data and information. If data collection and analysis is not supported by a QAPP, or its equivalent, or if it is not known if the data is supported by a QAPP, then the data and information would not be used by itself to support listing or delisting of a water segment. These data would only be used to corroborate other data and information with an appropriate QAPP.

2. The SWRCB should provide general guidance on the quality of data that is acceptable for use in the section 303(d) listing process. The development of data quality guidelines would bring clarity and transparency to the process of using available data to determine if a water body segment warrants listing. Even though all data and information will be used, data supported by a QAPP should provide the needed data quality assurance that previous listing cycles lacked. Data that are supported by a QAPP pursuant to the requirements of 40 CFR 31.45 are acceptable for use in developing the section 303(d) list. QAPPs drafted in accordance with the provisions of the SWAMP Quality Management Plan also satisfy this requirement. Additional information about QAPP preparation is available from USEPA (2002d). If a QAPP is not available it would be also acceptable to use available information that is equivalent to the information contained in a QAPP.

   The QAPP (or its equivalent) should contain a discussion of the QA/QC practices associated with the following:

   - Short description of the monitoring project.
   - Sample collection program.
   - Sample preservation and transportation.
   - Field measurements.
   - Laboratory measurements.
   - Generated data handling.
   - Past data selection (if used).
   - Corrective actions.
   - Summary report at project end.

Data supported by a QAPP and/or from the major monitoring programs in California are acceptable for use in developing the section 303(d) list. If a discharger monitoring report has been determined to be adequate for assessing compliance with WDRs, no further review of the QAPP is necessary.

Numeric data are considered credible and relevant for listing purposes if the data set submitted meets the minimum QA/QC requirements outlined below. A QAPP should be available containing, the following elements:

- Objectives of the study, project, or monitoring program;
- Methods used for sample collection and handling;
- Field and laboratory measurement and analysis;
- Data management, validation, and recordkeeping (including proper chain of custody) procedures;
- Quality assurance and quality control requirements;
- A statement certifying the adequacy of the QAPP (plus name of person certifying the document; and
- A description of personnel training.

A site-specific or project-specific sampling and analysis plan for numeric data should also be available that contains:

- Data quality objectives or requirements of the project;
- Rationale for the selection of sampling sites, water quality parameters, sampling frequency and methods that assure the samples are spatially and temporally representative of the surface water and representative of conditions within the targeted segment of time of sampling; and
- Information to support the conclusion that results are reproducible.

The RWQCBs should make a determination in the fact sheets on the availability of a QAPP or equivalent, adequacy of data collection and analysis practices, and adequacy of the data verification process including the chain of custody, detection limits, holding times, statistical treatment of data, precision and bias, etc. If any data quality objectives or requirements in the QAPP are not met the reason for not meeting them and the potential impact on the overall assessment should be clearly documented because these issues may have a large bearing the usefulness of the data.

Data without rigorous QC (such as photographic documentation) could be used to corroborate other data and information with an appropriate QAPP or if justified as part of the situation-specific weight of evidence. For these narrative and qualitative submittals to be most useful, the submission should:

- describe events or conditions that indicate impacts on water quality;
- provide linkage between the measurement endpoint (e.g., a study that may have been performed for some other purpose) and the water quality standard of interest;
- be scientifically defensible;
- provide analyst's credentials and training; and
- be verifiable by the SWRCB or RWQCB.

For photographic documentation, the submission should:

- identify the date;
- mark the location on a general area map;
- either mark the location on a USGS 7.5 minute quad map along with quad sheet name or provide location latitude/longitude;
- provide a thorough description of the photograph(s);
- describe the spatial and temporal representation of the photographs;
- provide the linkage between a photograph-represented condition and a condition that indicates an impact on water quality;
- provide the photographer's rationale for the area photographed and camera settings utilized; and be verifiable by SWRCB and RWQCB.

This alternative is the preferred alternative because it includes procedures to ensure that data collected are of adequate quality to make decisions to place or remove waters from the section 303(d) list.

**Recommendation:** Alternative 2. See Policy section 6.1.4.

*Issue 7F:* ***Spatial and Temporal Representation***

**Issue:** How should spatial and temporal characteristics of the water bodies be addressed by the Policy?

**Issue Description:** Water quality assessment includes monitoring to define the condition of the water body, detect trends, and provide information to establish cause and effect relationships. Important aspects of an assessment are the interpretation and reporting of monitoring results and recommendations for future actions. One of the main components in the assessment of water quality is spatial and temporal representation of the water body segment.

In California, there are many water body types (e.g., lakes, rivers, coastal, estuaries and bay,) with varying degrees of climatic, geologic and/or geographic characteristics where pollutants (natural or unnatural) can have widely different effects on the aquatic and ecological environment. In addition, physical conditions (e.g., flow patterns, flow rate, depth, currents, storm event, wind, temperature, sunlight, etc.) can vary widely within a water body, as well as from one water body to the next. When collecting data and information from a water body, one needs to consider whether the data and information is representative of the water body segment during the assessment period.

**Baseline:** In previous section 303(d) listing cycles, spatial and temporal representation were considered on a case-by-case basis.

**Alternatives:**

1. RWQCBs should interpret spatial and temporal data on a case-by-case basis. Under this alternative, the RWQCBs would have significant flexibility in considering spatial and temporal factors in evaluating data for a water body segment.

   The advantage of this alternative is the RWQCBs would be able to consider the various kinds of physical conditions in the assessment of water body. A disadvantage is that the lack of general guidance could lead to inconsistencies among RWQCBs, depending on the expertise and experience of the staff preparing the water body listing assessment.

2. The Policy should establish specific guidance in considering spatial and temporal representation in the evaluation of data and information. Specific guidelines would be outlined in the Policy to consider spatial and temporal factors in evaluating data from the water body segment. One advantage is that more specific guidance could lead to greater consistency among RWQCBs.

3. The Policy should establish general guidance when considering spatial and temporal representation in the evaluation of data and information. Under

this alternative, the Policy would provide general guidance on evaluating data so that it is spatially and temporally representative of a water segment. The general guidance could focus on those factors that are necessary to meet the minimal assumptions of virtually any statistical test, namely that the sampling be temporally and spatially independent and that sampling is random (in the sense that the measurements are not biased).

To the extent possible, all samples used in the listing process should statistically represent the segment of the water body or collected in a consistent targeted manner that represents the segment of the water body.

In order to limit spatial dependence of samples, measurements collected within 200 meters of each other shall be considered the same station or location. This value is used by other states to represent a small water segment (e.g., Florida DEP, 2002). However, samples less than 200 meters apart may be considered to be spatially independent samples but these findings should be justified in the water body fact sheet. Samples from mixing zones should not be included as part of the data set because, in these areas, standards are allowed to be exceeded for short periods of time.

Samples should also be temporally representative of characteristics of the water body. For example, measurements used in the section 303(d) assessment should be temporally independent to satisfy the requirements of most statistical tests. If the majority of samples were collected on a single day or during a single short-term natural event (e.g., a storm, flood, and wildfire), the data should not be used as the primary data set supporting the listing.

In general, to make sure standards exceedances are recurrent, measurements should be available from two or more seasons or from two or more events when effects or water quality objectives exceedances would be clearly manifested. Sampling representation can be either over short or long periods of time or can be from multiple sources; in either case, the measurements should be combined. Measurements from ephemeral waters, during a specific season, or during human-caused events (except spills) should also be used to assess significant pollutant-related exceedances of water quality standards. Timing of the sampling should include the time of day in which the sample was taken and the critical season for the pollutant and applicable water quality standard, to the extent possible. To be transparent, the water quality fact sheet should describe the significance of the sample timing.

Water body specific information should also be reported when assessing the spatial and temporal representativeness of the available measurements. One of the most important factors is that listing decisions are supported by

actual data from the segment. While this may be self-evident, there have been circumstances when waters with no monitoring data were listed because they had the same visual characteristics, as other waters with monitoring data that showed standards were not met. To avoid these situations, data used to assess water quality standards attainment should be actual data that can be quantified and qualified. Information that is descriptive, estimated, modeled, or projected should only be used as ancillary lines of evidence for listing or delisting decisions. At a minimum, data should be measured at one or more sites in a water segment to justify listing the water.

If applicable information is available, environmental conditions in a water body or at a site should also be taken into consideration. Water quality is affected greatly by season, events such as storms, the occurrence of wildfires, land use practices, etc. In addition, there are a variety of factors that affect measurements of water quality conditions including: (1) depth of water quality measurements, (2) flow, (3) hardness, (4) pH, (5) the extent of tidal influence (if coastal), and (5) other relevant sample- and water body-specific factors. Information related to these factors should be included in the fact sheet if it is available so interested parties can more clearly understand their influence.

This alternative is the preferred alternative because it would provide general statewide consistency in evaluating spatial and temporal representation of water body segments. Another advantage is that RWQCB would still have considerable flexibility to use professional judgement in assessing what the available data and information represent.

**Recommendation**: Alternative 3. See Policy sections 6.1.2.2, 6.1.4, 6.1.5, 6.1.5.1, 6.1.5.2, and 6.1.5.3.

*Issue 7G:* ***Data Age Requirement***

**Issue:** Should older data be used to support decisions to place or remove waters from the section 303(d) list?

**Issue Description:** An underlying assumption of the listing process is that the data and information assessments represent current conditions in States waters. If very old data are used to make assessments, it is possible that the data do not represent current water quality conditions. Another confounding factor is that as sampling and analysis methods improve, older data may be less relevant or not comparable to newer data and information.

For each data set, RWQCBs and SWRCB must determine how much of the data collected is relevant to the decision to list or not list the water body. If data are representative, it is likely that the decision will be correct. Unrepresentative data will likely result in incorrectly placing or not placing a water body segment on the section 303(d) list. This could result in the unnecessary expenditure of public resources or missing a problem completely.

Many states require that the data and information used to justify a listing decision be reasonably current, credible, and scientifically defensible. The range of older data allowed in these programs is generally from 5 to 10 years.

**Baseline:** All data and information of any age were used in the development of the 2002 section 303(d) list.

**Alternatives:** 1. Establish guidance on the age of data acceptable for listing. Under this alternative, the Policy would provide general guidance on the age of the data used in the listing decisions in order to provide some assurance that the data used are reasonably representative of water quality conditions.

Some states use data and information that is no more than five years old, with older data being used on a case-by-case basis (e.g., Arizona); while others allow for older data to be used (e.g., Florida allows data to be 7.5 years old). As with California, some states use any available data and information because little data or information is available on many state waters.

A disadvantage of requiring the use of recent data only is that some data takes years to make its way through the peer review process and the results may not be available until the age requirement has past. For example, peer review and reporting of USGS data may take years to get through the review process. If data age requirements were too short

otherwise high quality data would not be available to be used in the section 303(d) process.

General guidelines could be provided in the Policy on the age of the data but the RWQCBs should have flexibility in determining the circumstances of when to include older data and information. When reviewing the data (both newer and older), the RWQCBs should take into consideration temporal factors that could assist in determining whether the water quality problem is persistent or recurrent. Seasonal or year-to-year variations in the transport of the pollutant should be considered when reviewing the data and information.

Generally, listing decisions could be limited to using only the most recent ten-year period of data and information for water chemistry and sediment chemistry information. Data older than ten years would then only be used on a case-by-case basis. Older data could be used in conjunction with newer data, to demonstrate trends or if the conditions in the water body have not changed. In the interest of making listing decisions transparent, the reason(s) for using older data could be described in the water body fact sheet. In any case, older data should meet all data quality requirements presented in the Policy.

2. Use data and information, regardless of age, to determine which data should be used in the section 303(d) list assessments. The use of all data and information, regardless of age, ensures that all readily available data and information is used. However, older data may not represent current water quality conditions or may reflect the result of less precise laboratory analytical procedures. Under this alternative, no preference is given to current information so older, perhaps unrepresentative, data may bias the decision-making process.

   Older possibly unrepresentative data could identify a water body segment as not meeting standards, when standards are in fact met, or may identify a water body segment as meeting standards, when in fact, standards are not met.

   Using older data and information can provide context for newer data, such as characterizing trends or checking for compliance with antidegradation provisions, provided precautions are taken to avoid inappropriate interpretation of the data. Older data can be used to represent current conditions if it can be established that the water body has not changed over time. Conversely, if data are available before and after a change in the water body setting (e.g., a cleanup has been implemented or new permit conditions exist), it may be appropriate to base assessments on only the most recent data. Older data may be very useful in reevaluating previous listing decisions if guidelines or numeric objectives are enacted

or revised subsequent to the previous listing cycle and reassessment based on those data yield different findings of attainment of water quality standards.

If the Policy allows the use of all data, whatever the age, it becomes incumbent upon the RWQCBs to use their judgement to assess the reliability and quality of the data. All data should meet the data quality and quantity requirements as specified in the Policy.

This alternative represents the preferred alternative because all data and information should be used to make section 303(d) listing decisions. If older data are all that is available it should be used to decide if the water should be listed or delisted.

**Recommendation:** Alternative 2.

*Issue 7H:* ***Determining Water Body Segmentation***

**Issue:** How should water body segments be identified?

**Issue Description:** Basin Plans list water bodies within each region and establish water quality objectives to protect beneficial uses from degradation. In some instances, beneficial uses and water quality objectives apply to entire hydrologic units or areas; in other cases, Basin Plans identify water bodies individually by name, dividing some rivers into segments. For each watershed, water body and segment, beneficial uses are designated. In some Basin Plans, assigned beneficial uses of an identified water body are extended to all of its unlisted tributaries.

In developing the section 303(d) list, the evaluation of available data determines whether exceedances of water quality standards have occurred. Information on monitoring strategy, number of samples and the spatial representation of the samples determine the extent of the water quality impact within the water body. Together, this information determines if water quality impacts extend to whole watersheds, specific tributaries, whole water bodies, or specific sub-segments of a water body.

In order to make credible decisions about the extent of the water quality limited segment, a balance is needed between: (1) considering all grab samples to be representative of merely the cubic foot of water from which they were taken, and (2) assuming each grab sample is representative of conditions over hundreds of stream miles or thousands of lake acres (USEPA, 2003b).

**Baseline:** Identification of water quality limited segments during previous section 303(d) listing cycles varied between RWQCBs. Generally, RWQCBs based their listings on their Basin Plan surface water segmentation classifications by either listing according to hydrologic unit, area, and sub-area or by listing on the basis of water body type and name. Some RWQCBs added water body segments not identified in Basin Plans. Other RWQCBs established listings throughout watersheds even if the data indicated only a portion of the water body or segment was impacted.

**Alternatives:**

1. Use adopted Basin Plan water body listings to determine where water quality standards are not being met. Allow identification of new segments if warranted. Under this alternative, RWQCBs would list water bodies or segments in accordance with the segmentation approach used in the Basin Plans but would be allowed to further divide waters if warranted. In the absence of an adequate segmentation system, the RWQCBs would be encouraged to use professional judgement to define distinct reaches based on hydrology (e.g., stream order, tributaries, dams, or channel characteristics) and relatively homogeneous land use.

If available data suggest that a pollutant may cause an excursion above a water quality objective, the RWQCB should, if the information are readily available, identify land uses, subwatersheds, tributaries, or dischargers that could be contributing the pollutant to the water body. The RWQCBs would be encouraged to identify stream reaches or lake/estuary areas that may have different pollutant levels based on significant differences in land use, tributary inflow, or discharge input. Based on these evaluations of the water body setting, RWQCBs would aggregate the data by appropriate reach or area.

Another important factor is the area impacted in each segment. While CWA section 303(d) and associated federal regulations do not require estimation of the extent of the impacted water segment, this information is useful in determining the scale of the reported standards exceedance in the water quality limited segment. The length or area of estimated impact should be based on the data used to establish the listing and the extent should be limited to the length or area represented by these data.

Consequently, water segments should not be placed on the section 303(d) list unless data support this finding. Data should be measured at one or more sites in the water segment in order to place the water body on the section 303(d) list. Segments should only be placed on the list if the listing is backed by data.

This would reduce controversies regarding extent (miles or acres) estimates where impairment may be occurring because the data would be evaluated in the context of the measurements or samples, land use, and nature of the pollutant source.

This alternative is the preferred alternative because by establishing segments in this way, confusion would be avoided regarding applicable designated beneficial uses, the name of the segment, and the size and boundaries of the affected segment.

2. <u>List entire segments or watersheds if any data in the watershed show impacts.</u> The primary purpose of listing water bodies under section 303(d) is to identify water body segments within a region where water quality standards are not met. If waters are found to not meet standards in one part of a watershed it is possible that other parts of the watershed are similarly impacted. A conservative approach would be to list all segments of a watershed, even if data are available showing a small part of the watershed is impacted.

   Using watershed classification to list water bodies for designating beneficial uses and water quality objectives might provide broad

comprehensive protection to the waters within each RWQCBs jurisdiction. Broad protection of water quality was originally generated by the CWC section 13240 that requires RWQCBs to "adopt water quality control plans for *all areas* within the region." [*emphasis added*], and is buttressed by an interpretation of the definition of waters of the United States to mean that the standards of tributary waters are at least as stringent as the standards established for the waters to which they are tributary. When the Basin Plans were established, each RWQCB designated beneficial uses for most waters within the region. However, it was not possible to survey the beneficial uses of all waters of the state or even list all waters of the state. In order to provide full protection to unnamed water bodies, the Basin Plans typically include a statement which generally applies the beneficial uses of any specifically identified water body to all of its tributaries.

Such extension of protection of designated beneficial uses to all waters within a region is appropriate but the application of the same approach when developing the section 303(d) list is questionable. Identification of water quality limited segments is based on an assessment of site-specific monitoring data that documents a site within a water body segment where standards may not be attained.

Site-specific data documenting water quality impacts cannot apply to entire watersheds unless the monitoring data covers an entire watershed. The extension of documented water quality impacts to entire watersheds because beneficial uses are deemed applicable to the entire watershed, is not warranted unless it can be shown that the data are representative of the entire watershed.

**Recommendation:** Alternative 1. See Policy section 6.1.5.4.

*Issue 7I:* ***Natural Sources of Pollutants***

**Issue:** How should SWRCB address natural sources of pollutants under CWA section 303(d)?

**Issue Description:** Basin Plans address water quality problems caused or exacerbated by human activities. Natural processes can also cause water quality problems, which usually cannot be controlled. Many Basin Plans contain language distinguishing between controllable water quality factors that result in degradation of water quality and those factors that are not controllable. Controllable water quality factors are those actions, conditions, and circumstances resulting from human activities that may influence the quality of the waters of the state and may be reasonably controlled. Uncontrollable factors include those conditions caused by natural processes.

**Baseline:** During the 2002 section 303(d) listing process, a number of Lahontan RWQCB (Region 6) water bodies not meeting water quality standards for a particular pollutant originating from natural sources were removed from the 303(d) list.

**Alternatives:**

1. Place water bodies not meeting water quality standards due to natural sources on the section 303(d) list. Under this alternative, there would be no guidance regarding impacts relative to natural sources. This would provide the RWQCBs with the flexibility to add, remove, or not list waters depending on whether standards are exceeded and without regard to sources or types of pollutants. Water bodies recommended for section 303(d) listing in the future or existing listings recommended for removal from the list due to natural sources would require review and approval by the SWRCB.

   Once listed, the water body would be prioritized and scheduled for possible TMDL development. This could result in an attempt to control a pollutant loading originating from a natural uncontrollable source. Pollutants originating from natural sources are beyond the SWRCB and the RWQCB capabilities to correct.

   This alternative is the preferred alternative because water quality standards would be interpreted as they exist in plans and regulations and would not be judged relative to the feasibility of TMDL development or source of pollutants.

2. Do not place water bodies exceeding water quality standards due to natural sources on the section 303(d) list. Under this alternative, water bodies not meeting water quality standards due to natural sources would

not be listed on the section 303(d) list. Any waters previously listed would be removed from the section 303(d) list during subsequent listing cycles.

Under this alternative, it would have to be demonstrated that natural conditions or processes cause a segment of a water body to be considered a water quality limited segment. Documentation must address the natural source(s) of the substance and explain why human causes can be ruled out as the cause of the water quality limited segment. Human-caused sources (i.e., "waste" as defined in CWC section 13050(d) or "pollution" as defined in CWC section 13050(l) and 40 CFR 130.2(c)) can generally be ruled out where the excursions beyond objectives would occur in the absence of the human caused sources.

For example, the densities of fecal and total coliform in urban runoff can come from natural and human sources. It is not possible to determine *a priori* without site-specific study if the source is not a result of human activity. Consequently, it is appropriate for these waters to be listed and the portion of the contamination due to natural sources is determined during the development of the TMDL.

Another example is metal concentrations in some saline and geothermal waters. Because of its geological history, the Lahontan Region has a number of water bodies with concentrations of salts and/or toxic trace elements such as arsenic, which exceed drinking water standards or criteria for protection of freshwater aquatic life and wildlife. These waters include inland saline (desert playa) lakes and geothermal springs. Past state and federal guidance led to listing of a number of Lahontan Region waters which are "impaired" only by natural sources. As documented in the 2002 section 303(d) list staff report (SWRCB, 2003a), saline and geothermal waters are unique ecosystems with their own degree of physical, chemical, and biological integrity, and support aquatic life and wildlife adapted to extreme environmental conditions. These waters should not be judged as not meeting water quality standards on the basis of freshwater aquatic life criteria.

For the above reasons, water body-pollutant combinations would not be placed on the section 303(d) list if the excursion beyond standards occurs in the absence of any human-caused sources. Even though standards are not met in this instance, a TMDL is not required.

Waters could be recommended for listing even though a portion of the identified pollutant(s) are probably of natural origin because there is a high potential for human-caused sources to contribute to the excursion above standards.

**Recommendation:** Alternative 1.

## *Issue 8: Priority Ranking and TMDL Completion Schedule*

**Issue:** How should priority ranking and TMDL scheduling be established for water quality limited segments?

**Issue Description:** CWA section 303(d) requires that states develop a priority ranking of listed water bodies to assist in guiding TMDL development. Federal regulation further requires that the priority ranking specifically include the identification of waters targeted for TMDL development within the next two years.

In 1998, the SWRCB and RWQCB ranked water bodies as high, medium, or low priority for TMDL development. A general set of criteria associated with the importance and extent of the beneficial use threatened, degree of impairment, potential for beneficial use recovery, public concern and available information was applied. Once priority ranking was established, TMDL scheduling was based on considerations of available resources, watershed management initiative concerns, and attainability of the TMDL schedule. The TMDL development schedule was further divided into three separate categories. Level 1 waters were targeted for TMDL development over the next two years; Level 2 waters were targeted for TMDLs to be initiated over the next five years; and Level 3 waters were tentatively scheduled for TMDL completion over a period of 13 years. As a result of this priority ranking and scheduling approach, not all-high priority waters were targeted for TMDL development within two years.

**Baseline:** In the 2002 listing process, factors such as importance and extent of beneficial uses threatened, degree of impairment, potential for beneficial use recovery, public concern, and available information were considered. However, the resources available within the next two years were used to determine if a water body should be ranked as high priority for TMDL development. The approach taken during the 2002 listing process linked priority ranking with TMDL development schedules. Subsequently all waters determined to be high priority were also scheduled for TMDL development within the next two years.

**Alternatives:**

1. <u>Do not include a priority and schedule setting method in the Policy.</u> Under this alternative, each RWQCB would be allowed to establish priority and schedules for TMDL development depending on their needs, priorities, and resource availability and not necessarily in accordance with the water body priority ranking. There would be no link between priority of the water, as far as severity of impact to beneficial uses or the significance of the water body, and the need to develop a TMDL to achieve improvements in water quality. Therefore, water bodies with a

high priority ranking may not necessarily be scheduled for TMDL development.

2. Use general prioritizing and TMDL schedule setting factors used by the SWRCB in the 2002 listing process. Under this alternative water quality limited segments would be priority ranked and scheduled for TMDL development based on the following considerations:

   - Resource availability;
   - What is achievable within the next two years;
   - The importance and extent of the beneficial uses threatened;
   - Degree of impairment;
   - Potential for beneficial use recovery;
   - Public concern; and
   - Available information.

   By considering these issues, a link is established between priority setting and TMDL scheduling. This allows only those waters ranked high priority to be scheduled for TMDL development within the next two years.

3. Establish a schedule for TMDL completion without prioritizing water bodies according to the severity of the impacts, the significance of the water body, and the need to develop a TMDL. CWA section 303(d) requires the establishment of a priority ranking for waters identified for TMDL development. However, in recent guidance, USEPA (2003b) has stated that the development of such priorities and schedules should be as practical and expeditious as possible. Thus, USEPA has indicated that listed waters do not need to be classified as high, medium, or low priority and suggested that the established TMDL schedule, in and by itself, could reflect TMDL priority ranking.

   Under this alternative, a schedule would be established for waters on the section 303(d) list that would identify TMDLs that will be developed within the current listing cycle and the number of TMDLs scheduled to be developed thereafter. The schedule would reflect the State's priority ranking. Based on factors provided by the Supplemental Report of the 2001 Budget Act, each RWQCB would use their professional judgement to determine when TMDLs are scheduled for completion. It would not be necessary to identify each TMDL as a high, medium, or low priority as long as a schedule is established. The Policy would identify TMDLs scheduled for development as required by federal law and regulation (currently federal regulation requires a schedule for developing TMDLs in the next two-years). Since resource allotments can not be predicted more than one or two years into the future, schedule dates beyond two years would be considered estimates. USEPA guidance (2003b) recommends schedules no longer than 8 to 13 years but because resource commitments

cannot be established over such a long period of time, no limit on completion time frame should be established in the Policy.

When developing the TMDL-completion schedule for waters needing TMDLs, RWQCBs should take into consideration factors articulated in the Supplemental Report to the 2001 Budget Act related to TMDL priority setting and scheduling. These include but are not limited to the following criteria:

- Water body significance (such as importance and extent of beneficial uses, threatened and endangered species concerns, and size of water body);
- Degree that water quality objectives are not met or beneficial uses are not attained or threatened (such as the severity of the pollution or number of pollutants/stressors of concern) [40 CFR 130.7(b)(4)];
- Degree of impairment;
- Potential threat to human health and the environment;
- Water quality benefits of activities ongoing in the watershed;
- Potential for beneficial use protection and recovery;
- Degree of public concern;
- Availability of funding; and
- Availability of data and information to address the water quality problem.

All water bodies on the section 303(d) list should be assigned a TMDL development schedule date.

This alternative represents the preferred alternative because it adheres to USEPA guidance that recommends a TMDL schedule without a set priority and because it is a reasonable, efficient way to demonstrate TMDL priority.

**Recommendation:** Alternative 3. See Policy section 5.

# ENVIRONMENTAL EFFECTS OF THE PROPOSED POLICY

This section provides an analysis of the potential adverse environmental effects of the adoption of the "Water Quality Control Policy for Developing California's Clean Water Act Section 303(d) List."

The analysis that follows identifies differences between existing RWQCB listing and delisting practices pursuant to CWA section 303(d), the proposed Policy, and the potential environmental effects of these differences. Also, this analysis examines whether adoption of the proposed Policy would result in an environmental impact and, if so, does the impact have the potential for significant adverse effects.

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

## *Baseline*

The baseline conditions comprise the existing practices and procedures currently employed by the SWRCB and the RWQCBs for assessing the surface water bodies of the state in compliance with CWA section 303(d). The baseline is the process that occurred in the listing and delisting of water quality limited segments in the absence of the proposed Policy.

SWRCB and RWQCBs implement State (Porter-Cologne Act) and Federal law (CWA) for the protection of water quality. The SWRCB and RWQCBs are required to comply with all the provisions of the federal CWA. The section of the CWA pertinent to this Policy is section 303(d). To carry out the requirements of CWA section 303(d), the SWRCB and the RWQCBs have, since 1976 and every two years thereafter, assembled all readily available data and information in order to characterize and substantiate section 303(d) list updates.

SWRCB used a weight-of-evidence approach to evaluate RWQCB recommendations for the 2002-reporting year (SWRCB, 2003a). The approach required the evaluation of different types of data and information together, as well as an assessment of the strength, value, and believability of the evidence provided. The assessment determined whether there was a pollutant of concern associated with a water quality impact and the attainment of water quality standards, resulting in a scientifically defensible determination of whether beneficial uses were attained.

The categories of water bodies currently on the section 303(d) list are shown in Table 1. These water bodies were placed on the list as a result of the baseline process used by the SWRCB and RWQCBs that occurred in

the listing and delisting of water quality limited segments in the absence of the proposed Policy.

## *Potentially Significant Adverse Environmental Effects*

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

1. **Existing SWRCB and RWQCB Practices**
   This section provides a brief description of how the SWRCB and RWQCBs currently address this issue.

2. **Proposed Policy**
   This section briefly describes how the Policy addresses the issue and briefly explains 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 adverse environmental 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: Scope of the Listing/Delisting Policy*

**Existing SWRCB and RWQCB Practices**

The SWRCB and the RWQCBs are required to submit a new section 303(d) list every two years. The SWRCB does not have a formal Policy on the listing/delisting factors that should be considered in the development of the section 303(d) list.

**Proposed Policy**

The proposed Policy focuses exclusively on the listing and delisting factors as related to compliance with section 303(d) and does not consider revisions of beneficial uses or water quality standards before any listing decisions are made. In order to make decisions regarding standards attainment, this Policy provides guidance to interpret data and information by comparison to beneficial uses, existing numeric and narrative water quality objectives, and antidegradation considerations.

This approach was selected because it will establish a standardized methodology for developing California's section 303(d) list. Additional

advantages include: (1) deadlines are more likely to be met for completion of the list; (2) the established triennial review process for Basin Plans and Statewide Plans would not have to conform to the 2-year time frame for development of the list; and (3) the process would be manageable with existing staff resources.

**Differences Between the Policy and Existing Practices**

The proposed Policy affirms that review of water quality standards and the listing and delisting of water quality limited segments in accordance with section 303(d) are two distinctly different actions. The proposed Policy requires RWQCBs to apply a consistent methodology to the listing process used to comply with CWA sections 303(d).

**Potential Adverse Environmental Effects**

The implementation of this Policy will not have an adverse effect on the environment. The proposed Policy will establish listing/delisting factors that will provide a consistent, scientifically defensible approach to determine whether water quality standards are being met as required under section 303(d).

**Potentially Significant Adverse Environmental Effects**

None.

***Issue 2: Structure of Section 303(d) List***

**Existing SWRCB and RWQCB Practices**

In the past, California has developed the section 303(d) list independently of the CWA section 305(b) report. After the section 303(d) list is developed it is typically incorporated into the section 305(b) report. In 2002, the SWRCB developed four lists consisting of the following:

1. The section 303(d) List;
2. An Enforceable Programs List;
3. A TMDL Completed List; and
4. A Monitoring List.

**Proposed Policy**

This Policy proposes that the California section 303(d) list contain the following categories:

- Water Quality Limited Segments; and
- Water Quality Limited Segments Being Addressed.

No other lists or categories are proposed.

**Differences Between the Policy and Existing Practices**

In 2002, the SWRCB developed four lists associated with the requirements of section 303(d). The proposed Policy would develop one-list with two categories that would satisfy the requirements associated with section 303(d) only. The SWRCB is not precluded from using the USEPA guidance (2003b) to develop the section 305(b) report.

**Potential Adverse Environmental Effects**

The development of this Policy will not have an adverse effect on the environment. The Policy will provide consistency in the assessment approaches used by all RWQCBs while allowing the flexibility necessary to address regional differences and site-specific concerns. The resulting list will satisfy the requirements of CWA section 303(d).

**Potentially Significant Adverse Environmental Effects**

None.

***Issue 3: Weight of Evidence for Listing and Delisting***

**Existing SWRCB and RWQCB Practices**

In 2002, the SWRCB used a weight-of-evidence approach to evaluate RWQCB recommendations. The components of the weight-of-evidence consisted of the strength of each measurement endpoint and concurrence among endpoints. Confidence in the measurement endpoint varied depending on the quality of the data available or the manner in which the data was used to determine impairment. The factors used to assess the quality of the measurement endpoints are listed in the Policy. Each water body-pollutant combination was evaluated on a case-by-case basis.

**Proposed Policy**

The weight-of-evidence proposed in the Policy is a narrative process where individual lines of evidence are evaluated separately and, then, combined using the judgement of RWQCBs and SWRCB in order to make a stronger inference about water quality standards attainment. Using this approach, a single line of evidence could be sufficient by itself to demonstrate water quality standards attainment. In other situations and with many data types, multiple lines of evidence are needed to determine if standards are attained.

While most lines of evidence are addressed by the assessment and listing methodology in the Policy, there may be circumstances when additional lines of evidence may compel RWQCBs to place water bodies on the section 303(d) list. The weight-of-evidence approach specifies factors to evaluate data and information but also allows the use of a situation-specific weight-of-evidence listing factor where RWQCBs are afforded significant flexibility in assessing additional data and information. This

approach was selected because it allows for a scientifically valid process to consider additional data.

**Differences Between the Policy and Existing Practices**

Previously, SWRCB and RWQCB staff evaluated each addition, deletion, and change to the section 303(d) list based on all data and information available for each water body and pollutant. The SWRCB accepted the recommendations and analysis of the RWQCBs and reviewed each recommendation on a case-by-case basis, making an independent assessment of each water body and pollutant. The SWRCB took into account general factors that would be considered in making a scientifically defensible water quality standard attainment determination and also considered other facts relating to individual water bodies and pollutants.

The SWRCB is required by the Supplemental Report of the 2001 Budget Act to use a weight-of-evidence approach in developing a policy for listing and delisting waters and to include criteria that ensure that the data and information used are accurate and verifiable. The primary difference between the Policy and the 2002 section 303(d) list is that the decision rules are clearly defined for RWQCBs to use in their water quality standard attainment determinations.

**Potential Adverse Environmental Effects**

The development of this Policy will not have an adverse effect on the environment. The Policy will provide a consistent methodology for placement of water bodies on the section 303(d) list according to the type of water quality problem, availability of data, information, and actions that are being implemented in identified water bodies.

**Potentially Significant Adverse Environmental Effects**

None.

***Issue 4: Listing or Delisting with a Single Line of Evidence***

**Existing SWRCB and RWQCB Practices**

In the 2002 section 303(d) listing process, data were evaluated on a case-by-case basis. The data evaluation was usually expressed as the number of samples exceeding the standard or guideline out of a total number of samples. When appropriate, the magnitude of the measurements was also considered.

RWQCBs used a variety of approaches for evaluating bacterial water quality data, postings, and beach closure information, prior to the 2002 listing cycle. In 2002, evaluation of data and information for the section 303(d) list involved following preliminary recommendations by the BWQW. These recommendations include frequency of water quality

standards exceedances; additional, site-specific information; and comparison of the number of water quality standard exceedances against a relatively unimpaired watershed. A 10 percent of the total days exceeding standards per year was used as the threshold for listing. Permanent postings were counted as exceedances when they were based on site-specific water quality data. "Precautionary" postings and "Rain Advisories" were not counted as exceeding water quality standards. Listing was based on sufficient samples to determine if the numeric standards were exceeded with moderate confidence.

Bacterial water quality standards for lakes, rivers and streams are contained in the Basin Plans. Several counties have ordinances that contain bacterial standards that can trigger freshwater beach swimming warnings, postings, or closures. As with marine water bodies, postings are indicative of impaired water quality and the number of postings measure loss of a beneficial use. Each RWQCB develops recommendations for freshwater bacterial water quality objectives on a case-by-case basis. For freshwater bodies, RWQCBs compare monitoring data to Basin Plan water quality objectives. No specific approach or guidelines have been mandated. Frequency of standards exceedance has been used to assess nonattainment. Typically, RWQCBs used an exceedance frequency of 10 percent.

The SWRCB and RWQCBs have used a variety of guidelines or scientifically derived values to interpret narrative water quality objectives. In developing the 2002 section 303(d) list of water quality impaired segments, the determination of standard or use attainment were based on the RWQCB and SWRCB interpretation of narrative water quality objectives. Compliance with narrative water quality objectives was considered on a case-by-case basis using all relevant data submitted to the RWQCBs. Data were evaluated using relevant and well-accepted standards, criteria, guidelines, or other objective measures that interpret the sensitivity of a benchmark in determining standards or beneficial use attainment. Evaluation guidelines with no scientific basis for judging standards or beneficial use attainment were not used. Overall, constituents that violated narrative water quality objectives and were not supported with acceptable numeric evaluation guidelines were not listed.

Evaluation of tissue chemical concentrations have been based on screening values established by USEPA, NAS, and additional criteria used in the SMWP reports, such as MTRLs for the protection of human health and wildlife. In developing the 2002 section 303(d) list of water quality limited segments, measures used to interpret chemical residue concentrations in tissue included MTRLs and public health guidelines. In addition to MTRLs, guidelines that were well accepted and had a strong scientific basis with high levels of certainty and applicability were used.

Nuisance is defined in the CWC and in narrative water quality objectives in the Basin Plans. In previous section 303(d) listing cycles, water bodies were listed for trash impacts based largely on qualitative data and information. During the 2002 303(d) listing cycle, the SWRCB and RWQCBs' received several submittals of non-numeric information and a limited amount of data to support listing recommendations for trash.

Narrative water quality objectives for nutrients have been broadly applied by many RWQCBs. Recommendations for nutrient listings for the 2002 section 303(d) list included listings for DO, nitrates, ammonia and other nitrogen related substances. The 2002 section 303(d) list also cited impairments related to growth of noxious plants, algae, eutrophication, and increased turbidity (i.e., decreased water clarity).

In the 2002 section 303(d) listing process, the SWRCB did not list any new water bodies proposed for listing under section 303(d) for invasive species because, under CWA, invasive species are not a pollutant and it would be very difficult to develop TMDLs for invasive species. In 1998, the San Francisco Bay Estuary was listed for exotic species on the section 303(d) list.

**Proposed Policy**

The Policy proposes approaches for assessing lines of evidence for water quality objectives and beneficial uses that could be used by themselves to assess whether water quality standards are attained. They include: (1) numeric water quality objectives, criteria, or other applicable standards, (2) marine bacterial standards, (3) freshwater bacterial standards, (4) narrative water quality objectives, (5) tissue data, (6) trash, (7) nutrients, and (8) invasive species.

The Policy proposes that the evaluation of data be consistent with the expression of the numeric water quality objective, water quality criteria, or evaluation guideline. If the water quality objective, water quality criteria, or evaluation guideline state a specific averaging period and/or mathematical conversion, the data should be converted in a consistent manner prior to conducting list assessments. If sufficient data are not available for the stated averaging period, the available data should be used to represent the averaging period.

This Policy proposes a consistent process and decision rules to trigger listing recommendations for exceedances of marine and freshwater bacterial water quality standards. Data and information generated by regulatory activities (including NPDES permits compliance and special studies) conducted by the RWQCBs and various local agencies, monitoring and regulatory activities of local environmental health

agencies, and recognized private and public institutions would be evaluated.

General guidance for the interpretation of narrative standards and the types of interpretative guidelines that may be used would be established. The Policy recommends the use of evaluation guidelines with appropriate quantitative translators, if the translator meets specific criteria.

The Policy recommends RWQCBs compare available tissue data and information to the most appropriate measure to interpret chemical residue concentrations. RWQCBs could also incorporate current research that may set values that are more protective of the designated beneficial use as long as the evaluation guideline criteria are met. Acceptable tissue concentrations can be measured either as muscle tissue (preferred) or whole body residues. Animals can either be deployed (if a resident species) or collected from resident populations. Recurrent measurements in tissue are required.

Waters would be placed on the section 303(d) list if visual assessments and numeric water quality objectives or evaluation guidelines show that trash is a water quality problem. The types of numeric data that could be used include trash cleanup day data or spatially and temporally representative measurements of trash in waterways or at beaches. An alternative to a trash evaluation guideline is to compare trash accumulation to reference conditions (i.e., waters scarcely impacted by trash accumulations).

Specific guidance would be applied when nutrient listing decisions are being made. The Policy discusses guidelines for the use of diel measurements for DO or acceptable guidelines to evaluate nutrient concentrations in the absence of diel measurements. Additionally, the Policy discusses the use of evaluation guidelines for nutrient related excessive algae growth, unnatural foam, odor and taste.

The Policy proposes that water bodies impacted by invasive species should not be placed on the section 303(d) list. TMDL development would not be required for these water bodies; other appropriate water quality management actions would address the cause of invasive species impacts.

**Differences Between the Policy and Existing Practices**

Previously, each RWQCB used its own approach and methodology when making listing decisions. The magnitude and duration expressed in water quality objectives was used to assess the States waters. In most cases, data evaluation has been expressed as the number of samples exceeding the standard or guideline out of a total number of samples. The proposed

Policy recommends rules for evaluating water quality objectives. Prior to conducting list assessments, RWQCBs would determine if there are a sufficient number of samples and whether those samples are spatially and temporally representative of the water quality in the water body. Available data would be further evaluated to avoid temporal bias and ensure, when applicable, that seasonality is represented in the sampling plan. Additionally, the duration (i.e., averaging period) of concentrations expressed in the water quality objective would be considered in the assessment when standards are achieved. Data sets would, then, be compared to the water quality objective to determine if an exceedance has occurred.

Prior to the 2002 listing cycle, the RWQCBs were given significant latitude in deciding what constituted bacterial water quality standards exceedance for marine and freshwaters. For each circumstance, RWQCBs would decide which waters to list after considering the available data and information for the site based on regional interpretation of standards, postings, and closure data and information. The proposed Policy's criteria for addressing bacterial standards in marine and freshwaters to support listings on the section 303(d) list are based on recommendations from the BWQW. These guidelines provide a basis for assessing listing decisions.

The determination of standard or use attainment, for the 2002 section 303(d) list, was based on RWQCB and SWRCB interpretation of narrative water quality objectives. Overall, constituents that violated the narrative water quality objective and were not supported with acceptable numeric evaluation guidelines were not listed. The Policy would require evaluating narrative water quality objectives using interpretive evaluation guidelines that represent standards attainment or beneficial use protection. The Policy establishes general guidance for the interpretation of narrative standards and the types of interpretative guidelines that may be used.

For aquatic life tissue data, existing practices include listings based solely on USFDA action levels and MTRLs. The proposed Policy presents the use of the most appropriate measure to interpret chemical residue concentrations in tissue. This would provide RWQCBs with the flexibility to compare available tissue data and information to the most appropriate and current values that can be used to interpret chemical residue concentrations. The Policy also recommends tissue sampling from the appropriate target species and provides guidance on the minimum number of replicates and the number of individuals per replicate. The Policy does not allow the use of MTRLs and USFDA action levels.

Historically, water bodies recommended for section 303(d) listing, due to trash, have been addressed differently by each RWQCB. In general, assessments of impairments due to trash have been based largely on

qualitative information. The proposed Policy recommends an approach using numerical data and non-numeric information but allows existing programs to address any water related trash problem.

During previous listing cycles, water bodies were placed on the section 303(d) list for nutrient impacts without determining the specific constituent causing biostimulation. In some cases the stimulatory substance was inappropriately identified or the guideline used to determine impacts to specific beneficial uses was inappropriately used. The Policy recommends the use of a consistent systematic approach for listing water bodies impacted by nutrients and provides specific guidance to help in the identification of the constituent, and determination of the beneficial use that is impacted.

In the 1998 section 303(d) listing process, nine water body segments were listed for exotic species impacts. The Policy would not allow listing water bodies impacted by invasive species because a pollutant does not cause those types of impacts and a TMDL is not required.

**Potential Adverse Environmental Effects**

The development of this Policy will not have an adverse effect on the environment. The Policy recommends a process to consistently convert data when the water quality objective, water quality criteria, or evaluation guideline state a specific averaging period and/or mathematical conversion. Specific criteria are recommended for evaluating marine and freshwater bacteriological standard exceedances. Guidance is provided on the use of available defensible criteria to quantitatively assess the potential for narrative water quality standards exceedance; to interpret chemicals bioaccumulated in fish or shellfish tissue providing consistent interpretation of the levels of residue concentrations in tissue that impact beneficial uses; and a fairly consistent approach for listing water bodies due to trash. The Policy recommends a consistent approach for listing water bodies due to nutrients impacts, providing specific guidance to help identify the biostimulatory substance as well as the beneficial use that is impacted. The Policy recommends against listing for invasive species.

**Potentially Significant Adverse Environmental Effects**

None.

*Issue 5: Listing or Delisting with Multiple Lines of Evidence*

**Existing SWRCB and RWQCB Practices**

Each RWQCB typically has its own approach to the methodology used for listing. RWQCBs have assessed, case-by-case, which lines of evidence to use, data analysis procedures, and exceedance frequencies depending on site-specific factors. Existing practices specific to each sub-issue follows:

The issuance of health advisories by OEHHA or shellfish harvesting bans automatically led to the water quality of the segment being considered limited, especially if the chemical or biological contaminant was associated with sediment or water in the segment. The 2002 section 303(d) list required multiple lines of evidence to list or delist a water body and generally needed the pollutant(s) that caused or contributed to the adverse condition.

Data and information describing nuisance conditions, for the most part, has been qualitative (e.g., photographs, accounts of individuals, etc.). Some numeric data have been provided that describes nuisance conditions (e.g., measures of algae cover or water color). During previous section 303(d) listing cycles, water body segments have been listed for nuisance conditions related to color, odor, and excessive algae or scum using qualitative information.

During the development of the 2002 section 303(d) list, toxicity testing was used as a basis for listing as long as concurrently sampled chemical data was available that showed the chemical caused or contributed to the observed toxicity. Prior to the 2002 section 303(d) list, water bodies were listed with and without the chemical data and/or a pollutant identified.

Determining the impacts of sediment (including settleable material and turbidity) has been based on non-attainment of narrative and numeric water quality objectives and the threat to designated beneficial uses.

Water quality objectives for temperature are specified in Basin Plans and the California Thermal Plan. In 2002, section 303(d) listings were proposed for several North Coast rivers based on evaluation of MWAT data ranges, as compared to evaluation values for impacts on anadromous fish species. In addition, temperature data were evaluated with respect to current and historic presence of cold water fish. If a stream exhibited temperatures within the chronic reduced-growth MWAT ranges, and had a decreased salmonid fishery compared with historic levels, it was listed based on inferred historical stream MWATs.

Organism response to pollutants is typically assessed with toxicity tests or by observations of change in the biological population or communities. In

2002, listings for adverse biological response were not recommended. However, in previous lists (prior to 2002), some water bodies were placed on the section 303(d) list for abnormal fish histology.

Degradation of biological populations or communities has not been, traditionally, assessed by the RWQCBs. In the 2002 section 303(d) list, degradation of aquatic life populations or communities listings required multiple lines of evidence that identified the pollutant(s) causing or contributing to the adverse condition. At present for California, there are no widely accepted approaches for documenting trends in water quality. No existing listings are known to be based on findings related to antidegradation or trends in water quality.

**Proposed Policy**

The Policy proposes the use of Health Advisories, in conjunction with other water quality measurements, to list a water body. When OEHHA or DHS issues a health advisory against the consumption of edible resident organisms or a shellfish harvesting ban, the water quality of the segment is automatically considered limited if the chemical or biological contaminant is associated with sediment or water in the segment. Additional indicators to assess attainment with fish and shellfish consumption-based water quality are listed in the Policy.

The use of both quantitative and qualitative data and information in the evaluation of nuisance is recommended. For the section 303(d) list, the Policy recommends the identification of the pollutant or pollutants that cause or contribute to the observed impacts. The Policy requires that RWQCBs rely on existing numeric water quality objectives (related to nutrients or other pollutants) or evaluation guidelines that represent an acceptable level of beneficial use protection.

The Policy proposes listing for toxicity alone (without the pollutant identified) as one line of evidence to place water bodies on the section 303(d) list. The RWQCBs have the option to identify the pollutant during the development of the TMDL.

The interpretation of sediment impacts on a case-by-case basis is proposed in the Policy. Water bodies would be listed based on sufficient credible data and information that indicate water quality standards for sediment are not met, by comparison to acceptable evaluation guidelines, or that impacts to beneficial uses are caused by sediment.

The proposed Policy, in lieu of data to directly assess compliance with numeric temperature water quality objectives, recommends comparing recent temperature monitoring data for a specific water body to the temperature requirements of the resident aquatic life. Information on the

current and historic condition and distribution of the sensitive beneficial uses (e.g., fishery resources) in the water body is necessary, as well as recent temperature data on conditions experienced by the most sensitive life stage of the aquatic life species. Information about presence/absence or abundance of sensitive aquatic life species can be used to infer past temperature conditions.

General guidelines are outlined requiring the comparison of adverse biological response endpoints to reference conditions, the identification of pollutants suspected of causing or contributing to the adverse response, and the association of pollutants with an adverse response. Endpoints for this factor include fish kills, reduction in growth, reduction in reproductive capacity, abnormal development, histopathological abnormalities, and other adverse conditions but no specific cutoff values are proposed.

The proposed Policy recommends listing a water segment when significant degradation in biological populations and/or communities is exhibited, represented by diminished numbers of species or individuals of a single species or other metrics as compared to reference site(s) and associated water or sediment concentrations of pollutants. For population or community degradation related to sedimentation, the Policy recommends listing, if degraded populations or communities are identified and effects are associated with clean sediment loads in water or those stored in the channel.

Waters that currently meet standards but show a declining trend in water quality may not meet antidegradation requirements and could be considered for inclusion on the section 303(d) list.

**Differences Between the Policy and Existing Practices**

Existing practices allow RWQCBs broad flexibility in determining how to evaluate water and sediment measurements in association with health advisories. The proposed Policy recommends, when using health advisories or shellfish bans to list a water quality limited segment, that RWQCBs also consider available water segment-specific data indicating the evaluation guideline for tissue is exceeded. More than one criterion may be necessary to determine if the water segment is impaired.

In previous section 303(d) listings, qualitative information alone has been used to list water bodies for nutrient impairments; some numeric data has also been provided. The SWRCB and the RWQCBs have received documentation in the form or photographs, and accounts of individuals, etc. that describes nuisance conditions. The proposed Policy recommends using qualitative information combined with quantitative data related to excessive nutrients to evaluate the potential for nuisance conditions.

In previous section 303(d) lists, water bodies were listed with and without the chemical data and/or a pollutant identified. Listing proposals, without the pollutant identified, were not placed on the 2002 section 303(d) list. The proposed Policy recommends listing water bodies for impairments due to toxicity on the section 303(d) list.

Determining the impacts of sediment has been based on each RWQCBs interpretation of non-attainment of water quality objectives and the threat to designated beneficial uses. The Policy provides general guidance to list water bodies due to sediment impacts based on sufficient credible data and information that indicate water quality standards for sediment are not met by comparison to acceptable evaluation guidelines, or documented impacts to beneficial uses that are caused by sediment.

In 2002, section 303(d) listings were proposed based on evaluation of MWAT data ranges, as compared to evaluation values for impacts on anadromous fish species. In addition, temperature data were evaluated with respect to the current and historic presence of cold water fish. The proposed Policy would require listing water segments for temperature focusing on beneficial use impacts and likely effects of elevated temperature on sensitive species based on the assumption that aquatic life beneficial uses (e.g., cold and warm water fisheries) are sensitive to modifications to natural temperature.

In prior listings, the only adverse biological response considered was abnormal fish histology. The proposed Policy recommends general guidance when basing a listing decision on adverse biological response and provides general criteria upon which endpoints can be compared. The SWRCB and the RWQCBs would need to consider additional stronger lines of evidence (e.g. endpoints compared to reference conditions, identification of pollutants suspected of causing or contributing to the adverse response, and association of pollutants with an adverse response).

Generally, the RWQCBs have measured biological conditions indirectly, through the use of chemical-specific analysis and toxicity; they have not used bioassessment by itself prior to 2002 to substantiate a section 303(d) listing recommendation. The proposed Policy recommends specific guidance on the use of bioassessment but only if associated with water and sediment pollutant measurements.

The Policy allows that documented trends in declining water quality, to levels that may not meet the antidegradation provisions of water quality standards, are sufficient to place the water body on the section 303(d) list. Also, an indication is required that the water bodies are toxic, there are impacts on aquatic life communities or populations, or there is other adverse biological response.

**Potential Adverse Environmental Effects**

The development of this Policy will not have an adverse effect on the environment. The Policy only provides a consistent, comprehensive approach for: evaluating water bodies listed for impacts, due to the issuance of fish consumption advisories or shellfish bans; using both quantitative and qualitative data and information in the evaluation of nuisance conditions; and listing water bodies for toxicity with and without a pollutant identified. The Policy provides general guidance for placing water bodies impacted by sedimentation on the section 303(d) list on a case-by-case basis and the assembling of sufficient credible data and information that indicate water quality standards for sediment are not met. Additionally, the Policy provides guidance on: determining whether the beneficial uses of a waterbody are impacted by temperature; evaluating adverse biological response data and information while providing significant flexibility to interpret impacts due to these factors; using assessments of biological communities along with water and sediment measurements to determine water quality impacts; and documenting trends in water quality that may eventually exceed water quality objectives or criteria, in violation of the antidegradation provisions of water quality standards.

**Potentially Significant Adverse Environmental Effects**

None.

***Issue 6: Statistical Evaluation of Numeric Water Quality Data***

**Existing SWRCB and RWQCB Practices**

During previous listing cycles, the RWQCBs sampled information, but little or no statistical validation of data, was used in making recommendations for the 2002 section 303(d). The RWQCBs did not use hypothesis testing. RWQCBs and SWRCB did not employ a level of statistical confidence in section 303(d) listing decisions.

During the development of the section 303(d) list, RWQCBs used various exceedance rates and a variety of minimum sample sizes in their section 303(d) listing decision assessments. Data were evaluated on a case-by-case basis. The data evaluation was usually expressed as the number of samples exceeding the standard or guideline out of a total number of samples. When appropriate, the magnitude of the measurements was also considered.

Water quality data often include observed measurements that are below or less than the QL of the analytical instruments. In 2002, the RWQCBs used several methods to evaluate non-detect data that ranged from using one half the value of the detection limit to evaluating the number of

exceedances in the total number of samples collected (i.e., the total number of samples that included non-detects).

**Proposed Policy**

The Policy provides guidance to base section 303(d) listing/delisting decisions on statistics to validate numeric data evaluations. It also requires SWRCB and RWQCBs follow appropriate scientific/statistical guidelines in establishing hypotheses; statistical procedures; and establishes acceptable levels of Type I and Type II errors; and preliminary hypotheses designed to minimize error. This increases confidence in decision making, quantifies the level of confidence and power, and follows standard scientific protocols for using hypothesis testing in decision-making.

When available data are less than or equal to the QL and that is less than the water quality standard, the value will be considered as meeting the water quality standard, objective, criterion, or evaluation guideline. When the sample value is less than the QL and the QL is greater than the water quality standard, objective, criterion, or evaluation guideline, the result shall not be used in the analysis. The QL includes the minimum level, practical quantitation level, or reporting limit. The Policy recommends a statistical approach that balances the Type I and Type II errors.

**Differences Between the Policy and Existing Practices**

During previous listing cycles, the RWQCBs assessed information, but did not statistically validate data used in making recommendations for the 2002 section 303(d) list. Previously, RWQCBs used critical exceedance rates to judge when a water body was not meeting water quality standards but the process was implemented without the use of statistical analysis. The RWQCBs used several methods to evaluate non-detect data. The Policy provides general guidelines to determine the process in interpreting when and how a non detect value can be included in the 303(d) listing evaluation.

The Policy contains provisions for using statistics to validate numeric information to make sound scientific section 303(d) listing/delisting decisions; makes a recommendation as to the form of the null hypothesis and alternate hypothesis; and recommends an exact binomial statistical test that balances errors. The Policy requires that a range of critical exceedance rates be applied to determine the number of samples needed to place waters on the section 303(d) list.

**Potential Adverse Environmental Effects**

The development of this Policy will not have an adverse effect on the environment. The Policy recommends using statistics to validate numeric information and test trends to make sound scientific section 303(d) listing/delisting decisions. The Policy adopts a critical exceedance

frequency that assesses only the strength of the decision to list or delist based on the sample population (i.e., grab samples) available. The Policy provides general guidance on interpreting non-detect or below QL data.

**Potentially Significant Adverse Environmental Effects.**

None.

***Issue 7: Policy Implementation***

**Existing SWRCB and RWQCB Practices**

The SWRCB has used previous section 303(d) lists as the basis for the development of the biennial list. The 1998 section 303(d) list formed the basis for the 2002 list submittal. Previous listings were reevaluated if new data and information were available.

The RWQCBs and SWRCB, in the process of evaluating whether water quality standards are being met, have traditionally relied on data and information documenting specific environmental characteristics pertaining to the physical, chemical, and biological conditions of each region's water bodies and watershed systems.

In the 2002 section 303(d) listing cycle, SWRCB and RWQCBs solicited all readily available data and information. Each RWQCB submitted staff reports, along with copies of public submittals, data and information, and documents referenced in the submittal to the SWRCB. The SWRCB reviewed all RWQCBs recommendations and compiled a statewide listing for SWRCB approval. After several public hearings and workshops, the SWRCB approved the section 303(d) list for submittal to USEPA.

For each water body and pollutant recommended by the RWQCBs for the 2002 section 303(d) list, SWRCB staff developed fact sheets outlining all pertinent information needed to make listing decisions.

In previous section 303(d) listing cycles, the quality of the data and information used to determine impairment varied greatly not only among the RWQCBs but among the past listing cycles as well. In the 2002 listing cycle, if the RWQCB provided information on the quality of the data, it was recorded it in the fact sheet.

Spatial and temporal representation were considered on a case-by-case basis and data of varying ages were used for the 2002 section 303(d) list.

Identification of water quality limited segments during previous section 303(d) listing cycles varied between RWQCBs. Generally, RWQCBs based listings on their Basin Plan surface water segmentation classifications by either listing according to hydrologic unit, area, and sub-

area or by listing on the basis of water body type and name. Some RWQCBs added water body segments not identified in Basin Plans; other RWQCBs established listings throughout watersheds even if the data indicated only a portion of the water body or segment was impacted.

Most of the RWQCB Basin Plans currently contain language distinguishing between controllable factors that result in degradation of water quality and those factors that are not controllable.

**Proposed Policy**

The Policy recommends revising an existing listing if requested by interested. Existing and readily available data and information in paper or electronic format from all available sources includes but is not limited to specifically listed reports and other sources of information listed in the policy. Data supported by a QAPP or equivalent would be acceptable for use in developing the section 303(d) list.

The Policy proposes that both the RWQCBs and the SWRCB manage the approval process. The RWQCBs would evaluate all readily available data and information and assemble fact sheets with the pertinent information for each potential water body-pollutant combination. Fact sheets shall present a description of the line(s) of evidence used to support each component of the weight-of-evidence approach. If the data and information reviewed indicate standards are attained, a single fact sheet may address multiple water and pollutant combinations. Public hearings, held by each RWQCB, will consider each proposed water body fact sheet, and provide written response to comments from testimony given at the hearing. After considering all testimony, the RWQCB would approve recommendations by resolution for the section 303(d) lists. The SWRCB would consider the RWQCB recommendation at a workshop. The list would be approved at a SWRCB Board meeting after consideration of all public comments.

The Policy recommends general guidance on collecting data that would be spatially and temporally representative of the water body segment. In general, samples should be available from two or more seasons or from two or more events when effects or water quality objective exceedances would be clearly manifested. Guidelines are also proposed on the age of data acceptable for listing. Only the most recent 10-year period of data and information would be used for listing and delisting waters.

RWQCBs would list water bodies or segments in accordance with the segmentation approach used in the Basin Plans but would be allowed to further divide waters if warranted. In the absence of an adequate segmentation system, the RWQCBs would be encouraged to define distinct reaches based on hydrology (e.g., stream order, tributaries, dams,

or channel characteristics) and relatively homogeneous land use. These components of the stream system could be logically grouped depending on the nature of the source of the pollutant and the designation of beneficial uses. The RWQCBs would be encouraged to identify stream reaches or lake/estuary areas that may have different pollutant levels based on significant differences in land use, tributary inflow, or discharge input. Based on these evaluations of the water body setting, RWQCBs would aggregate the data by appropriate reach or area.

**Differences Between the Policy and Existing Practices**

The proposed Policy presents a process for reconsidering existing listings. In previous listings, each RWQCB has used its judgement in identifying which data and information to use in its listing process. The proposed Policy recommends existing and readily available data and information in paper or electronic format including but not limited to the data and written information specifically described in the Policy.

In the past, the RWQCBs have held primary responsibility in making water body-pollutant recommendations pertaining to the section 303(d) list. This proposed Policy would allow each RWQCB to go through their adoption processes by holding workshops or hearings on the proposed water body-pollutant recommendations, provide a public comment period, and for the RWQCBs to respond to those comments. SWRCB would review the RWQCB recommendations for consistency and applicability with the Policy.

Documentation of proposed listings and the quality of the data and information used have varied widely. The 2002 listing process and the proposed Policy use a standard fact sheet format. The RWQCBs would be required to submit summaries of the data and information to support recommendations for the listing and delisting of water bodies. Fact sheets would only be prepared in circumstances where data and information are available. All readily available data and information would be considered. In 2002, California used all information and data to support listings regardless of age. The proposed Policy provides general guidance on the quality data that is acceptable for use in the section 303(d) listing process. The RWQCBs would evaluate and make a finding in the fact sheets on the appropriateness of data collection and analysis practices.

In previous section 303(d) listing cycles, spatial and temporal representation were considered on a case-by-case basis. The RWQCBs Basin Plans establish lists of water bodies within each region where water quality standards apply and waters will be protected from water quality degradation. Each identified water body within the established list is segmented by hydrologic unit, area and sub area, and each segments beneficial uses are designated, where such uses are applicable. The Policy

establishes general guidance when considering spatial and temporal representation in the evaluation of data and information from water body segments. The use of Basin Plan hydrologic units, areas and sub areas, and water body type classifications to determine where water quality standards are not being met is also recommended. The water segment would be listed on the section 303(d) list, although it may only be a smaller portion of the segment that is impaired. Listings of water segments would not be allowed unless data from the segment showed standards are not attained.

Previously, some water bodies not meeting water quality standards for a particular pollutant originating from natural sources were placed on the section 303(d) list. The proposed Policy does not provide guidance regarding impacts relative to natural sources. Water bodies recommended for section 303(d) listing in the future or existing listings recommended for removal from the section 303(d) list due to natural sources will require review and approval by the SWRCB.

**Potential Adverse Environmental Effects**

The development of this Policy will not have an adverse effect on the environment. The Policy recommends a more rigorous method of determining and specifying the data and information format to ensure that any listing recommendation is credible and scientifically defensible. The Policy allows for a more consistent approach in the development of the section 303(d) list. To support listing recommendations, the Policy provides guidance to ensure that data and information is adequately documented; of sufficiently high quality; and spatially and temporally representative of water body segments. The Policy identifies a process for establishing segments avoiding confusion regarding applicable designated beneficial uses, the name of the segment, and the size and boundaries of the affected segment.

**Potentially Significant Adverse Environmental Effects**

None.

***Issue 8: Priority Ranking and TMDL Completion Schedule***

**Existing SWRCB and RWQCB Practices**

In the 1998 listing cycle, the RWQCBs established priority ranking of listed water quality limited segments following a general SWRCB/USEPA guidance document. Criteria used to rank water bodies as high, medium, or low priority for TMDL development included the importance and extent of the beneficial uses threatened, degree of impairment, potential for beneficial use recovery, public concern and availability of information. However, TMDL scheduling was not linked with priority setting.

The 2002 prioritization process was based on the 1998 ranking methods. However, resource availability and considerations of achievability within the next two years were also taken into account in determining whether a water body should be ranked as high priority for TMDL development. The 2002 listing process linked priority ranking with the TMDL development schedule and subsequently scheduled TMDLs for all water bodies determined to be high priority.

**Proposed Policy**

The Policy proposes the establishment of a schedule for waters on the section 303(d) list that identify the TMDLs that would be developed within the current listing cycle and the number of TMDLs scheduled to be developed thereafter. The schedule in and of itself would reflect the State's priority ranking. The Policy would identify TMDLs scheduled for development using the following three categories of waters.

**Differences Between the Policy and Existing Practices**

The listing cycle prior to 2002 determined that water bodies would be ranked as high, medium and low and TMDL scheduling would not be linked. The Policy provides for each RWQCB to use their professional judgement to determine which TMDLs are high priority and which are not; but it would not be necessary to identify each TMDL as a high, medium, or low priority as long as a schedule is established.

**Potential Adverse Environmental Effects**

The development of this Policy will not have an adverse effect on the environment. The Policy establishes guidelines for and allows the TMDL scheduling to reflect the priority setting for establishing TMDLs.

**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 that would remove obstacles to population growth (a major expansion of a wastewater 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 CWA section 303(d) list as required by CWC section 13191.3(a). 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 guideline 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 that 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 that are related to the proposed action. Foreseeable projects that would result from the placement of waters on the CWA section 303(d) can vary greatly depending on the pollutant and level of regulatory response needed.

RWQCBs have wide latitude and numerous options that apply when determining how to address waters on the section 303(d) list. Irrespective of whether section 303(d) of the CWA requires a TMDL, the process for addressing waters that do not meet applicable standards will be accomplished through many existing regulatory tools and mechanisms. If a listed water segment meets water quality standards, the appropriate regulatory response is to remove the water from the list (to delist). If the failure to attain standards is revealed to be the result of the applicable standards not being appropriate, the regulatory response should be to

correct the standards through mechanisms such as Use Attainability Analysis, a Site-Specific Objective, or other modification of the water quality standard. In addition, an antidegradation finding may authorize the lowering of water quality to some degree, which may address the impairment.

The federal requirement to calculate TMDLs for listed waters is limited to those pollutants that USEPA determines are suitable for such calculation. At present this includes all pollutants. However, there are many existing regulatory tools that can be used to address water quality problems identified on the section 303(d) list.

Existing regulatory tools include individual or general WDR (NPDES permits or requirements solely under California law), individual or general waivers of WDRs, enforcement actions, interagency agreements, regulations, Basin Plan amendments, and/or other policies for water quality control. Basin Plan amendments can include implementing a specific water quality control plan, adopting prohibitions, or (where appropriate) modifying standards.

TMDLs are generally adopted at the time programs are instituted to implement actions to correct impairment. TMDLs may be adopted in any of the following ways: as part of a Basin Plan amendment, in the assumptions underlying a permitting action, in an enforcement action, or in another single regulatory action that is designed by itself to correct the impairment. The TMDL is adopted with the regulatory action that implements it.

Any environmental impacts associated with individual TMDLs or other efforts in lieu of a TMDL shall be addressed when the RWQCBs and SWRCB develop and approve those efforts. It is not possible for the SWRCB to consider potential direct and indirect environmental impacts of TMDLs planned for development or foresee all possible ways standards non-attainment will be addressed. It is unknown what actions will be necessary to implement the future TMDLs or other regulatory actions. During the development of TMDLs and implementation plans, RWQCBs and SWRCB will conduct a CEQA review and consider potential environmental impacts.

The response of RWQCBs to the placement of waters on the section 303(d) list is so varied, situation-specific, and site-specific that it is impossible to reasonably foresee the potential cumulative impacts of these projects or of placing waters on the section 303(d) list.

# 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 100, Sacramento, CA 95812-0100
(916) 341-5560

3. Date Checklist Submitted: December 2, 2003

4. Agency Requiring Checklist: Resources Agency

5. Name of Proposal, if applicable: Water Quality Control Policy for Developing California's Clean Water Act Section 303(d) List

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] |

| | Potentially Significant Impact | Potentially Significant Unless Mitigation Incorporated | Less Than Significant Impact | No Impact |
|---|---|---|---|---|
| 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

| | | | | |
|---|---|---|---|---|
| Would the proposal result in or expose people to potential impacts involving: | | | | |
| a. Fault rupture? | [ ] | [ ] | [ ] | [X] |
| 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] |

| | | Potentially Significant Impact | Potentially Significant Unless Mitigation Incorporated | Less Than Significant Impact | No Impact |
|---|---|---|---|---|---|
| f. | Change in the quantity of groundwaters, either through direct additions or withdrawals, or through interception of an aquifer by cuts or excavations or through substantial loss of groundwater recharge capability? | [ ] | [ ] | [ ] | [X] |
| g. | Altered direction or rate of flow of groundwater? | [ ] | [ ] | [ ] | [X] |
| h. | Impacts to groundwater quality? | [ ] | [ ] | [ ] | [X] |
| i. | Substantial reduction in the amount of groundwater otherwise available for public water supplies? | [ ] | [ ] | [ ] | [X] |
| 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] |

| | Potentially Significant Impact | Potentially Significant Unless Mitigation Incorporated | Less Than Significant Impact | No Impact |
|---|---|---|---|---|
| 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] |
| 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] |

| | Potentially Significant Impact | Potentially Significant Unless Mitigation Incorporated | Less Than Significant Impact | No Impact |
|---|---|---|---|---|
| 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] |
| 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] |

| | | Potentially Significant Impact | Potentially Significant Unless Mitigation Incorporated | Less Than Significant Impact | No Impact |
|---|---|---|---|---|---|
| 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] |
| 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 for the development of the Clean Water Act section 303(d) list will not have a significant adverse effect on the environment.

December 2, 2003
Date

Stan Martinson, Chief
Division of Water Quality
State Water Resources Control Board

EXPLANATIONS

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 placement of waters on the section 303(d) list, water quality limited segments category will lead to the development of TMDLs or implementation of other regulatory actions. Depending on the pollutant and pollutant source, agricultural operations may be impacted by the implementation of the TMDL or these other actions. Site-specific impacts of individual TMDLs will be considered by the RWQCBs and SWRCB when the TMDL and implementation plans are developed. Addressing these kinds on potential impacts at this stage would be speculative.

II.a.,b.,c.;XV.a. There is nothing in the proposed Policy that would affect population, housing or recreation.

III.a, b, d. These geologic problems are not caused by water pollution or the development of the section 303(d) list. However, during the implementation of TMDLs people could potentially be exposed to such impacts during the construction or operation of new facilities to treat water pollution to reduce or eliminate pollutant inputs. If such actions are necessary the potential environmental effects will be addressed during the development of the TMDL and implementation 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 or the development of the section 303(d) list.

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 as a result of additional effort to reduce pollutant loads as a result of implementing TMDLs. If such actions are necessary to address pollutant impacts to ensure that water quality standards are met, potential environmental effects will be addressed in the specific TMDL designed to address the water quality problem.

III.h. Expansion of soils is influenced by amount of moisture change and 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. Placement of waters on the section 303(d) list does not affect the shrink-swell capacity of soils.

IV.a.,b.,d.,e.,f.,g.,i. The placement of waters on the section 303(d) list does not affect absorption rates, drainage patterns, surface runoff, flooding, quantity of surface or groundwater, surface water currents, or groundwater flow or supply. The proposed Policy does not apply to groundwater; it only applies to surface waters.

IV.c. The proposed Policy is expected to provide procedures that would enable the SWRCB and the RWQCBs to apply a consistent, scientifically defensible approach for assessing waters of the State in terms of water quality standards and beneficial use attainment. The section 303(d) list would also direct the scheduling of waters that receive TMDLs. Depending on the pollutant and pollutant source, many waters of the State may be impacted by the implementation of a TMDL or other regulatory actions necessary to address the listing. Site-specific impacts of individual TMDLs will be considered by the RWQCBs and SWRCB when the TMDL and implementation plans are developed. Addressing these kinds of site-specific potential impacts at this stage would be speculative.

IV.h.;V.a.,b. The proposed Policy does not apply to groundwater or air quality.

V.c. The identification of water quality limited segments does not affect significantly 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 result in a consistent and scientifically defensible section 303(d) listing methodology. The provisions of the proposed Policy are expected to encourage better regulation of waters that do not meet water quality standards. Therefore, the proposed Policy will encourage protection of rare and endangered species as will as fish and wildlife habitats generally. If there are potential impacts to these resources identified in the development and implementation of TMDLs or other regulatory actions, the potential environmental effects will be addressed in the environmental documentation supporting the future action.

VIII.c. The proposed Policy does not involve or affect the availability of a mineral resource.

IX.c.,d.;XVI.d. The proposed Policy is not expected to cause adverse effects to human health. The proposed Policy will identify waters that may pose a health hazard.

XII.c.,d.,e.,g. Effects on water utility and service systems could potentially occur if TMDLs (developed as a result of the proposed Policy) cause the regulated community to take compliance actions that involved construction or substantial alterations to treatment facilities. However, the Policy will not require dischargers to take such compliance actions. If there are potential impacts

to these resources identified in the development of TMDLs or other regulatory actions resulting from the section 303(d) list, then the potential environmental impacts will be addressed in the environmental documentation developed for these actions. For point discharges to waters placed on the section 303(d) list, final permit limits will be unaffected by the listing because final effluent limits will be developed following the State Implementation Policy (SWRCB Order No. 2001-06).

XV.b. Pollutants in water and sediment can affect recreational opportunities such as swimming if water quality standards are not achieved in a water body. The provisions of the proposed Policy establish consistent, scientifically defensible methods to determine if specific waters are not meeting water quality standards. The provisions of the proposed Policy are expected to encourage better regulation of waters that do not meet water quality standards. Therefore, the proposed Policy will encourage protection of human health. If there are potential impacts to these resources identified in the development and implementation of TMDLs or other regulatory actions, the potential environmental effects will be addressed in the environmental documentation supporting these actions

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

# GLOSSARY

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| α (Alpha) | The statistical error of rejecting a null hypothesis that is true. This type of error is also called Type I error. |
| Alternate hypothesis | A statement or claim that a statistical test is set up to establish. |
| Beneficial Uses | Uses of water that may be protected against degradation include, but are not limited to, domestic, municipal, agricultural and industrial supply; power generation; recreation; aesthetic enjoyment; navigation; preservation and enhancement of fish, wildlife, and other aquatic resources and preserves (CWC section 13050(f)). |
| β (Beta) | The statistical error of failing to reject a null hypothesis that is not true. This type of error is also called Type II error. |
| Best Management Practices (BMP) | 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. |
| BINOMDIST | An Excel® function that is used to calculate the cumulative binomial distribution. |
| Binomial Distribution | A binomial distribution statistically describes the probabilities associated with the possible number of times particular outcomes will occur in series of observations (i.e., samples). Each observation may have only one of two possible results (e.g., yes/no, on/off, and violation/compliance). The following assumptions must apply in order to reliably employ binomial distribution statistics:<br>♦ Each observation may result in only two possible outcomes.<br>♦ An "experiment" consists of *N* identical trials or observations.<br>♦ The probability of one particular result (out of two) remains constant from one observation to the next.<br>♦ The observations (i.e., samples) are independent, so that the outcome of one observation has no effect on the outcome of another. |
| Bioaccumulation | The process by which a chemical is taken up by an aquatic organism, both from water and through food. |
| Bioassessment | Biological assessment is the use of biological community information along with the measure of the physical/habitat |

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| | quality to determine, in the case of water quality, the integrity of a water body of interest. |
| Contamination | An impairment of the quality of the water of the state by waste to a degree which creates a hazard to the public health through poisoning or through the spread of disease. "Contamination" includes any equivalent effect resulting from the disposal of waste whether or not waters of the state are affected (CWC section 13050(k)). |
| California Toxics Rule (CTR) | USEPA established numerical water quality criteria for priority toxic pollutants for California Inland Surface Waters, Enclosed Bays and Estuaries. |
| Conventional Pollutants | Include dissolved oxygen, pH, and temperature (from the section 305(b) guidance). |
| Diel | Pertaining to a 24-hour period of time; a regular daily cycle. |
| Effect size | The maximum magnitude of exceedance frequency that is tolerated. |
| Effects Range-Median (ERM) and Effects Range-Low (ERL) Values | Sediment quality guidelines based on a biological effects empirical approach. These values represent chemical concentration ranges that are rarely (i.e., below the ERL), sometimes (i.e., between ERL and ERM), and usually (i.e., above the ERM) associated with toxicity for marine and estuarine sediments. Ranges are defined by the tenth percentile and fiftieth percentile of the distribution of contaminant concentrations associated with adverse biological effects. |
| Equilibrium Partitioning (EqP) Approach | Methodology of developing sediment quality guidelines that assumes that an organism receives an equivalent exposure from water only exposures or from any equilibrated phase (e.g., either from pore water via respiration; or from organic carbon, via ingestion; or from a mixture of the routes). Approach results in guideline values expressed in terms of a sediment phase controlling contaminant bioavailability (e.g., organic carbon for nonionic organic compounds or sulfides for metals). |
| Equilibrium Partitioning Sediment Guidelines | Sediment quality guidelines derived using the EqP approach. When used in conjunction with appropriately protective water only exposure concentration, a resulting guideline represents the sediment contaminant concentration that protects benthic organisms from the effects of that contaminant. |

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| Index of Biological Integrity (IBI) | The response of indicators designed to monitor or detect biological, community, or ecological conditions. IBI is a multimetric index indicating the ability of a habitat to support and maintain a balanced, integrated, adaptive biological system having the full range of elements expected in a region's natural habitat. |
| Maximum Contaminant Level (MCL) | The maximum permissible level of a contaminant in water delivered to any user of a public water system. |
| Maximum Tissue Residue Level (MTRL) | MTRLs were developed from human health water quality objectives in the 1997 California Ocean Plan and from the California Toxic Rule as established in the Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California. MTRLs are used as alert levels or guidelines indicating water bodies with potential human health concerns and are an assessment tool and not compliance or enforcement criteria. The MTRLs are calculated by multiplying human health water quality objectives by the bioconcentration factor for each substance. |
| National Academy of Science (NAS) Tissue Guidelines | NAS guidelines are established guidelines for the protection of predators. Values are suggested for residues in whole fish (wet weight) for DDT (including DDD and DDE), aldrin, dieldrin, endrin, heptachlor (including heptachlor epoxide), chlordane, lindane, benzene hexachloride, toxaphene, and endosulfan either singularly or in combination. |
| National Toxics Rule | USEPA established numerical water quality criteria for priority toxic pollutants for 12 states and two Territories who failed to comply with the section 303(c)(2)(B) of the Clean Water Act. |
| Nonpoint Source | Pollution sources are diffused and do not have a single point of origin or are not introduced into a receiving stream from a specific outlet. The commonly used categories for nonpoint sources are agriculture, forestry, mining, construction, land disposal, and salt intrusion. |
| Null hypothesis | A statement used in statistical testing that has been put forward either because it is believed to be true or because it is to be used as a basis for argument, but has not been proved. |
| Point Source | Any discernible, confined, and discrete conveyance, including but not limited to, any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, landfill leachate collection system, vessel or |

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| | other floating craft from which pollutants are or may be discharged. This term does not include return flows from irrigation agriculture or agricultural storm water runoff (40 CFR 122.2). |
| Pollutants | Defined in section 502(6) of the CWA as "dredged spoil, solid waste, incinerator residue, filter backwash, sewage, garbage, sewage sludge, munitions, chemical wastes, biological materials, radioactive materials, heat, wrecked or discarded equipment, rock, sand, cellar dirt and industrial, municipal, and agricultural waste discharged into water." |
| Pollution | The term *pollution* is defined in section 502(19) of the CWA as the "the man-made or man-induced alteration of the chemical, physical, biological, and radiological integrity of water." *Pollution* is also defined in CWC section 13050(1) as an alternation of the quality of the waters of the state by waste to a degree that unreasonably affects either the waters for beneficial uses or the facilities that serve these beneficial uses. |
| Probable Effect Concentration (PEC) | Consensus based PECs are empirically derived freshwater sediment quality guidelines (SQG) that rely on the correlation between the chemical concentration in field collected sediments and observed biological effects. PECs are based on geometric means of various SQG approaches (with matching chemical and toxicity field data) to predict toxicity for freshwater sediment on a regional and national basis. |
| Probable Effects Level (PELs) and Threshold Effects Levels (TEL) | Sediment quality guidelines based on a biological effects empirical approach similar to ERMs/ERLs. A generalized approach used to develop effects-based guidelines for the state of Florida and others. The lower of the two guidelines for each chemical (i.e., the TEL) is assumed to represent the concentration below which toxic effects rarely occur. In the range of concentrations between the two guidelines, effects occasionally occur. Toxic effects usually or frequently occurs at concentrations above the upper guideline value (i.e., the PEL). Ranges are defined by specific percentiles of both the distribution of contaminant concentrations associated with adverse biological effects and the "no effects" distribution. |
| Rank correlation | Association between paired values of two variables that have been replaced by their ranks within their respective samples (e.g., chemical measurements and response in a toxicity test). |

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| Reference Condition | The characteristics of water body segments least impaired by human activities. As such, reference conditions can be used to describe attainable biological or habitat conditions for water body segments with common watershed/catchment characteristics within defined geographical regions. |
| Spatial Representation | The degree of compatibility or overlap in the study area, locations of measurements or samples, locations of stressors or potential pollutant sources, and locations of potential exposure to pollutants. |
| Statistical Significance | A finding (for example, the observed difference between the means of two random samples) is statistically significant when it can be demonstrated the probability of obtaining such a difference by chance only is relatively low. |
| Temporal Representation | Compatibility or overlap between measurements (when data were collected or the period for which data are representative) and the period during which effects of concern would likely to be detected. |
| Total Maximum Daily Load (TMDL) | TMDL is the sum of individual wasteload allocations and load allocations; a margin of safety. TMDLs can be expressed in terms of mass per time, toxicity, or other appropriate measures that relate to a state's water quality standards. |
| Toxicants | Include priority pollutants, metals, chlorine and nutrients (from the section 305(b) guidance). |
| Toxicity Identification Evaluation (TIE) | TIE is technique to identify the unexplained cause(s) of toxic events. TIE involves selectively removing classes of chemicals through a series of sample manipulations (e.g. solid phase extraction to remove organic compounds), effectively reducing complex mixtures of chemicals in natural waters to simple components for analysis. Following each manipulation the toxicity of the sample is assessed to see whether the toxicant class removed was responsible for the toxicity. |
| Toxicity Test | A test to determine the toxicity of a chemical in ambient water using living organisms. A toxicity test measures the degree of effect on exposed test organism. Toxicity is determined when there is a statistically significant difference in mortality, and/or growth and reproduction of an organism in water compared to the laboratory control. |

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| Waste Discharge Requirements (WDR) | WDRs are issued under State law pursuant to CWC section 13263 and apply to dischargers that discharge waste to land or to water. WDRs implement water quality control plans, take into consideration beneficial uses, water quality objectives, other waste discharges, the need to prevent nuisance, and the provisions of CWC section 13241. The disposal method may be by agricultural or non-agricultural irrigation, ponds, landfills, mono-fills, or leachfields. |
| Water Quality Limited Segment | Any segment [of a water body] where it is known that water quality does not meet applicable water quality standards, and /or is not expected to meet applicable water quality standards, even after application of technology-based effluent limitations required by CWA sections 301(d) or 306 as defined in the federal regulation. |
| Water Quality Objectives | The limits or levels of water quality constituents or characteristics which are established for the reasonable protection of beneficial uses of water or the prevention of nuisance within a specific area. |
| Water Quality Standard | Provisions of State and Federal Law which consist of a designated use or uses for the waters of the United States, water quality criteria for such waters based upon such uses. Water quality standards are to protect public health or welfare, enhance the quality of the water and serve the purpose of the Clean Water Act (40 CFR 131.3). |

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FINAL

# Functional Equivalent Document

## Appendix A

Water Quality Control Policy

JULY 2004

DIVISION OF WATER QUALITY
STATE WATER RESOURCES CONTROL BOARD

**STATE WATER RESOURCES CONTROL BOARD**
*P.O. 100*
*Sacramento, CA 95812-0100*

*To request copies of the draft Final FED and proposed Policy please call (916) 341-5566.*

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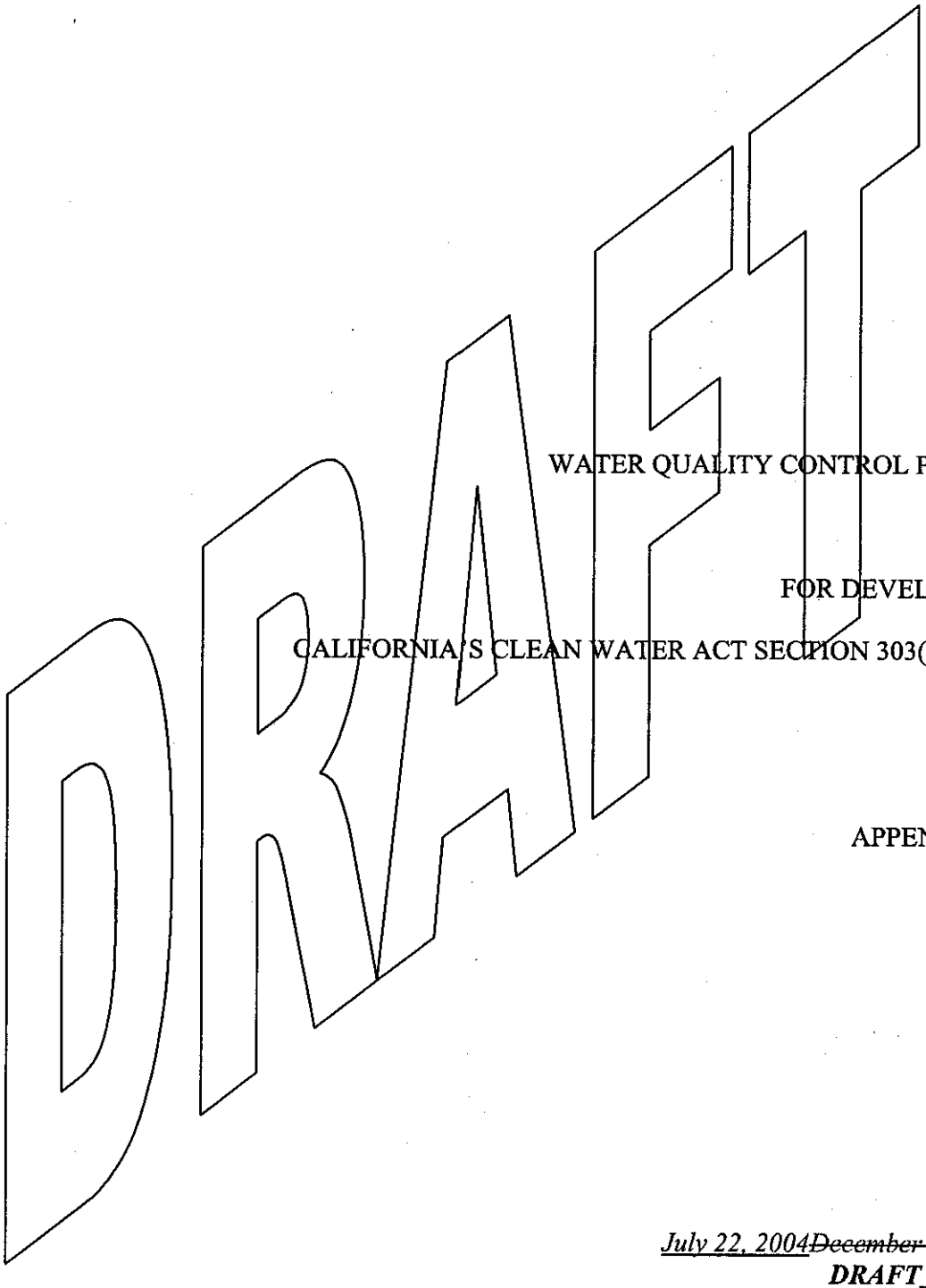
State of California

STATE WATER RESOURCES CONTROL BOARD




# WATER QUALITY CONTROL POLICY

# FOR DEVELOPING

# CALIFORNIA'S CLEAN WATER ACT SECTION 303(d) LIST

## APPENDIX A

*July 22, 2004*~~*December 2, 2003*~~

***DRAFT FINAL***

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

# Table of Contents

# WATER QUALITY CONTROL POLICY FOR DEVELOPING CALIFORNIA'S CLEAN WATER ACT SECTION 303(d) LIST

## 1 Introduction

Pursuant to California Water Code section 13191.3(a), this State policy for water quality control (Policy) describes the process by which the State Water Resources Control Board (SWRCB) and Regional Water Quality Control Boards (RWQCBs) ~~shall~~will comply with the listing requirements of section 303(d) of the federal Clean Water Act (CWA). The ~~goal~~objective of this Policy is to establish a standardized approach for developing California's section 303(d) list in order to achieve the overall goal of achieving water quality standards and maintaining beneficial uses in all of California's surface waters.

CWA section 303(d) requires states to identify waters that do not meet, or are not expected to meet by the next listing cycle, applicable water quality standards after the application of certain technology-based controls~~.~~ and schedule such waters for development of Total Maximum Daily Loads (TMDLs) [40 Code of Federal Regulations (CFR) 130.7(c) and (d)]. The states are required to assemble and evaluate all existing and readily available water quality-related data and information to develop the list [40 CFR 130.7(b)(5)] and to provide documentation for listing or not listing a state's waters [40 CFR 130.7(b)(6)]. -The methodology to be used to develop the section 303(d) list [40 CFR 130.7(b)(6)(i)] is established by this Policy and includes:

- California Listing Factors and Delisting Factors;
- ~~t~~The process for gathering and evaluati~~o~~ng of readily available data and information; and
- Total Maximum Daily Load (TMDL) ~~priority setting and~~ scheduling.

This Policy applies only to the listing process methodology used to comply with CWA section 303(d). In order to make decisions regarding standards attainment, this Policy provides guidance ~~to~~ for interpreting data and information ~~by comparison~~as they are compared to beneficial uses, existing numeric and narrative water quality objectives, and antidegradation considerations. The Policy shall not be used to:

- determine compliance with any permit or waste discharge requirement provision;
- establish, revise, or refine any water quality objective or beneficial use; or
- translate narrative water quality objectives for the purposes of regulating point sources.

Data and information from water bodies shall be analyzed under the provisions of this Policy using a weight-of-evidence approach. The weight-of-evidence approach shall be used to

evaluate whether the evidence is in favor of or against placing waters on or removing waters from the section 303(d) list (section 2). The following steps describe the weight-of-evidence approach:

1. Data and Information Preprocessing: All data and information for existing listings shall be solicited and assembled, as appropriate (sections 6.1.1 and 6.1.2.1). Water body fact sheets (section 6.1.2.2) describing the assessments shall be prepared. Evaluation guidelines (section 6.1.3), if needed, shall be selected and the quality of the data (section 6.1.4) and quantity of data (section 6.1.5) shall be assessed.

2. Data and Information Processing: All data and information shall be evaluated using the decision rules listed in sections 3 or 4, as appropriate, and using applicable implementation factors (including, but not limited to, sections 6.1.2.2 and 6.1.5.1 through 6.1.5.9). RWQCBs shall also develop a schedule for completion of TMDLs (section 5). All other information not addressed under sections 3, 4, 5, or 6, shall be evaluated and presented in fact sheets.

3. Data Assessment: An assessment in favor of or against a list action for a water body-pollutant combination shall be presented in fact sheets. The assessment shall identify and discuss relationships between all available lines of evidence for water bodies and pollutants. This assessment shall be made on a pollutant-by-pollutant (including toxicity) basis. RWQCBs shall approve all decisions to list or delist a water segment (section 6.2).

# 2 Structure of the CWA Section 303(d) List

This section ~~contains~~describes the categories of waters ~~to~~that shall be included in the section 303(d) list. Sections 3 and 4 contain the factors that shall be used to add and remove waters from the list. At a minimum, ~~t~~The California section 303(d) list shall identify waters where standards are not met, pollutants or toxicity contributing to standards exceedance, and the TMDL completion schedule. The section 303(d) list shall contain the following categories:

## ~~1.1~~2.1 Water Quality Limited Segments ~~Category~~

Waters shall be placed ~~on~~ in this ~~portion~~ category of the section 303(d) list if it is determined, in accordance with the California Listing Factors, that the water quality standard is not attained~~,~~; the standards nonattainment is due to toxicity, a pollutant, or pollutants~~,~~; and remediation of the standards attainment problem requires ~~a~~ one or more TMDLs.

~~This category constitutes the list of water quality limited segments for which one or more TMDL(s) are needed. A water segment shall be placed in this category if it is determined, in accordance with the California Listing Factors, that a pollutant has caused or is suspected of causing standards to not be attained.~~

~~Where more than one pollutant is associated with the standards not attained for a single water segment, t~~The water segment shall remain in this category of the section 303(d) list until TMDLs for all pollutants have been completed, ~~are approved by~~U.S. Environmental Protection Agency (USEPA) has approved the TMDLs, and ~~an~~ implementation plans ~~is~~have been adopted~~, and water quality standards are attained~~.

## ~~1.2~~2.2 Water Quality Limited Segments Being Addressed ~~TMDLs Completed Category~~

Water segments shall be ~~listed~~ placed in this category under two circumstances:

1. ~~once~~ A~~a~~ TMDL has been developed and approved by ~~the U.S. Environmental Protection Agency (~~USEPA~~)~~ and ~~that, when implemented, are~~the approved implementation plan is expected to result in full attainment of the standard within an adopted time frame; ~~. Waters shall only be removed from this category of water quality standards are attained.~~or

2. If a RWQCB certifies under the provisions of the Water Quality Control Policy for Addressing Impaired Waters that

## ~~2.3Enforceable Program Category~~

~~Water segments shall be listed in this category of the section 303(d) list if~~ pollution control requirements other than TMDLs are reasonably expected to result in the attainment of the water quality standard within an adopted time frame. ~~Consistent with 40 CFR 130.7(b)(1)(i), (ii), and (iii), water segments shall be listed in this subcategory when other pollution control~~

~~requirements required by local, state, or federal authority are stringent enough to implement water quality standards applicable to such waters.~~

Waters shall only be removed from this category if it is demonstrated in accordance with section 4 that water quality standards are attained.

# 3 California Listing Factors

RWQCBs and SWRCB shall use the following factors to develop the California section 303(d) list. ~~The factors for placement of water segments on the list are presented below.~~

## ~~1.1~~3.1 Water Quality Limited Segments Factors

This section provides the methodology for developing the Water Quality Limited Segments ~~portion~~ category of the section 303(d) list. Waters meeting the conditions in section 3.1 ~~do not attain~~exceed water quality standards.~~, waters not meeting the conditions in section 3.1 attain water quality standards. If data and information do not meet the data quality or quantity requirements (sections 6.2.4 and 6.2.5), it is uncertain if water quality standards are attained.~~

In developing the list, the state shall evaluate all existing readily available water quality-related data and information. Data and information, collected during a known spill or violation of an effluent limit in a permit or waste discharge requirement (WDR), ~~shall not be used in the assessment of objectives and beneficial use attainment as required by this Policy~~may be used in conjunction with other data to demonstrate that there is an exceedance of a water quality standard in the water body. ~~If standards exceedances reflect physical alteration of the water body that cannot be controlled or natural background conditions, the water segment shall not be placed on the section 303(d) list. Except as allowed by section 6.2.5.2, only the most recent data and information (up to 10 years old) shall be used. Data shall be appropriately transformed as described in section 6.2.5.9 depending on the averaging period stated in the water quality objective or criterion.~~ Visual assessments or other semi-quantitative assessments ~~may~~ shall also be considered ~~not be used~~ as ~~the sole~~ancillary lines of evidence to support a section 303(d) listing.

Water segments shall be placed on the section 303(d) list if any of the following conditions are met~~:~~.

### ~~1.1.1~~3.1.1 Numeric Water Quality Objectives and Criteria for Toxicants in Water

Numeric water quality objectives for toxic pollutants, including maximum contaminant levels where applicable, or California/National Toxics Rule water quality criteria are exceeded as follows:

- Using the binomial distribution, waters shall be placed on the section 303(d) list if the number of measured exceedances supports rejection of the null hypothesis as presented in Table 3.1.
- For sample populations less than 21, when 3 or more samples exceed standards, the segment shall be listed.

~~exceeded in 10 percent of the samples with a confidence level of 90 percent using a binomial distribution (Table 3.1). For sample populations less than 20, when 5 or more samples exceed the water quality objective, the segment shall be listed.~~

### ~~1.1.2~~3.1.2 Numeric Water Quality Objectives for Conventional or Other Pollutants in Water

Numeric water quality objectives for conventional pollutants are exceeded as follows:

- Using the binomial distribution, waters shall be placed on the section 303(d) list if the number of measured exceedances supports rejection of the null hypothesis as presented in Table 3.2.
- For sample populations less than 26, when 5 or more samples exceed standards, the segment shall be listed.

~~in 10 percent of the samples with a confidence level of 90 percent using a binomial distribution (Table 3.2). For sample populations less than 20, when 5 or more samples exceed the water quality objective, the segment shall be listed.~~

For depressed dissolved oxygen, if measurements of dissolved oxygen taken over the day (diel) show low concentrations in the morning and sufficient concentrations in the afternoon, then it shall be assumed that nutrients are responsible for the observed dissolved oxygen concentrations if riparian cover, substrate composition or other pertinent factors can be ruled out as controlling dissolved oxygen fluctuations. When continuous monitoring data are available, the seven-day average of daily minimum measurements shall be assessed. ~~-~~In the absence of diel measurements, concurrently collected measurements of nutrient concentration shall be assessed using ~~as described in section 3.1.1 to~~ applicable ~~and appropriate~~ water quality objectives or acceptable evaluation guidelines (section 6.1.3~~6.2.3~~) and using the binomial distribution as described in section 3.1.1.

### ~~1.1.3~~3.1.3 Numerical Water Quality Objectives or Standards for Bacteria Where Recreational Uses Apply

In the absence of a site-specific exceedance frequency, a water segment shall be placed on the section 303(d) list if bacteria water quality standards in California Code of Regulations, Basin Plans, or statewide plans are exceeded using the binomial distribution as described in section 3.1.2. ~~in 10 percent of the samples with a confidence level of 90 percent using a binomial distribution (Table 3.1). For sample populations less than 20, when 5 or more samples exceed the water quality objective the segment shall be listed.~~

If a site-specific exceedance frequency is available, it may be used instead of the ~~10~~ten percent exceedance frequency as described in Table 3.2. The site-specific exceedance frequency shall be the number of water quality standard exceedances in a relatively unimpacted watershed (i.e., a reference water segment). To the extent possible and allowed by water quality objectives, RWQCBs shall identify one or more reference beaches or water segments ~~in a relatively unimpacted watershed~~ to compare ~~to~~the measurements.

For bacterial measurements from coastal beaches, if water quality monitoring was conducted April 1 through October 31 only, a 4four percent exceedance percentage shall be used. If the exceedance is due to a beach closure related to a sewage spill, the water segment shall not be placed on the section 303(d) list. Beach postings that are not backed by water quality data shall not be used to support placement of a water segment on the section 303(d) list.

### ~~1.1.4~~3.1.4 Health Advisories

A water segment shall be placed on the section 303(d) list if a~~A~~ health advisory against the consumption of edible resident organisms, or a shellfish harvesting ban has been issued by the Office of Environmental Health Hazard Assessment (OEHHA), or Department of Health

Services and there is a designated or existing fish consumption beneficial use for the segment. In addition, water segment-specific data ~~are~~must be available indicating the evaluation guideline for tissue is exceeded.

### ~~1.1.5~~3.1.5 Bioaccumulation of Pollutants in Aquatic Life Tissue

A water segment shall be placed on the section 303(d) list if t~~T~~he tissue pollutant levels in organisms exceed a pollutant-specific evaluation guideline (satisfying the requirements of section 6.1.3~~6.2.3~~) using the binomial distribution as described in section 3.1.1.~~in 10 percent of the samples with a confidence level of 90 percent using a binomial distribution (Table 3.1). For sample populations less than 10, when 3 or more samples exceed the evaluation guideline, the segment shall be listed.~~

Acceptable tissue concentrations ~~are~~may be based on composite samples measured either as muscle tissue or whole body residues. Residues in liver tissue alone are not considered a suitable measure. ~~Animals can either be~~Samples can be collected either from transplanted animals ~~(if a resident species)~~ or ~~collected~~ from resident populations.

### ~~1.1.6~~3.1.6 Water/Sediment Toxicity

A water segment shall be placed on the section 303(d) list if t~~T~~he water segment exhibits statistically significant water or sediment toxicity using the binomial distribution as described in section 3.1.1.~~in 10 percent of the samples with a confidence of 90 percent using a binomial distribution (Table 3.1) and the toxicity is associated with a pollutant or pollutants. For sample populations less than 10, when 3 or more samples exhibit toxicity,~~ tThe segment shall be listed if the observed toxicity is associated with a pollutant or pollutants. Waters may also be placed on the section 303(d) list for toxicity alone. If the pollutant causing or contributing to the toxicity is identified, the pollutant shall be included on the section 303(d) list as soon as possible (i.e., during the next listing cycle). ~~If the pollutant has not been identified, studies identifying the pollutant causing or contributing to the toxicity shall be completed prior to the development of a TMDL.~~

Reference conditions may include laboratory controls (using a t-test or other applicable statistical test), the lower confidence interval of the reference envelope, or, for sediments, response less than 90 percent of the minimum significant difference for each specific test organism.

Appropriate reference and control measures must be included in the toxicity testing. Acceptable methods include, but are not limited to, those listed in water quality control plans, the methods used by Surface Water Ambient Monitoring Program (SWAMP), the Southern California Bight Projects of the Southern California Coastal Water Research Project, American Society for Testing and Materials (ASTM), ~~U.S. Environmental Protection Agency~~USEPA, the Regional Monitoring Program of the San Francisco Estuary Institute, and the Bay Protection and Toxic Cleanup Program (BPTCP).

Association of pollutant concentrations with toxic or other biological effects should be determined by any one of the following:

A. Sediment quality guidelines (satisfying the requirements of section 6.1.3~~6.2.3~~) are exceeded using the binomial distribution as described in section 3.1.1~~in 10 percent of the samples with a confidence level of 90 percent using a binomial distribution (Table 3.1). For sample populations less than 10, when 3 or more samples exceed the evaluation guideline, the segment shall be listed.~~ In addition, using rank correlation, the observed effects are correlated with measurements of chemical concentration in sediments. If these conditions are met, the pollutant shall be identified as "sediment pollutant(s)."

B. For sediments, an evaluation of equilibrium partitioning or other type of toxicological response that identifies the pollutant that may cause the observed impact. Comparison to reference conditions within a watershed or ecoregion may be used to establish sediment impacts.

C. Development of an evaluation (such as a toxicity identification evaluation) that identifies the pollutant that contributes to or caused the observed impact.

### 3.1.7 Nuisance

A water segment shall be placed on the section 303(d) list if qualitative assessments of the water segment for ~~N~~nuisance water odor, taste, excessive algae growth, foam, turbidity, oil, ~~litter or~~ trash, and color ~~shall be placed on the section 303(d) list if qualitative visual assessments or other semi-quantitative assessments of the water segment and associated~~ are associated with numerical water quality data that meets any one of the following:

~~1.1.1.1~~*3.1.7.1 Nutrient-related*

~~For excessive algae growth, unnatural foam, odor, and taste,~~ An acceptable nutrient-related evaluation guidelines ~~are~~ is exceeded using the binomial distribution as described in section 3.1.1 for excessive algae growth, unnatural foam, odor, and taste. Waters may also be placed on the section 303(d) list when a significant nuisance condition exists as compared to reference conditions, or when nutrient concentrations cause or contribute to excessive algae growth. If listing for nitrogen or phosphorus specifically, RWQCBs should consider whether the ratio of these two nutrients indicates which is the limiting agent.

~~1.1.1.2~~*3.1.7.2 Other Types*

An acceptable evaluation guideline is exceeded using the binomial distribution as described in section 3.1.1 for taste, color, oil sheen, turbidity, litter, trash, and odor not related to nutrients. ~~These types of nuisance~~ Water segments may also be placed on the section 303(d) list when there is significant nuisance condition ~~when~~ compared to reference conditions.

### ~~1.1.8~~3.1.8 Adverse Biological Response

A water segment shall be placed on the section 303(d) list if the~~A~~ water segment exhibits adverse biological response ~~as compared to reference conditions~~ measured in resident individuals as compared to reference conditions and these impacts are ~~with~~ associated with water or sediment concentrations of pollutants as described in section 3.1.6. Endpoints for this factor include reduction in growth, reduction in reproductive capacity, abnormal development, histopathological abnormalities, and other adverse conditions.

~~Growth Measures: Reductions in growth can be determined using suitable measurements of field populations.~~

~~Reproductive Measures: 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: Can be determined using measures of physical or behavioral disorders or aberrations.~~

~~Histopathology: Abnormalities representing distinct adverse effects, such as carcinomas or tissue necrosis, must be evident.~~
Qualitative visual assessments or other semi-qualitative assessments may be used as secondary lines of evidence to support placement on the section 303(d) list ~~for~~. These types of assessments include ~~repeated~~ fish kills or ~~repeated~~ bird kills related to water quality conditions.

For adverse biological response related to sedimentation, the water segment shall be placed on the section 303(d) list if adverse biological response is identified and effects are associated with clean sediment loads in water or ~~those~~ with loads stored in the channel. Waters shall be placed on the section 303(d) list if evaluation guidelines (satisfying the conditions of section 6.1.3~~6.2.3~~) are exceeded using the binomial distribution as described in section 3.1.1.~~in 10 percent of the samples with a confidence level of 90 percent using a binomial distribution (Table 3.1). For sample populations less than 20, when 5 or more samples exceed the water quality objective, the segment shall be listed.~~

**~~1.1.9~~3.1.9 Degradation of Biological Populations and Communities**

A water segment shall be placed on the section 303(d) list if the~~A~~ water segment exhibits significant degradation in biological populations and/or communities as compared to reference site(s) and is associated with water or sediment concentrations of pollutants including but not limited to chemical concentrations, temperature, dissolved oxygen, and trash~~as described in section 3.1.6~~. -This condition requires diminished numbers of species or individuals of a single species or other metrics when compared to reference site(s). -The analysis should rely on measurements from at least two stations. Comparisons to reference site conditions shall be made during similar season and/or hydrologic conditions.

Association of chemical concentrations, temperature, dissolved oxygen, trash, and other pollutants shall be determined using sections 3.1.1, 3.1.2, 3.1.6, 3.1.7, 6.1.5.9, or other applicable sections.

For population or community degradation related to sedimentation, the water segment shall be placed on the section 303(d) list if degraded populations or communities are identified and effects are associated with clean sediment loads in water or ~~those~~ with loads stored in the channel when compared to evaluation guidelines (satisfying the conditions of section 6.1.3) using the binomial distribution as described in section 3.1.1 or as compared to reference sites.~~.~~

Bioassessment data used for listing decisions shall be consistent with section 6.1.5.8. For bioassessment, measurements at one stream reach may be sufficient to warrant listing provided that the impairment is associated with a pollutant(s) as described in this section.

~~Waters shall be placed on the section 303(d) list if evaluation guidelines (satisfying the conditions of section 6.2.3) are exceeded in 10 percent of the samples with a confidence level of 90 percent using a binomial distribution (Table 3.1). For sample populations less than 20, when 5 or more samples exceed the water quality objective, the segment shall be listed.~~

**~~1.1.10~~3.1.10 Trends in Water Quality**

A water segment shall be placed on the section 303(d) list if the~~A~~ water segment exhibits concentrations of pollutants or water body conditions for any listing factor that shows a trend of declining water quality standards attainment. This section is focused on addressing the antidegradation component of water quality standards and threatened waters as defined in 40 CFR 130.2(j) by identifying trends of declining water quality. Numeric, pollutant-specific water quality objectives need not be exceeded to satisfy this listing factor. In assessing trends in water quality RWQCBs shall:

1. Use data collected for at least three years;
2. Establish specific baseline conditions;
3. Specify statistical approaches used to evaluate the declining trend in water quality measurements;
4. Specify the influence of seasonal effects, interannual effects, changes in monitoring methods, changes in analysis of samples, and other factors deemed appropriate; ~~and~~
5. Determine the occurrence of adverse biological response (section 3.1.8), degradation of biological populations and communities (section 3.1.9), or toxicity (section 3.1.6); and
6. Assess whether the declining trend in water quality is expected to not meet water quality standards by the next listing cycle.

Waters shall be placed on the section 303(d) list if the declining trend in water quality is substantiated (steps 1 through 4 above) and impacts are observed (step 5).

**~~1.1.11~~3.1.11 Situation-Specific Weight of Evidence Listing Factor ~~Alternate Data Evaluation~~**

~~For data (or aspects of data such as measurement magnitude) not otherwise addressed in section 4.2 or for situations where an individual line of evidence would not support the placement of a water on the section 303(d) list, waters should be placed on the section 303(d) list if water quality objectives are exceeded providing the RWQCB justifies in the water body fact sheet the decision to list. At a minimum the justification must demonstrate:~~

- ~~The data and information are related to a pollutant or toxicity.~~
- ~~The data and information meet quality assurance requirements (section 6.2.4).~~
- ~~The measurements can be analyzed using a scientifically defensible procedure that provides an equivalent level of confidence as the listing factors in section 3.1 and tests the null hypothesis that water quality standards are attained.~~

~~□The data and information can be compared to applicable water quality objectives, water quality criteria, or numeric guidelines (section 6.2.3).~~
~~□The magnitude of the water quality objective or water quality criterion exceedance shall be considered, if appropriate.~~
~~□Corroborating evidence from independent lines of evidence show narrative water quality standards are not attained.~~

~~RWQCBs may use an alternate exceedance frequency, if justified. Justification may include, but is not limited to:~~

~~□site specific study that identifies an applicable exceedance frequency.~~
~~□significance of the water body (e.g., Outstanding National Resource Water, State Water Quality Protection Area, etc.).~~
When all other Listing Factors do not result in the listing of a water segment but information indicates non-attainment of standards, a water segment shall be placed on the section 303(d) list if the weight of evidence demonstrates that a water quality standard is not attained.

When recommending listing based on the situation-specific weight of evidence, the RWQCB must justify its recommendation by:

- Providing any data or information supporting the listing;
- Describing in fact sheets how the data or information affords a substantial basis in fact from which the listing can be reasonably inferred;
- Demonstrating that the weight of evidence of the data and information indicate that the water quality standard is not attained; and
- Demonstrating that the approach used is scientifically defensible and reproducible.

| TABLE 3.1: MINIMUM NUMBER OF MEASURED EXCEEDANCES NEEDED TO PLACE A WATER SEGMENT ON THE SECTION 303(D) LIST WITH AT LEAST 90% CONFIDENCE THAT THE ACTUAL EXCEEDANCE RATE IS GREATER THAN OR EQUAL TO 10 PERCENT | | | | | |
|---|---|---|---|---|---|
| Sample sizes | | Place on the section 303(d) list if at least this number of exceedances | Sample sizes | | Place on the section 303(d) list if at least this number of exceedances |
| From | To | | From | To | |
| 10 | 11 | 3 | 245 | 253 | 32 |
| 12 | 18 | 4 | 254 | 262 | 33 |
| 19 | 25 | 5 | 263 | 270 | 34 |
| 26 | 32 | 6 | 271 | 279 | 35 |
| 33 | 40 | 7 | 280 | 288 | 36 |
| 41 | 47 | 8 | 289 | 297 | 37 |
| 48 | 55 | 9 | 298 | 306 | 38 |
| 56 | 63 | 10 | 307 | 315 | 39 |
| 64 | 71 | 11 | 316 | 324 | 40 |
| 72 | 79 | 12 | 325 | 333 | 41 |
| 80 | 88 | 13 | 334 | 343 | 42 |
| 89 | 96 | 14 | 344 | 352 | 43 |
| 97 | 104 | 15 | 353 | 361 | 44 |
| 105 | 113 | 16 | 362 | 370 | 45 |
| 114 | 121 | 17 | 371 | 379 | 46 |
| 122 | 130 | 18 | 380 | 388 | 47 |
| 131 | 138 | 19 | 389 | 397 | 48 |
| 139 | 147 | 20 | 398 | 406 | 49 |
| 148 | 156 | 21 | 407 | 415 | 50 |
| 157 | 164 | 22 | 416 | 424 | 51 |
| 165 | 173 | 23 | 425 | 434 | 52 |
| 174 | 182 | 24 | 435 | 443 | 53 |
| 183 | 191 | 25 | 444 | 452 | 54 |
| 192 | 199 | 26 | 453 | 461 | 55 |
| 200 | 208 | 27 | 462 | 470 | 56 |
| 209 | 217 | 28 | 471 | 471 | 57 |
| 218 | 226 | 29 | 480 | 489 | 58 |
| 227 | 235 | 30 | 490 | 498 | 59 |
| 236 | 244 | 31 | 499 | 500 | 60 |

For samples greater than 500, the number of exceedances to place waters on the section 303(d) list shall be calculated using the following equation: Excel® function CRITBINOM(Number of samples, 0.10, 0.90) + 1.

TABLE 3.1: MINIMUM NUMBER OF MEASURED EXCEEDANCES NEEDED TO PLACE A WATER SEGMENT ON THE SECTION 303(D) LIST FOR TOXICANTS.

*Null Hypothesis: Actual exceedance proportion < 5 percent.*
*Alternate Hypothesis: Actual exceedance proportion > 20 percent.*
*The minimum effect size is 15 percent.*

| Sample Size | List if the number of exceedances equal or is greater than |
|---|---|
| 21 – 28 | 3 |
| 29 – 37 | 4 |
| 38 – 46 | 5 |
| 47 – 55 | 6 |
| 56 – 64 | 7 |
| 65 – 73 | 8 |
| 74 – 82 | 9 |
| 83 – 91 | 10 |
| 92 – 100 | 11 |
| 101 – 109 | 12 |
| 110 – 118 | 13 |
| 119 – 127 | 14 |

For sample sizes greater than 127, the minimum number of measured exceedances is established where $\alpha$ and $\beta < 0.2$ and where $|\alpha - \beta|$ is minimized.

$\alpha$ = Excel® Function BINOMDIST(n-k, n, 1 – 0.05, TRUE)
$\beta$ = Excel® Function BINOMDIST(k-1, n, 0.20, TRUE)
where n = the number of samples,
k = minimum number of measured exceedances to place a water on the section 303(d) list,
0.05 = acceptable exceedance proportion, and
0.20 = unacceptable exceedance proportion.

TABLE 3.2: MINIMUM NUMBER OF MEASURED EXCEEDANCES NEEDED TO PLACE A WATER SEGMENT ON THE SECTION 303(D) LIST FOR CONVENTIONAL OR OTHER POLLUTANTS.

*Null Hypothesis: Actual exceedance proportion < 10 percent.*
*Alternate Hypothesis: Actual proportion > 25 percent.*
*The minimum effect size is 15 percent.*

| Sample Size | List if the number of exceedances equal or is greater than |
|---|---|
| 26 – 30 | 5 |
| 31 – 36 | 6 |
| 37 – 42 | 7 |
| 43 – 48 | 8 |
| 49 – 54 | 9 |
| 55 – 60 | 10 |
| 61 – 66 | 11 |
| 67 – 72 | 12 |
| 73 – 78 | 13 |
| 79 – 84 | 14 |
| 85 – 91 | 15 |
| 92 – 97 | 16 |
| 98 – 103 | 17 |
| 104 – 109 | 18 |
| 110 – 115 | 19 |
| 116 – 121 | 20 |

For sample sizes greater than 121, the minimum number of measured exceedances is established where $\alpha$ and $\beta < 0.2$ and where $|\alpha - \beta|$ is minimized.

$\alpha$ = Excel® Function BINOMDIST(n-k, n, 1 – 0.10, TRUE)
$\beta$ = Excel® Function BINOMDIST(k-1, n, 0.25, TRUE)
where n = the number of samples,
k = minimum number of measured exceedances to place a water segment on section 303(d) list,
0.10 = acceptable exceedance proportion, and
0.25 = unacceptable exceedance proportion.

## 3.2 Water Quality Limited Segment Being Addressed~~TMDLs Completed Category Factors~~

This section provides the methodology for development of the ~~TMDL completed~~ Water Quality Limited Segments Being Addressed category. A water segment shall be placed on this portion of the section 303(d) list if the conditions for placement in the water quality limited segments category (section 3.1) are met and ~~either~~ any of the following additional conditions are met:

~~□~~1. A TMDL has been approved by USEPA for the pollutant-water segment combination and ~~□~~A an implementation plan has been approved for the TMDL.

2. The RWQCB has certified under the provisions of the Water Quality Control Policy for Addressing Impaired Waters that pollution control requirements other than TMDLs are reasonably expected to result in the attainment of the water quality standard within an adopted time frame.

## ~~3.3Enforceable Program Category Factors~~

~~This section provides the methodology for development of the enforceable program list portion of the section 303(d) list. Waters shall be placed in the enforceable program category if water quality standards are not met and there is an existing program being implemented to address the identified problem. A water segment shall be placed on this list if the conditions for placement on the list of water quality limited segments are met (section 3.1) and the all of the following additional conditions are met:~~

~~□For point sources, the discharge controls are enforceable. The control mechanism for nonpoint sources must be included in an agency sponsored watershed plan or other programs that will obviate the need for a TMDL. It must be demonstrated that control measures for point and nonpoint sources will be implemented.~~

~~□The controls are specific to the water body and pollutant(s) of concern.~~

~~□If the enforceable program is a permit or waste discharge requirement, the majority of the pollutant loading is associated with the permitted source.~~

~~□The controls are in place or scheduled for implementation. Documentation shall include, but is not limited to: permits, WDRs, contracts, Superfund site remediation planning documents, or enforcement actions. Documentation that Best Management Practices (BMPs) will lead to attainment of water quality standards shall be based on site specific study, case studies from other similar locations, or research results from applicable situations.~~

~~□The timeframe for implementation is established.~~

~~□The controls are sufficient to assess if water quality standards will be attained within a reasonable time. Documentation shall include an estimate of when attainment of water quality standards is expected. Acceptable timeframes for standards attainment are: (1) before next listing cycle, (2) within the life of the permit, (3) prior to renewal of the WDR, (4) within the compliance schedule, or (5) within the schedule presented in a watershed plan.~~

~~□Water quality standards attainment can be demonstrated through an existing monitoring program or a future monitoring program with reasonable assurance of implementation.~~

~~Control efforts that address one or more of the sources of pollutants that cause or contribute to the water quality standards not being met that do not address other contributing sources shall not be placed in the enforceable program category.~~

~~Water segments placed in this category shall be moved to the water quality limited segments category if the implemented management measures are unsuccessful within the scheduled timeframe or if the program is not implemented as scheduled.~~

# ~~2~~4 California Delisting Factors

This section provides the methodology for removing waters from the section 303(d) list (including the water quality limited segments category~~, enforceable program category,~~ and ~~TMDLs completed~~ Water Quality Limited Segments Being Addressed category).

All listings of water segments shall be ~~reevaluated~~ removed from the section 303(d) list if the listing was based on faulty data, and it is demonstrated that the listing would not have occurred in the absence of such faulty data. Faulty data include, but are not limited to, typographical errors, improper quality assurance/quality control procedures, or limitations related to the analytical methods that would lead to improper conclusions regarding the water quality status of the segment.

If objectives or standards have been revised and the site or water meets water quality standards, the water segment shall be removed from the section 303(d) list. The listing of a segment shall be reevaluated if the water quality standard has been changed.

Any interested party may request an existing listing be reassessed under the delisting factors of this Policy. In requesting the reevaluation, the interested party must, using the delisting factors: state the reason(s) the listing is inappropriate and the Policy would lead to a different outcome; and provide the data and information necessary to enable the RWQCB and SWRCB to conduct the review.

Water segments or pollutants shall be removed from the section 303(d) list if any of the following conditions are met~~:~~.

## 4.1 Numeric Water Quality Objectives, Criteria, or Standards for Toxicants in Water

Numeric water quality objectives for toxic pollutants, including maximum contaminant levels where applicable, or California/National Toxics Rule water quality criteria are not exceeded as follows:

- Using the binomial distribution, waters shall be removed from the section 303(d) list if the number of measured exceedances supports rejection of the null hypothesis as presented in Table 4.1.

~~in fewer than 10 percent of the samples with a confidence level of 90 percent using a binomial distribution (Table 4.1). The minimum sample size is 22.~~

## ~~1.2~~4.2 Numeric Water Quality Objectives for Conventional or Other Pollutants in Water

Numeric water quality objectives for conventional pollutants are not exceeded as follows:

- Using the binomial distribution, waters shall be removed from the section 303(d) list if the number of measured exceedances supports rejection of the null hypothesis as presented in Table 4.2.

~~in fewer than 10 percent of the samples with a confidence level of 90 percent using a binomial distribution (Table 4.2). The minimum sample size is 22.~~

## ~~1.3~~4.3 Numeric Water Quality Objectives for Bacteria in Water

Numeric water quality objectives or standards for bacteria are not exceeded using the binomial distribution as described in section 4.2. If a site-specific exceedance frequency was used to place the water on the section 303(d) list, then the same exceedance frequency shall be used in the assessment to remove waters from the section 303(d) list.~~in fewer than 10 percent of the samples with a confidence level of 90 percent using a binomial distribution (Table 4.1). The minimum sample size is 22.~~ To the extent possible and allowed by water quality objectives, RWQCBs shall identify one or more reference beaches or water segments in a relatively unimpacted watershed to compare the measurements.

## ~~1.4~~4.4 Health Advisories

The health advisory used to list the water segment has been removed or the chemical or biological contaminant-specific evaluation guideline for tissue is no longer exceeded.

## ~~1.5~~4.5 Bioaccumulation of Pollutants in Aquatic Life Tissue

Numeric pollutant-specific evaluation guidelines are not exceeded using the binomial distribution as described in section 4.1. ~~in fewer than 10 percent of the samples with a confidence level of 90 percent using a binomial distribution (Table 4.1). The minimum sample size is 22.~~

## ~~1.6~~4.6 Water/Sediment Toxicity

Water/Sediment Toxicity or associated water or sediment quality guidelines are not exceeded using the binomial distribution as described in section 4.1. ~~in fewer than 10 percent of concurrently collected samples with a confidence level of 90 percent using a binomial distribution (Table 4.1). The minimum sample size is 22.~~

## ~~1.7~~4.7 Nuisance

The water segment no longer satisfies the conditions for a ~~to be listed for~~ nuisance listing ~~condition~~ or associated numerical water or sediment data meets any one of the following:

### ~~1.1.1~~4.7.1 Nutrient-related

For excessive algae growth, unnatural foam, odor, taste, applicable numerical nutrient-related evaluation guidelines are not exceeded using the binomial distribution as described in sections ~~4.1 or 4.2~~4.1.

### ~~1.1.2~~4.7.2 Other Types

Acceptable numerical evaluation guidelines are not exceeded using the binomial distribution as described in sections 4.1 and 4.2 for color, oil sheen, turbidity, ~~litter,~~ trash, taste, or odor not

related to nutrients. These types of nuisance shall also be removed from the list when there is no significant nuisance condition when compared to reference conditions.

## ~~1.8~~4.8 Adverse Biological Response

Adverse ~~B~~biological ~~R~~response is no longer evident or associated water or sediment numeric pollutant-specific evaluation guidelines are not exceeded using the binomial distribution as described in section 4.1.~~in fewer than 10 percent of samples with a confidence level of 90 percent using a binomial distribution (Table 4.1). The minimum sample size is 22.~~

## ~~1.9~~4.9 Degradation of Biological Populations and Communities

Biological ~~P~~populations and ~~C~~communities degradation in the water segment is no longer evident as compared to reference site(s) or associated water or sediment numeric pollutant-specific evaluation guidelines are not exceeded using the binomial distribution as described in section 4.1.~~in fewer than 10 percent of samples with a confidence level of 90 percent using a binomial distribution (Table 4.1). The minimum sample size is 22.~~

## ~~1.10~~4.10 Trends in Water Quality

The factors for assessing trends in water quality (section 3.1.10) are not substantiated (steps 1 through 4) or impacts are no longer observed (step 5).

## ~~4.10~~4.11 Situation-Specific Weight of Evidence Delisting Factor ~~Alternate Data Evaluation~~

~~For data and aspects of data (e.g., measurement magnitude) not otherwise addressed in the above sections or for situations where an individual line of evidence would not support the removal of a water on the section 303(d) list, waters shall be removed from the list if water quality objectives are no longer exceeded providing that:~~

- ~~The data and information are related to a pollutant or toxicity.~~
- ~~Data meet quality assurance requirements (section 6.2.4).~~
- ~~The measurements can be analyzed using a scientifically defensible procedure that provides an equivalent level of confidence as the factors in section 4 and tests the null hypothesis that water quality standards are not attained.~~
- ~~The data and information can be compared to applicable water quality objectives, water quality criteria, or numeric guidelines (section 6.2.3).~~
- ~~If appropriate, the magnitude of the water quality objective or water quality criterion exceedance shall be considered.~~
- ~~Corroborating evidence from independent lines of evidence show narrative water quality standards are attained.~~
- ~~An alternative approach was used originally to place the water segment on the list (section 3.1.11).~~

When all other Delisting Factors do not result in the delisting of a water segment but information indicates attainment of standards, a water segment shall be removed from the section 303(d) list if the weight of evidence demonstrates that a water quality standard is attained.

When recommending delisting based on the situation-specific weight of evidence, the RWQCB must justify its recommendation by:

- Providing any data or information supporting the delisting;
- Describing in fact sheets how the data or information affords a substantial basis in fact from which the delisting can be reasonably inferred;
- Demonstrating that the weight of evidence of the data and information indicates that the water quality standard is attained; and
- Demonstrating that the approach used is scientifically defensible and reproducible.

TABLE 4.1: MAXIMUM NUMBER OF MEASURED EXCEEDANCES ALLOWABLE TO REMOVE A WATER SEGMENT FROM THE SECTION 303(D) LIST WITH AT LEAST 90% CONFIDENCE THAT THE ACTUAL EXCEEDANCE RATE IS LESS THAN 10 PERCENT.

| Sample sizes | | Maximum number of exceedances allowable for delisting | Sample sizes | | Maximum number of exceedances allowable for delisting |
|---|---|---|---|---|---|
| From | To | | From | To | |
| 22 | 37 | 0 | 290 | 300 | 22 |
| 38 | 51 | 1 | 301 | 311 | 23 |
| 52 | 64 | 2 | 312 | 323 | 24 |
| 65 | 77 | 3 | 324 | 334 | 25 |
| 78 | 90 | 4 | 335 | 345 | 26 |
| 91 | 103 | 5 | 346 | 356 | 27 |
| 104 | 115 | 6 | 357 | 367 | 28 |
| 116 | 127 | 7 | 368 | 378 | 29 |
| 128 | 139 | 8 | 379 | 389 | 30 |
| 140 | 151 | 9 | 390 | 401 | 31 |
| 152 | 163 | 10 | 402 | 412 | 32 |
| 164 | 174 | 11 | 413 | 423 | 33 |
| 175 | 186 | 12 | 424 | 434 | 34 |
| 187 | 198 | 13 | 435 | 445 | 35 |
| 199 | 209 | 14 | 446 | 456 | 36 |
| 210 | 221 | 15 | 457 | 467 | 37 |
| 222 | 232 | 16 | 468 | 478 | 38 |
| 233 | 244 | 17 | 479 | 489 | 39 |
| 245 | 255 | 18 | 490 | 500 | 40 |
| 256 | 266 | 19 | | | |
| 267 | 278 | 20 | | | |
| 279 | 289 | 21 | | | |

For samples greater than 500, the number of allowable exceedances shall be calculated using the following equation: Excel® function CRITBINOM(Number of samples, 0.10, 0.10) - 1.

TABLE 4.1: MAXIMUM NUMBER OF MEASURED EXCEEDANCES ALLOWED TO REMOVE A WATER SEGMENT FROM THE SECTION 303(D) LIST FOR TOXICANTS.

*Null Hypothesis: Actual exceedance proportion > 20 percent.*
*Alternate Hypothesis: Actual proportion < 5 percent of the samples*
*The minimum effect size is 15 percent.*

| Sample Size | Delist if the number of exceedances equal or is less than |
|---|---|
| 21 – 28 | 2 |
| 29 – 37 | 3 |
| 38 – 46 | 4 |
| 47 – 55 | 5 |
| 56 – 64 | 6 |
| 65 – 73 | 7 |
| 74 – 82 | 8 |
| 83 – 91 | 9 |
| 92 – 100 | 10 |
| 101 – 109 | 11 |
| 110 – 118 | 12 |
| 119 – 127 | 13 |

For sample sizes greater than 127, the maximum number of measured exceedances allowed is established where $\alpha$ and $\beta < 0.2$ and where $|\alpha - \beta|$ is minimized.

$\alpha$ = Excel® Function BINOMDIST(k, n, 0.20, TRUE)
$\beta$ = Excel® Function BINOMDIST(n-k-1, n, 1 – 0.05, TRUE)
where n = the number of samples,
k = maximum number of measured exceedances allowed,
0.05 = acceptable exceedance proportion, and
0.20 = unacceptable exceedance proportion.

TABLE 4.2: MAXIMUM NUMBER OF MEASURED EXCEEDANCES ALLOWED TO REMOVE A WATER SEGMENT FROM THE SECTION 303(D) LIST FOR CONVENTIONAL OR OTHER POLLUTANTS.

*Null Hypothesis: Actual exceedance proportion > 25 percent.*
*Alternate Hypothesis: Actual exceedance proportion < 10 percent.*
*The minimum effect size is 15 percent.*

| Sample Size | Delist if the number of exceedances equal or is less than |
|---|---|
| 26 – 30 | 4 |
| 31 – 36 | 5 |
| 37 – 42 | 6 |
| 43 – 48 | 7 |
| 49 – 54 | 8 |
| 55 – 60 | 9 |
| 61 – 66 | 10 |
| 67 – 72 | 11 |
| 73 – 78 | 12 |
| 79 – 84 | 13 |
| 85 – 91 | 14 |
| 92 – 97 | 15 |
| 98 – 103 | 16 |
| 104 – 109 | 17 |
| 110 – 115 | 18 |
| 116 – 121 | 19 |

For sample sizes greater than 121, the maximum number of exceedances allowed is established at $\alpha$ and $\beta < 0.2$ and where $|\alpha - \beta|$ is minimized.

$\alpha$ = Excel® Function BINOMDIST(k, n, 0.25, TRUE)
$\beta$ = Excel® Function BINOMDIST(n-k-1, n, 1 – 0.1, TRUE)
where n = the number of samples,
k = maximum number of measured exceedances allowed,
0.10 = acceptable exceedance proportion, and
0.25 = unacceptable exceedance proportion.

## ~~3~~5 TMDL~~Priority Setting and~~ Scheduling

A schedule shall be established by the RWQCBs and SWRCB for ~~W~~waters on the section 303(d) list ~~shall be ranked into high, medium, and low categories in order to set priority for development of TMDLs.~~that identifies the TMDLs that will be established within the current listing cycle and the number of TMDLs scheduled to be developed thereafter. ~~The rankings shall be based on:~~

~~□Water body significance (such as importance and extent of beneficial uses, threatened and endangered species concerns, and size of water body).~~

~~□Degree that water quality objectives are not met or beneficial uses are not attained or threatened (such as the severity of the pollution or number of pollutants/stressors of concern) [40 CFR 130.7(b)(4)].~~

~~□Availability of funding and information to address the water quality problem.~~

For ~~water on the list of~~ water quality limited segments needing a TMDL, RWQCBs shall develop a completion schedule in compliance with federal law and regulation ~~for those waters needing a TMDL using~~ based on, but not limited to, the following ~~categories~~criteria:

- Water body significance (such as importance and extent of beneficial uses, threatened and endangered species concerns, and size of water body);
- Degree that water quality objectives are not met or beneficial uses are not attained or threatened (such as the severity of the pollution or number of pollutants/stressors of concern) [40 CFR 130.7(b)(4)];
- Degree of impairment;
- Potential threat to human health and the environment;
- Water quality benefits of activities ongoing in the watershed;
- Potential for beneficial use protection and recovery;
- Degree of public concern;
- Availability of funding; and
- Availability of data and information to address the water quality problem.

~~1.Those waters given a high priority are targeted for TMDL completion in the next two years.~~

~~2.Medium priority to be completed within 5 years.~~

~~3.Low priorities will be completed in more than 5 years.~~

All water body-pollutant combinations on the section 303(d) list shall be assigned a TMDL schedule date.

~~All waters placed in the enforceable programs category and TMDL completed category shall be assigned a low priority and shall not be scheduled for TMDL development.~~

# 46 Policy Implementation

This section provides SWRCB guidance on implementation of this Policy.

## ~~1.1Evaluating Existing Listings~~

~~Water segment and pollutants on the section 303(d) list shall be reevaluated if new data and information become available. The steps to complete a reevaluation are:~~

~~A. All readily available data and information shall be used to assess a water segment. Data and information older than ten years may be used if the original listing was based on that data.~~

~~B. In performing the reassessment the RWQCBs shall use the California Listing Factors (i.e., waters shall be assessed as if they had never been listed before) to assess each water segment pollutant combination. If the original listing was established using the provisions of this Policy, then the California Delisting Factors shall be used.~~

~~An interested party may request an existing listing be reassessed under the provisions of the Policy. In requesting the reevaluation, the interested party must describe the reason(s) the listing is inappropriate, state the reason the Policy would lead to a different outcome, and provide the data and information necessary to enable the RWQCB and SWRCB to conduct the review.~~

The most recently completed section 303(d) list shall form the basis for any subsequent lists.

## ~~1.2~~6.1 Process for Evaluation of Readily Available Data and Information

All readily available data and information shall be evaluated. To develop the section 303(d) list ~~T~~the RWQCBs and SWRCB shall use the following process. ~~to develop the section 303(d) list described above. The process has seven steps including:~~

~~- Definition of readily available data and information;~~
~~- Administration of the listing process;~~
~~- Evaluation guideline selection process;~~
~~- Data quality assessment process;~~
~~- Data quantity assessment process;~~
~~- RWQCB approval; and~~
- ~~SWRCB approval.~~

### ~~6.2.1~~6.1.1 Definition of Readily Available Data and Information

RWQCBs and SWRCB shall actively solicit, assemble, and consider all readily available data and information. ~~The d~~Data and information that shall be reviewed ~~in the following order~~include, but are not limited to: submittals resulting from the solicitation, selected data possessed by the RWQCBs, and other sources. At a minimum, readily available data and information includes paper and electronic copies of:

- The most recent section 303(d) list, and the most recent section 305(b) report~~, and the most recent California Integrated Water Quality Report~~;
- Drinking water source assessments;
- Municipal Separate Storm Sewer System (MS4) reports;
- Information on water quality problems in documents prepared to satisfy Superfund and Resource Conservation and Recovery Act requirements;
- Fish and shellfish advisories, beach postings and closures, or other water quality-based restrictions;
- Reports of fish kills, cancers, lesions or tumors;
- Dilution calculations, trend analyses, or predictive models for assessing the physical, chemical, or biological condition of streams, rivers, lakes, reservoirs, estuaries, coastal lagoons, or the ocean;
- Applicable water quality data and information from SWAMP, USEPA's Storage and Retrieval Database Access (STORET) or other USEPA databases and information sources, the Bay-Delta Tributaries Database, Southern California Coastal Water Research Project, and the San Francisco Estuary Regional Monitoring Program; and
- Water quality problems and existing and readily available water quality data and information reported by local, state and federal agencies (including receiving water monitoring data from discharger monitoring reports), citizen monitoring groups, academic institutions, and the public. The Federal agencies that shall be actively solicited for data and information include but are not limited to: U.S. Department of Agriculture, National Oceanic and Atmospheric Administration, U.S. Geological Survey, and U.S. Fish and Wildlife Service.

**~~6.2.2~~6.1.2 Administration of the Listing Process**

*~~6.2.2.1~~6.1.2.1 Solicitation of All Readily Available Data and Information*

SWRCB and RWQCBs shall seek all readily available data and information on the quality of surface waters of the State. ~~To do this, the RWQCBs shall solicit all data and information available including information available from the public. The SWRCB shall solicit all available data and information by gathering data and information from other state and federal agencies or groups that can provide data that are statewide in scope. The SWRCB information solicitation letter shall request that all parties having data and information pertaining to a specific Region should send the data and information directly to that RWQCB.~~

Readily available data and information shall be solicited from any interested party, including but not limited to~~:~~, private citizens~~;~~, public agencies~~;~~, state and federal governmental agencies~~;~~, non-profit organizations~~;~~, and businesses possessing data and information regarding the quality of the Region's waters.

Though~~In general,~~ the SWRCB and RWQCBs ~~shall seek~~ must specifically solicit all readily available data and assessment information, SWRCB and RWQCB may place emphasis in the solicitation on the data and information generated since the last listing cycle. For the purposes of ~~data and information~~this solicitation, information ~~is~~means any documentation describing the water quality condition of a surface water body. Data are considered ~~to be~~ a subset of

information that consists of reports detailing measurements of specific environmental characteristics. The data and information may pertain to physical, chemical, and/or biological conditions of the ~~Region's~~State's waters or watersheds.

Information solicited should contain the following:

- The name of the person or organization providing the information;
- The name of the person certifying the completeness and accuracy of the data and information and a statement describing the standards exceedance;
- Mailing address, telephone numbers, and email address of a contact person for the information provided;
- ~~Two hard copies and A~~an ~~electronic~~ copy of all information provided. The submittal must specify the software used to format the information and provide definitions for any codes or abbreviations used;
- Bibliographic citations for all information provided; and
- If computer model outputs are included in the information, provide bibliographic citations and specify any calibration and quality assurance information available for the model(s) used.

Data solicited should contain the following:

- Data in electronic form, ~~in~~ spreadsheet, database, or ASCII formats. The submittal should use the SWAMP data format and should define any codes or abbreviations used in the database.
- Metadata for the field data, i.e., when measurements were taken, locations, number of samples, detection limits, and other relevant factors.
- Metadata for any Geographical Information System data must be included. The metadata must detail all the parameters of the projection, including datum.
- A copy of the quality assurance procedures.
- ~~Two hard copies~~A copy of the data.
- Data from citizen volunteer water quality monitoring efforts require the name of the group and indication of any training in water quality assessment completed by members of the group. Data submitted by citizen monitoring groups should meet the data quality assurance procedures as detailed in section 6.1.4.
- For photographic documentation, adhere to the guidelines detailed in section 6.1.4.

Data and information previously submitted to RWQCBs, such as Discharge Monitoring Reports, ~~shall~~need not be solicited if~~as~~ the data and information are ~~already~~remain available to RWQCBs.

~~*1.1.1.2*~~*6.1.2.2 RWQCB Fact Sheet Preparation*

When data and information are available, each RWQCB shall prepare a standardized fact sheet for each water and pollutant combination that is proposed for inclusion ~~on~~ in or deletion from the section 303(d) list. Fact sheets shall present a description of the line(s) of evidence used to

support each component of the weight of evidence approach. Fact sheets shall be prepared for all data and information solicited. If the data and information reviewed indicate standards are attained, a single fact sheet may address multiple water and pollutant combinations.

The fact sheets shall contain the following:

A. Region
B. Type of water body (Bay and Harbors, Coastal Shoreline, Estuary, Lake/Reservoir, Ocean, Rivers/Stream, Saline Lake, Tidal Wetlands, Freshwater Wetland)
C. Name of water body segment (including Calwater watershed)
D. Pollutant or type of pollution that appears to be responsible for standards exceedance
E. Medium (water, sediment, tissue, habitat, etc.)
F. Water quality standards (copy applicable water quality standard, objective, or criterion from appropriate plan or regulation) including:
   1. Beneficial use affected
   2. Numeric water quality objective/water quality criteria plus metric (single value threshold, mean, median, etc.) or narrative water quality objective plus guideline(s) used to interpret attainment or non-attainment
   3. Antidegradation considerations (if applicable to situation)
   4. Any other provision of the standard used
G. Brief Watershed Description (e.g., land use, precipitation patterns, or other factors considered in the assessment)
H. Summary of ~~numeric~~ data and/or information
   ~~1.Quality assurance assessment~~
   ~~2.~~1. Spatial representation, area that beneficial use is affected or determined to be supported, including a map, any site specific information, and reference condition
   ~~3.~~2. Temporal representation
   ~~4.~~3. Age of data and/or information
   ~~5.~~4. Effect of seasonality and events/conditions that might influence data and/or information evaluation (e.g., storms, flow conditions, laboratory data qualifiers, etc.)
   ~~6.~~5. Number of samples or observations
   ~~7.~~6. Number of samples or observations exceeding guideline or standard
   ~~8.~~7. Source of or reference for data and/or information
I. ~~I. Summary of non-~~For numeric data ~~and information~~include:
   1. Quality assurance assessment
J. For non-numeric data include:
   1. Types of observations
   ~~2.Spatial representation, size affected including a map, any site specific information, and reference condition~~
   ~~3.Temporal representation including site specific~~
   ~~4.Age of information~~
   ~~5.Effect of seasonality~~
   ~~6.Events/conditions that might influence information evaluation (e.g., storms, flow conditions, laboratory data qualifiers, etc.)~~

~~7.Number of samples or observations~~
~~8.Number of samples or observations exceeding guideline or standard~~
~~9.~~2. Perspective on magnitude of problem
~~10.~~3. Numeric indices derived from qualitative data
~~11.Source of information~~

K~~J~~. Potential source of pollutant (the source category should be identified as specifically as possible)

L~~K~~. Program(s) addressing the problem, if known ~~and any conditions of the enforceable program category met~~

M~~L~~. Data evaluation as required by S~~s~~ections 3 or 4 of this Policy

N~~M~~. Recommendation

~~N. Priority ranking (developed only for the section 303(d) list as required by section 5 of this Policy).~~

O. TMDL schedule (developed only for the section 303(d) list as required by section 5 of this Policy).

### ~~1.1.3~~6.1.3 Evaluation Guideline Selection Process

Narrative water quality objectives shall be evaluated using ~~numerical~~ evaluation guidelines. When evaluating narrative water quality objectives or beneficial use protection, RWQCBs and SWRCB shall identify ~~numeric~~ evaluation guidelines that represents standards attainment or beneficial use protection. The guidelines are not water quality objectives and ~~should~~shall only be used for the purpose of developing the section 303(d) list. ~~This section supersedes any regional water quality control plan or water quality control policy to the extent of any conflict.~~

To select an evaluation guideline, the RWQCB or SWRCB shall:

- Identify the water body, pollutants, and beneficial uses;
- Identify the narrative water quality objectives or applicable water quality criteria;
- Identify the appropriate ~~numeric~~ interpretive evaluation guideline that potentially represents water quality ~~objectives~~objective attainment or protection of beneficial uses. If this Policy requires evaluation values to be used as one line of evidence, the evaluation value selected shall be used in concert with the other required line(s) of evidence to support the listing or delisting decision. Depending on the beneficial use and narrative standard, the following considerations ~~should~~shall be used in the selection of evaluation guidelines:

  1. Sediment Quality Guidelines for Marine, Estuarine, and Freshwater Sediments: RWQCBs may select sediment quality guidelines that have been published in the peer-reviewed literature or by state or federal agencies. Acceptable guidelines include selected values~~:~~ (e.g., effects range-median, probable effects level, probable effects concentration), and other sediment quality guidelines. Only those sediment guidelines that are predictive of sediment toxicity shall be used (i.e., those guidelines that have been shown in published studies to be predictive of sediment toxicity in 50 percent or more of the samples analyzed).

2. Evaluation Guidelines for ~~the~~ Protection ~~of~~ from the Consumption of Fish and Shellfish: RWQCBs may select ~~the most restrictive~~ evaluation guidelines published by USEPA or OEHHA.~~the Office of Environmental Health Hazard Assessment.~~ Maximum Tissue Residue Levels (MTRLs) and Elevated Data Levels (EDLs) shall not be used to evaluate fish or shellfish tissue data.

3. Evaluation Guidelines for Protection of Aquatic Life from Bioaccumulation of Toxic Substances: -RWQCBs may select the evaluation values for the protection of aquatic life published by the National Academy of Science.

~~4.~~For other parameters, evaluation guidelines may be used if it can be demonstrated that the evaluation guideline is:

- Applicable to the beneficial use
- Protective of the beneficial use
- Linked to the pollutant under consideration
- Scientifically-based and peer reviewed
- Well described
- ~~Previously used or specifically developed to assess water quality conditions of similar hydrographic units~~

~~□Not more limiting than the natural background concentration (if applicable)~~

- Identifies a range above which impacts occur and below which no or few impacts are predicted. For non-threshold chemicals, risk levels shall be consistent with comparable water quality objectives or water quality criteria.

RWQCBs shall assess the appropriateness of the guideline in the hydrographic unit. Justification for the alternate evaluation guidelines shall be ~~presented~~ referenced in the water body fact sheet.

### ~~1.1.4~~6.1.4 Data Quality Assessment Process

Even though all data and information must be used, t~~T~~he quality of the data used in the development of the section 303(d) list shall be of sufficient~~ly~~ high quality to make determinations of water quality standards attainment. Data supported by a Quality Assurance Project Plan (QAPP) pursuant to the requirements of 40 CFR 31.45 are acceptable for use in developing the section 303(d) list.

The data from major monitoring programs in California and published U.S. Geological Survey (USGS) reports are considered of adequate quality. The major programs include SWAMP, the Southern California Bight Projects of the Southern California Coastal Water Research Project, ~~U.S. Environmental Protection Agency's~~ USEPA's Environmental Monitoring and Assessment Program, the Regional Monitoring Program of the San Francisco Estuary Institute, and the ~~Bay Protection and Toxic Cleanup Program~~ (BPTCP).

Numeric data are considered credible and relevant for listing purposes if the data set submitted meets the minimum quality assurance/quality control requirements outlined below. A QAPP or equivalent ~~information~~ documentation must be available containing, at a minimum, the following elements:

- Objectives of the study, project, or monitoring program;
- Methods used for sample collection and handling;
- Field and laboratory measurement and analysis;
- Data management, validation, and recordkeeping (including proper chain of custody) procedures;
- Quality assurance and quality control requirements;
- A statement certifying the adequacy of the QAPP (plus name of person certifying the document); and
- A description of p~~P~~ersonnel training.

A site-specific or project-specific sampling and analysis plan for numeric data ~~must~~ should also be available containing:

- Data quality objectives or requirements of the project;
- A statement that data quality objectives or requirements were achieved;
- Rationale for the selection of sampling sites, water quality parameters, sampling frequency and methods that assure the samples are spatially and temporally representative of the surface water and representative of conditions within the targeted sampling timeframe; and
- ~~Information~~ Documentation to support the conclusion that results are reproducible.

The RWQCBs shall ~~clearly evaluate and~~ make a finding in the fact sheets on the ~~appropriateness~~availability of the QAPP (or equivalent), adequacy of data collection, ~~and~~ analysis practices, and adequacy of the data verification process (including the chain of custody, detection limits, holding times, statistical treatment of data, precision and bias, etc). If any data quality objectives or requirements in the QAPP are not met, the reason for not meeting them and the potential impact on the overall assessment shall be ~~clearly~~ documented.

Data without rigorous quality control can be ~~useful~~ used in combination with high quality data and information. If the data collection and analysis is not supported by a QAPP (or equivalent) or if it is not possible to tell if the data collection and analysis ~~was~~were supported by a QAPP (or equivalent), then the data and information ~~cannot~~should not be used by itself to support listing or delisting of a water segment. All data of whatever quality can be used as part of a weight of evidence determination (sections 3.1.11 or 4.11). ~~These data may only be used to corroborate other data and information with appropriate quality assurance and quality control.~~

For narrative and qualitative submittals, the submission must:

- describe events or conditions that indicate impacts on water quality~~, and that are outside the expected natural range of conditions~~;

- provide linkage between the measurement endpoint (e.g., a study that may have been performed for some other purpose) and the water quality standard of interest;
- be scientifically defensible;
- provide analyst's credentials and training; and
- be verifiable by SWRCB or RWQCB.

For photographic documentation, the submission must:

- identify the date;
- identify location on a general area map;
- either mark location on a USGS 7.5 minute quad map along with quad sheet name or provide location latitude/longitude;
- provide a thorough description of photograph(s);
- describe the spatial and temporal representation of the photographs;
- provide linkage between photograph-represented condition and condition that indicates impacts on water quality ~~that are outside the expected natural range of conditions~~;
- provide photographer's rationale for area photographed and camera settings used; and
- be verifiable by SWRCB and RWQCB.

### ~~6.2.5~~6.1.5 Data Quantity Assessment Process

~~Once the available data and information are assembled, RWQCBs shall implement the following considerations b~~Before determining if water quality standards are exceeded, RWQCBs have wide discretion establishing how data and information are to be evaluated, including the flexibility to establish water segmentation, as well as the scale of spatial and temporal data and information that are to be reviewed. The following considerations shall be documented in each water body fact sheet.

#### ~~1.1.1.1~~6.1.5.1 *Water Body Specific Information*

Data used to assess water quality standards attainment should be actual data that can be quantified and qualified. Information that is descriptive, estimated, modeled, or projected may be used as ancillary lines of evidence for listing or delisting decisions. In order to be used in developing the lists:

- Data must be measured at one or more sites in the water segment;
- If applicable and available, e~~E~~nvironmental conditions in a water body or at a site must be taken into consideration (e.g., effects of seasonality, events such as storms, the occurrence of wildfires, land use practices, etc.); and
- The fact sheet shall contain a description of readily available pertinent factors such as the depth of water quality measurements, flow, hardness, pH, the extent of tidal influence, and other relevant sample- and water body-specific factors.

~~*6.2.5.2Age of Data*~~

~~Only the most recent 10 year period of data and information shall be used for listing and delisting waters. Data older than 10 years may be used on a case by case basis if the older data are used in conjunction with newer data to demonstrate trends or if the conditions in a water~~

~~body have not changed. In either case, the reason for using older data shall be described in the water body fact sheet. Older data must meet all data quality requirements presented in this Policy (Section 6.2.4).~~

~~*1.1.1.3*~~*6.1.5.2 Spatial Representation*

Samples should ~~shall be collected to~~ be representative ~~of spatial characteristics~~ of the water body segment. To the extent possible, ~~all~~ samples ~~should be collected to statistically represent the segment of the water body or collected~~ should represent statistically or in a consistent targeted manner ~~that represents~~ the segment of the water body.

Samples collected within 200 meters of each other ~~shall~~should be considered samples from the same station or location. However, samples less than 200 meters apart may be considered to be spatially independent samples if justified in the water body fact sheet. ~~Samples from mixing zones should not be included as part of the data set.~~

~~*1.1.1.4*~~*6.1.5.3 Temporal Representation*

Samples should ~~shall be collected to~~ be representative of ~~temporal characteristics~~the critical timing that the pollutant is expected to impact~~of~~ the water body. Samples used in the assessment must be temporally independent. If the majority of samples were collected on a single day or during a single short-term natural event (e.g., a storm, flood, or wildfire), the data shall not be used as the primary data set supporting the listing decision.

Documentation should include the time of day in which the sample was taken, and, to the extent possible, the critical season for the pollutant and applicable water quality standard. In general, samples should be available from two or more seasons or from two or more events when effects or water quality objectives exceedances would be expected to be clearly manifested.

Sampling ephemeral waters, during a specific season, or during human-caused events (except spills) should be used to assess significant pollutant-related exceedances of water quality standards. Timing of the sampling should include the critical season for the pollutant and applicable water quality standard. If the implementation of a management practice(s) has resulted in a change in the water body segment, only recently collected data [since the implementation of the management measure(s)] should be considered. The water quality fact sheet should describe the significance of the sample timing.

~~*6.2.5.5Minimum Number of Samples*~~

~~Generally, for assessment of numeric water quality standards or evaluation guidelines, a minimum of 10 or 20 temporally independent samples is needed from each water body segment for placement on the planning list or the section 303(d) list, respectively. Fewer samples may be used on a case by case basis if standards are exceeded frequently as described in the California Listing Factors.~~

~~For entire water bodies, comparable measurements (e.g., field measurements, constituents in water, sediment, or tissue) collected at multiple sites may be aggregated to meet the minimum requirement.~~

*~~6.2.5.6~~6.1.5.4 Aggregation of Data by Reach/Area*

~~For some water bodies, Basin Plans define distinct water segments.~~ At a minimum, data shall be aggregated by the water body segments as defined in the Basin Plans. In the absence of a Basin Plan segmentation system, the RWQCBs should ~~consider defining~~ define distinct reaches based on hydrology ~~(e.g., stream order, tributaries, dams, or channel characteristics)~~ and relatively homogeneous land use. ~~These components of the stream system can be logically grouped depending on the nature of the source of the pollutant and the designation of beneficial uses. Similarly, a lake or estuary can be divided into areas or embayments based on circulation studies, water quality data and adjacent land uses or discharges.~~

If available data suggest that a pollutant may cause an excursion above a water quality objective, the RWQCB should, to the extent information is readily available, identify land uses, subwatersheds, tributaries, or dischargers that could be contributing the pollutant to the water body. The RWQCBs should identify stream reaches or lake/estuary areas that may have different pollutant levels based on significant differences in land use, tributary inflow, or discharge input. Based on these evaluations of the water body setting, RWQCBs should aggregate the data by appropriate reach or area.

Data must be measured at one or more sites in the water segment in order to place a water segment on the section 303(d) list. ~~Data related to the same pollutant from two or more adjoining segments shall be combined provided that there is at least one measurement above the applicable water quality objective in each segment of the water body. The pooled data shall be analyzed together.~~

~~*6.2.5.6Natural Sources*~~

~~If it is documented that natural conditions or processes cause a segment of a water body to be considered a water quality limited segment then the segment shall not be placed on the section 303(d) list. Documentation must address the natural source(s) of the chemical and explain why human causes can be ruled out as the cause of the water quality limited segment. Human-caused sources (i.e., "waste" as defined in Water Code section 13050(d) or "pollution" as defined in Water Code section 13050(l) and 40 CFR 130.2(e)) can generally be ruled out where the excursions beyond objectives would occur in the absence of the human caused sources.~~

*~~6.2.5.7~~6.1.5.5 Quantitation of Chemical Concentrations*

When available data are less than or equal to the quantitation limit and the quantitation limit is less than or equal to the water quality standard, ~~:~~

~~T~~the value will be considered as meeting the water quality standard, objective, criterion, or evaluation guideline, ~~and~~

~~One half of the value of the quantitation limit shall be used in statistical analyses.~~

When the sample value is less than the quantitation limit and the quantitation limit is greater than the water quality standard, objective, criterion, or evaluation guideline, the result shall not be used in the analysis.

The quantitation limit includes the minimum level, practical quantitation level, or reporting limit.

~~6.2.5.8~~6.1.5.6 *Evaluation~~Transformation~~ of Data Consistent with the Expression of Numeric Water Quality Objectives, Water Quality Criteria, or Evaluation Guidelines*

If the water quality objectives, criteria, or guidelines state a specific averaging period and/or mathematical transformation, the data should be ~~transformed~~ evaluated in a consistent manner prior to conducting any statistical analysis for placement of the water on the section 303(d) list. If sufficient data are not available for the stated averaging period, the available data shall be used to represent the averaging period.

To be considered temporally independent, samples collected during the averaging period shall be combined and considered one sampling event. For data that is not temporally independent (e.g., when multiple samples are collected at a single location on the same day), the measurements shall be combined and represented by a single resultant value. For dissolved oxygen measurements, the minimum value shall be used to determine compliance with the water quality objective. For pH measurements, the minimum or maximum values of the data set shall be used to determine compliance with the water quality objective.

If the averaging period is not stated for the standard, objective, criterion, or evaluation guideline, then the samples collected less than 7 days apart shall be averaged.

~~6.2.5.9~~6.1.5.7 *Binomial Model Statistical Evaluation*

Once data have been summarized, RWQCBs shall determine if standards are exceeded. The RWQCBs shall determine for each averaging period which data points exceed water quality standards. The number of measurements that exceed standards shall be reported in the water body fact sheet.

When numerical data are evaluated, all of the following steps shall be completed:

A. For each data point representing the averaging period, the RWQCB shall answer the question: Are water quality standards met?

B. If the measurement is greater than the water quality standard, objective, criterion, or evaluation guideline, then the standard is ~~considered~~ exceeded.

C. Sum the number of samples exceeding the standard, objective, criterion, or evaluation guideline.

D. Sum the total number of measurements (sample population).

E. Compare the result to the appropriate table (i.e., Tables 3.1, 3.2, ~~or~~ 4.1, or 4.2).

F. Report the result of this comparison in the water body fact sheet.

~~6.2.5.10~~6.1.5.8 *Evaluation of Bioassessment Data*

When evaluating biological data and information, RWQCBs shall evaluate all readily available data and information and shall:

- Identify appropriate reference sites within water segments, watersheds, or ecoregions. Document methods for selection of reference sites.
- Evaluate bioassessment data at reference sites using water segment-appropriate method(s) and index period(s). Document sampling methods, index periods, and Quality Assurance/Quality Control procedures for the habitat being sampled and question(s) being asked.
- Evaluate bioassessment data from other sites, and compare to reference conditions. Evaluate physical habitat data and other water quality data, when available, to support conclusions about the status of the water segment.
- Calculate biological metrics for reference sites and develop Index of Biological Integrity if possible.

~~6.2.5.11~~6.1.5.9 *Evaluation of Temperature Data*

Temperature water quality objectives shall be evaluated as described in~~s~~ sections ~~6.2.5.1~~6.1.5.1 through ~~6.2.5.10~~6.1.5.7. When "historic" or "natural" temperature data are not available, alternative approaches shall be employed to assess temperature impacts.

In the absence of necessary data to interpret numeric water quality objectives, recent temperature monitoring data shall be compared to the temperature requirements of aquatic life in the water segment. In many cases, fisheries, particularly salmonids, represent the beneficial uses most sensitive to temperature. Information on ~~the~~ current and historic conditions and distribution of ~~the~~ sensitive beneficial uses (e.g., fishery resources) in the water segment is necessary, as well as recent temperature data reflective of conditions experienced by the most sensitive life stage of the aquatic life species. If temperature data from past (historic) periods corresponding to times when the beneficial use was fully supported are not available, information about presence/absence or abundance of sensitive aquatic life species shall be used to infer past (historic) temperature conditions if loss of habitat, diversions, toxic spills, and other factors are also considered.

Determination of life stage temperature requirements of sensitive aquatic life species shall be based on peer-reviewed literature. Similarly, evaluation of temperature data shall be based on temperature metrics reflective of the temperature requirements for the sensitive aquatic life species, including but not limited to, the maximum weekly average temperature and upper lethal limit. ~~For example, a common metric for assessing chronic (i.e., sub-lethal) effects on salmonids is the maximum weekly average temperature (MWAT), the highest value of the 7-day moving average of temperature. The MWAT of a particular water body can be compared to MWAT growth requirements for salmonids. Another measure of temperature requirements is the upper lethal limit, an acute temperature threshold. These thresholds vary for different species and for different ranges of species, and should be determined based on peer-reviewed literature.~~

## ~~1.3~~6.2 RWQCB Approval

At a public hearing, the RWQCB shall consider and approve each proposed list change as documented in water body fact sheet. Advance notice and opportunity ~~to~~ for public comment shall be provided. ~~After receiving testimony,~~ RWQCB shall develop written responses to all comments. After consideration of all testimony, RWQCBs shall approve a resolution ~~transmitting~~ in support of their recommendations for the section 303(d) list. RWQCBs shall submit to SWRCB the water body fact sheets, responses to comments, documentation of the hearing process, and a copy of all data and information considered. For the 2004 section 303(d) list, RWQCB approval of list changes is not required.

## ~~1.4~~6.3 SWRCB Approval

During the development of the 2004 section 303(d) list, SWRCB shall perform all tasks required by this Policy.

Subsequent to the 2004 listing cycle, SWRCB shall evaluate RWQCB-developed water body fact sheets for completeness, consistency with this Policy, and consistency with applicable law. The SWRCB shall assemble the fact sheets and consolidate all the RWQCB lists into the statewide section 303(d) list.

Before the adoption of the section 303(d) list, the SWRCB shall hold a public workshop. Advance notice and opportunity ~~to~~ for public comment shall be provided. Comments shall be limited to the issues raised before the RWQCBs. Requests for review of specific listing decisions must be submitted to the SWRCB within 30 days of the RWQCB's decision. The SWRCB shall consider changes ~~to~~ only to waters that are requested for review unless the SWRCB, on its own motion, decides to consider ~~the~~ recommendations on other waters. Subsequent to the workshop, the SWRCB shall approve the section 303(d) list at a Board Meeting. The approved section 303(d) list and the supporting fact sheets shall be submitted to USEPA for approval as required by the Clean Water Act.

# 7 Definitions

α (Alpha) is the statistical error of rejecting a null hypothesis that is true. This type of error is also called Type I error.

ALTERNATE HYPOTHESIS is a statement or claim that a statistical test is set up to establish.

β (Beta) is the statistical error of failing to reject a null hypothesis that is not true. This type of error is also called Type II error.

BINOMDIST is an Excel® function that is used to calculate the cumulative binomial distribution.

BINOMIAL DISTRIBUTION is a mathematical distribution that describes the probabilities associated with the possible number of times particular outcomes will occur in series of observations (i.e., samples). Each observation may have only one of two possible results (e.g., standard exceeded or standard not exceeded).

BIOACCUMULATION is the process by which a chemical is taken up by an organism from its surrounding medium through gill membranes, epithelial tissue, or from food and subsequently concentrated and retained in the body of the organism.

BIOASSESSMENT is an assessment of biological community information along with measures of the physical/habitat quality to determine, in the case of water quality, the integrity of a water body of interest.

CONVENTIONAL POLLUTANTS include dissolved oxygen, pH, and temperature.

DIEL measurements pertain to measurements taken over a 24-hour period of time.

EFFECT SIZE is maximum magnitude of exceedance frequency that is tolerated.

NULL HYPOTHESIS is a statement used in statistical testing that has been put forward either because it is believed to be true or because it is to be used as a basis for argument, but has not been proved.

RANK CORRELATION is the association between paired values of two variables that have been replaced by their ranks within their respective samples (e.g., chemical measurements and response in a toxicity test).

REFERENCE CONDITION refers to the characteristics of water body segments least impaired by human activities. As such, reference conditions can be used to describe attainable biological or habitat conditions for water body segments with common watershed/catchment characteristics within defined geographical regions.

STATISTICAL SIGNIFICANCE occurs when it can be demonstrated that the probability of obtaining a difference by chance only is relatively low.

TOXICANTS include priority pollutants, metals, chlorine, and nutrients.

TOXICITY IDENTIFICATION EVALUATION (TIE) is a technique to identify the unexplained cause(s) of toxic events. TIE involves selectively removing classes of chemicals through a series of sample manipulations, effectively reducing complex mixtures of chemicals in natural waters to simple components for analysis. Following each manipulation the toxicity of the sample is assessed to see whether the toxicant class removed was responsible for the toxicity.

WATER QUALITY LIMITED SEGMENT is any segment of a water body where it is known that water quality does not meet applicable water quality standards, and/or is not expected to meet applicable water quality standards, even after application of technology-based effluent limitations required by CWA sections 301(d) or 306.

FINAL

# Functional Equivalent Document

## Appendix B

Responses To Comments

JULY 2004

DIVISION OF WATER QUALITY
STATE WATER RESOURCES CONTROL BOARD

**STATE WATER RESOURCES CONTROL BOARD**
*P.O. 100*
*Sacramento, CA 95812-0100*

*To request copies of the draft Final FED and proposed Policy please call (916) 341-5566.*

*Documents are also available at:*

*http://www.swrcb.ca.gov*

STATE WATER RESOURCES CONTROL BOARD
DIVISION OF WATER QUALITY

# FINAL FUNCTIONAL EQUIVALENT DOCUMENT

# WATER QUALITY CONTROL POLICY FOR DEVELOPING CALIFORNIA'S CLEAN WATER ACT SECTION 303(d) LIST

## RESPONSES TO COMMENTS

## APPENDIX B

July 2004
FINAL

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*FINAL FUNCTIONAL EQUIVALENT DOCUMENT:*

*WATER QUALITY CONTROL POLICY FOR DEVELOPING CALIFORNIA'S CLEAN WATER ACT SECTION 303(d) LIST*

*APPENDIX B:*

*RESPONSES TO COMMENTS*

## Introduction

This section of the Functional Equivalent Document contains the responses to all comments received by State Water Resources Control Board (SWRCB) on the draft FED (SWRCB, 2003).

The draft FED was made available for public review and comment on December 2, 2003. The hearing notice was sent to several thousand interested parties. This appendix presents a compilation of the SWRCB responses to all comments received during the January 28 and February 5, 2004 hearings and to all written letters received on or before February 18, 2004.

Persons or organizations that submitted written comments, or presented oral testimony during the public hearings are listed in Table 1. Each person or organization submitting comments or providing oral testimony is identified by number. All remarks, observations or recommendations were extracted from each comment letter or oral testimony and assigned a comment number. All comments that addressed the same issue were grouped and a response was developed for the comment. Unique comments were answered individually. A summary of all comments submitted and the SWRCB response to each comment is presented in Table 2.

## Key to Reading the Comments and Responses

The comments and responses are grouped by the section of the draft FED (SWRCB, 2003) or draft Policy. General comments, comments unrelated to the Listing Policy, and comments focused on the Policy adoption process, are presented separately.

**Column 1 Comment Number:** Each comment was assigned a comment number consisting of two parts that are separated by a period. Starting from the left, the comment number begins with a number representing the person or organization submitting

comments or providing oral testimony during the public hearings. Numbers less than 100 were assigned to written comments submitted during the comment period ending on February 18, 2004. Numbers greater than 100 were assigned to comments received as oral testimony during the public hearing held on January 28, 2004. Numbers greater than 200 were assigned to comments received as oral testimony given during the hearing held on February 5, 2004.

The number after the period represents the individual comment presented in the written submittal or testimony.

**Column 2 Summary of Comment:** This column presents a summary of the comment extracted from each comment letter or oral testimony. When comments are grouped, one comment was selected to represent the group.

**Column 3 Response:** This column contains the SWRCB response to each comment.

**Column 4 Revision:** This column states whether the Policy and/or FED were revised based on the comment.

## References

SWRCB. 2003. Draft Functional Equivalent Document: Water Quality Control Policy for Developing California's Clean Water Act Section 303(d) List. Sacramento, CA: State Water Resources Control Board.

SWRCB. 2004a. Transcripts from January 28, 2004 hearing. Sacramento, CA: State Water Resources Control Board.

SWRCB. 2004b. Transcripts from February 5, 2004 hearing. Sacramento, CA: State Water Resources Control Board.

# Table 1:
# List of Commenters
# (December 2, 2003 through February 18, 2004)

1. Mike Livak
   Squaw Valley Ski Corporation
   P.O. Box 2007
   Olympic Valley, CA 96146

2. David Jenkins
   David Jenkins and Associates
   11 Yale Circle
   Kensington, CA 94708

3. John Rice
   Department of Statistics
   University of California, Berkeley
   Berkeley, CA 94720

4. Nicolas Papadakis
   Association of Monterey Bay Area Governments
   445 Reservation Road, Suite G
   Marina, CA 93933

5. Art O'Brien
   Wastewater Utility
   2005 Hilltop Circle
   Roseville, CA 95747

6. Mike Livak
   Squaw Valley Ski Corporation
   P.O. Box 2007
   Olympic Valley, CA 96149

7. Greg Scoles
   City of Santa Rosa
   100 Santa Rosa Avenue
   Santa Rosa, CA 95402

8. Thomas Herman
   Barman & Herman
   P.O. Box 173
   Eureka, CA 95502

9. Jack M. Stewart
   California Manufacturers and Technology Association
   980 Ninth Street, Suite 2200
   Sacramento, CA 95814

10. Alan Levine
    Coast Action Group
    P.O. Box 215
    Point Arena, CA 95468

11. Rod Kubomoto
    Department of Public Works, County of Los Angeles
    P.O. Box 1460
    Alhambra, CA 91802

12. Robert Howard
    Operations and Maintenance Department
    115 Elm Street
    Modesto, CA 95354

13. William E. Snyder
    Department of Forestry and Fire Protection
    P.O. Box 944246
    Sacramento, CA 94244

14. Thomas Pinkos
    Central Valley RWQCB
    11020 Sun Center #200
    Rancho Cordova, CA 95670

15. Mark Smith
Charles Abbot Associates, Inc.
371 Van Ness Way
Torrance, CA 90501

16. John Headlee
U.S. Army Corp of Engineers, Sacramento District
1325 J Street
Sacramento, CA 95814

17. Rita Robinson
City of Los Angeles, Bureau of Sanitation
433 South Spring Street
Los Angeles, CA 90013

18. Thomas E. Mumley
TMDL Round Table, San Francisco Bay RWQCB
1515 Clay Steet, Suite 1400
Oakland, CA 94612

19. Rod Kubomoto
Department of Public Works, County of Los Angeles
900 South Fremont Avenue
Alhambra, Ca 91803

20. Roger Briggs
Central Coast RWQCB
895 Aerovista Place, Suite 101
San Luis Obispo, CA 93401

21. G. Fred Lee
G. Fred Lee and Associates
27298 East El Marcero Drive
El Macero, CA 95618

22. Carl W. Mosher
City of San Jose
801 North First Street, Rm 308
San Jose, CA 95110

23. Allen Short
San Joaquin Tributaries Association
P.O. Box 4060
Modesto, CA 95352

24. Peter McGaw
Turlock Irrigation District
2033 North Main Street, Suite 800
Walnut Creek, CA 94596

25. David Fike
City of Monrovia
415 South Ivy Avenue
Monrovia, CA 91016

26. Bruce Reznik
California CoastKeeper
2515 Wilshire Boulevard
Santa Monica, CA 90403

27. Gerald J. Thibeault
Santa Ana RWQCB
3737 Main Street, Suite 500
Riverside, CA 92501

28. Patti Krebs
Industrial Environmental Association
701 "B" Street, Suite 1445
San Diego, CA 92101

29. Kerry Schmitz
Sacramento County Department of Water Resources
827 7th Street, Room 301
Sacramento, CA 95814

30. Charles Bell
National Resource Conservation Service
430 G Street #4164
Davis, CA 95616

31. Karen Henry
Storm Water Pollution Prevention Program, The City of San Diego
19710 B Street, MS 27A
San Diego, CA 92102

32. Paul Helliker
Department of Pesticide Regulation
1001 I Street
Sacramento, CA 95812

33. Leslie A. Keane
City of Laguna Woods
24264 El Toro Road
Laguna Woods, CA 92653

34. William Ault
City of Fountain Valley
10200 Slater Avenue
Fountain Valley, CA 92708

35. A.J. Holmon III
City of Garden Grove
13802 New Hope Street
Garden Grove, CA 92842

36. Phillip Gruenberg
Colorado River RWQCB
73-720 Fred Waring Drive, Suite 100
Palm Desert, CA 92260

37. Harold J. Singer
Lahontan RWQCB
2501 Lake Tahoe Boulevard
South Lake Tahoe, CA 96150

38. Steven Arita
Western States Petroleum Association
1415 L Street, Suite 600
Sacramento, CA 95814

39. Wendell Kido
Sacramento Regional County Sanitation District
10545 Armstrong Avenue
Mather, CA 95655

40. Alexis Strauss
USEPA Region 9
75 Hawthorne Street
San Francisco, CA 94105

41. Donald Kendall
Calleguas Municipal Water District
2100 Olsen Road
Thousand Oaks, CA 91360

42. John A. Robertus
San Diego RWQCB
9174 Sky Park, Suite 100
San Diego, CA 92123

43. Larry Forester
Coalition for Practical Regulation
2175 Cherry Avenue
Signal Hill, CA 90755

44. Susan Damron
Los Angeles Department of Water and Power
111 North Hope Street
Los Angeles, CA 90051

45. Douglas S. Stack
City of Brea
1 Civic Center Circle
Brea, CA 92821

46. Williams Huber
City of San Juan Capistrano
32400 Paseo Adelanto
San Juan Capistrano, CA 92675

47. Craig Johns
Partnership for Sound Science in Environmental Policy
980 9th Street, Suite 2200
Sacramento, CA 95814

48. Larry McKenney
County of Orange
300 North Flower Street
Santa Ana, CA 92702

49. Donald Freitas
Bay Area Stormwater Management Agencies Association
1515 Clay Street, Suite 1400
Oakland, CA 94612

50. Sharon Duggan
Environmental Protection Information Center
2070 Allston Way, Suite 300
Berkeley, CA 94704

51. Linda Sheehan
Environmental Caucus of the AB 982 Public Advisory Group
116 New Montgomery Street, Suite 810
San Francisco, CA 94105

52. Kenneth H. Rosenfield, P.E.
City of Laguna Hills
25201 Paseo de Alicia
Laguna Hills, CA 92653

53. Val Connor
SWRCB, SWAMP Roundtable
1001 I Street
Sacramento, CA 95812

54. Mike Loving
City of Irvine
One Civic Center Plaza
Irvine, CA 92623

55. Terry Roberts
State Clearing House
1400 Tenth Street
Sacramento, CA 95812

56. Victoria Conway
Los Angeles County Sanitation Districts
1955 Workman Mill Road
Whittier, CA 90607

57. Desi Alvarez
Stormwater Program
1111 Brookshire Avenue
Downey, CA 90241

58. Desi Alvarez
Stormwater Program
1111 Brookshire Avenue
Downey, CA 90241

59. Robert Lucas
California Council for Environmental and Economic Balance
100 Spear Street
San Francisco, CA 94105

60. Karen Ashby
California Stormwater Quality Association
P.O. Box 2313
Livermore, CA 94551

61. Bill Busath
Department of Utilities, City of Sacramento
1395 35th Avenue
Sacramento, CA 95822

62. Gary W. LaForge
City of Costa Mesa
77 Fair Drive
Costa Mesa, CA 92628

63. Travis Lange
City of Santa Clarita
23920 Valencia Boulevard, Suite 300
Santa Clarita, CA 91355

64. Sharon Green and Raymond Miller
Tri-TAC and SCAP
P.O. Box 4998
Whittier, CA 90607

65. Timothy Piasky
Construction Industry Coalition on Water Quality
2149 East Garvey Avenue, Suite A-11
West Covina, CA 91791

66. Bruce Wolfe
San Francisco Bay RWQCB
1515 Clay Street, Suite 1400
Oakland, CA 94612

67. Rodney Anderson and Bonnie Teaford
City of Burbank
275 East Olive Avenue
Burbank, CA 91510

68. Valerie Nera
California Chamber of Commerce
1215 K Street, Suite 1400
Sacramento, CA 95812

69. Rex Hime
California Business Properties Association
1121 L Street
Sacramento, CA 95812

70. Jon Van Rhyn
Department of Public Works, County of San Diego
5555 Overland Avenue
San Diego, CA 92123

71. Clifford Moriyama
California Coalition for Clean Water
1121 L Street, Suite 809
Sacramento, CA 95814

72. Gary Lorden
California Institute of Technology, Department of Mathematics
355 South Holliston Avenue
Pasadena, CA 91125

73. Roberta Larson
California Association of Sanitation Agencies
925 L Street, Suite 1400
Sacramento, CA 95814

74. David Williams
East Bay Municipal Utility District
P.O. Box 24055
Oakland, CA 94623

75. Tracy Egoscue
Santa Monica Bay Keeper
P.O. Box 10096
Marina del Rey, CA 90295

76. Lawrence Jackson Jr.
Ventura County Watershed Protection District
800 South Victoria Avenue
Ventura, CA 93009

77. Donald Weston
University of California, Berkeley
3060 Valley Life Science Building
Berkeley, CA 94720

78. Lawrence Pierce
Department of Public Works
33282 Golden Lantern
Dana Point, CA 92629

79. Donald Jensen
City of Santa Fe Springs
11710 Telegraph Road
Santa Fe Springs, CA 90670

80. Dennis A. Dickerson
Los Angeles RWQCB
230 West Fourth Street
Los Angeles, CA 90013

81. Byron Sher
California State Senate
State Capitol 2082
Sacramento, CA 95814

82. Jane De Lay
345 Lake Avenue, Suite A
Santa Cruz, CA 95065

84. Emily Dean
Sonoma County Water Agency
2150 West College Avenue
Santa Rosa, CA 95401

101. Tom Mumley
San Francisco Bay RWQCB/TMDL Roundtable
1515 Clay Street, Suite 1400
Oakland, CA 94612

102. Linda Sheehan
The Ocean Conservatory
116 New Montgomery Street, Suite 810
San Francisco, CA 94105

103. Sarah Newkirk
The Ocean Conservatory
116 New Montgomery Street, Suite 810
San Francisco, CA 94105

104. Bill Jennings
DeltaKeeper
3536 Rainier Avenue
Stockton, CA 95204

105. Leo O'Brien
WaterKeeper
P.O. Box 29921
San Francisco, CA 94129

106. Alan Levine
Coast Action Group
P.O. Box 215
Point Arena, CA 95468

107. David Paradies
The Bay Foundation of Morro Bay
875 Santa Ysabel
Los Osos, CA 93402

108. David Beckman
Natural Resources Defense Council
6310 San Vicente Boulevard, Suite 250
Los Angeles, CA 90048

109. Peter Kozelka
USEPA, Region 9
75 Hawthorne Street
San Francisco, CA 94105

110. Tom Herman
Soper-Wheeler
P.O. Box 173
Eureka, CA 95502

111. Craig Johns
California Manufacturer's and Technology Association
980 Ninth Street, Suite 2200
Sacramento, CA 95814

112. Valerie Nera
California Chamber of Commerce
1215 K Street
Sacramento, CA 95814

113. Tess Dunham
California Coalition for Clean Water
1127 11th Street, Suite 626
Sacramento, CA 95814

114. Sharon Green
Tri-TAC and CASA
P.O. Box 4998
Whittier, CA 90607

115. Steven Arita
Western States Petroleum Association
1415 L Street, Suite 600
Sacramento, CA 95814

116. Karen Ashby
California Stormwater Quality Association
707 4th Street, Suite 200
Davis, CA 95616

117. Bob Lucas
California Council for Environmental Economic Balance
1121 L Street, Suite 407
Sacramento, CA 95814

118. Armand Ruby
County of Sacramento
707 4th Street
Davis, CA 95616

119. Sterling McWhorter
Humboldt Cattlemens Buckeye Conservancy
P.O. Box 210
Petrolia, CA 95558

120. Bill Busath
City of Sacramento
1395 35th Avenue
Sacramento, CA 95822

121. Tim Piasky
Construction Industry Coalition on Water Quality
1330 South Valley Vista Drive
Diamond Bar, CA 91765

201. John K. Pratt
City of Bellflower
16600 Civic Center Drive
Bellflower, CA 90706

202. Desi Alvarez
Los Angeles County Executive Advisory Committee
1111 Brookshire Avenue
Downey, CA 90241

203. Carrie Inciong
Department of Public Works, Los Angeles County
900 South Fremont Avenue
Alhambra, CA 91803

204. Heather Merenda
City of Santa Clarita
23920 Valencia Boulevard
Santa Clarita, CA 91355

205. Clayton Yoshida
City of Los Angeles
433 South Spring Street
Los Angeles, CA 90013

206. James Colston
Orange County Sanitation District
10844 Ellis Avenue
Fountain Valley, CA 92708

207. Richard Watson
Coalition for Practical Regulation
2175 Cherry Avenue
Signal Hill, CA 90755

208. Blane Frandsen
City of Lawndale
14717 Burin Avenue
Lawndale, CA 90260

209. Eric Escolar
City of Inglewood
One Manchester Boulevard, Suite 300
Inglewood, CA 90301

210. Heather Lamberson
Los Angeles County Sanitation Districts
1955 Workman Mill Road
Whittier, CA 90601

211. Mary Jane Foley
Southern California Alliance of Publicly Owned Treatment Works
30200 Rancho Viejo Road, Suite B
San Juan Capistrano, CA 92675

212. Rodney Anderson
City of Burbank Public Works
275 E. Olive Avenue
Burbank, CA 91510

213. Phyllis Papen
City of Signal Hill
2175 Cherry Avenue
Signal Hill, CA 90755

214. Larry McKenney
Orange County Flood District
300 North Flower Street
Santa Ana, CA 92703

215. Gerald Greene
City of Downey
11111 Brookshire Avenue
Downey, CA 90241

216. Robin Rierdan
9232 Lapeer Court
Santee, CA 92071

217. Mark Gold
Heal the Bay
3220 Nebraska Avenue
Santa Monica, CA 90404

218. Sujatha Jahagirdar
CalPIRG
3435 Wilshire Boulevard, Suite 385
Los Angeles, CA 90010

219. Rick Wilson
Surfrider Foundation
215 South Highway 101, # 206
Solana Beach, CA 92075

220. Gabriel Solmer
San Diego Bay Keeper
2924 Emerson Street, Suite 220
San Diego, CA 92106

221. David Paradies
The Morro Bay Foundation
875 Santa Ysabel
Los Osos, CA 93402

222. Conner Everts
Southern California Watershed Alliance
5321 Amestoy Avenue
Encino, CA 91316

# Table 2: Responses to Comments and Testimony

| COMMENT NUMBER | SUMMARY OF COMMENT | RESPONSE | REVISION |
|---|---|---|---|
| **DFED, Introduction** | | | |
| 51.70 | In its description of the Policy the FED sets forth a variety of measures that if implemented would to some extent mitigate some of the Policy's adverse environmental impacts. However, these measures cannot be found in the Policy itself. These inconsistencies are misleading and cause the FED's project description to be inaccurate. | The FED should be viewed as the justification for the various provisions of the draft Policy. In order to avoid duplication, the draft Policy does not include all of the information, justification, alternatives, etc. that are presented in the FED. The Policy provides the requirements for placement or removal of waters from the section 303(d) list. | No |
| **DFED, Environmental Setting** | | | |
| 51.68 | The Environmental Setting section of the FED is deeply flawed and falls far short of CEQA's requirements. The FED utterly fails to describe California's widespread pollution problems and degraded beneficial uses. As such it is inadequate under the law. The FED does not describe the vast amounts of pollutants and pollution that have been and continue to be discharged into California's waters. No effort is made to quantify these discharges in terms of mass, toxic effect or other impact. The FED makes no effort to describe the widespread violations of standards and impairments in each of these watersheds. The FED does not describe the numerous water bodies in California that are in danger of becoming impaired by pollutants. Nor does the FED make any attempt to describe the beneficial uses that have been harmed by these impairments. Information about the environmental setting is essential to support an analysis of the cumulative impacts of this policy and the analysis of alternatives. Without this information it is impossible for the public to fully evaluate SWRCB's decision. Consequently without this additional information the FED is inadequate under the law. | This section of the FED contains a description of the physical environmental conditions using descriptions of the Regions and the water bodies from the Basin Plans, as they exist, from both a local and regional perspective. This description represents the baseline condition upon which the environmental impacts were determined at the time that the FED was commenced. The FED has been revised to include a table that lists the total water bodies on the 2002 303(d) list and the estimated size of the area affected, by region and water body type, so that a more complete picture of the baseline condition is represented. | Yes |
| **DFED, Issue 1: Scope of the Listing/Delisting Policy** | | | |
| 1.17, 5.3, 6.2, 6.1, 11.2, 11.12, 12.2, 12.5, 19.2, 19.14, 30.2, 30.4, 43.58, 43.5, 47.10, 60.48, 60.46, 60.49, 63.4, 71.6, 71.3, 113.3, 113.1, 203.1, 207.14 | The NRC recommendation that states develop appropriate use designations for water bodies prior to the 303( d) listing process, and that states refine use designations prior to TMDL development should be incorporated into California' s listing policy. | The purpose of section 303(d) of the Clean Water Act is to list water quality limited segments relative to existing standards. Re-evaluation of existing standards is usually accomplished under CWA section 303(c)(1) and implementing regulation (40 CFR 131.20). During the triennial review period the RWQCBs hold public hearings for the purpose of reviewing water quality standards and as appropriate, modify or adopt new standards.<br><br>If the section 303(d) listing process and the triennial review process were combined it would be impossible to complete the section 303(d) list every two years as mandated by federal regulation. | No |

| COMMENT NUMBER | SUMMARY OF COMMENT | RESPONSE | REVISION |
|---|---|---|---|
| 2.1 | Agree with the recommendation to make the document as specific and focused as possible. | Comment acknowledged. | No |
| 5.2, 12.3, 71.4 | Per National Research Council (NRC) recommendations, SWRCB should (a) implement appropriate beneficial use designations before listing; (b) define water quality criteria for magnitude, frequency, and duration; and (c) create both a preliminary list and an action list in addition to the final 303(d) list. | Modification of beneficial use designations is a very large task that is beyond the scope of preparation of the CWA section 303(d) list. Water quality objectives and criteria have been established in Basin Plans and in federal regulation. For numeric objectives and criteria, magnitude has been established. For many water quality objectives and criteria, duration and frequency have been established. The structure of the list is addressed in Issue 2. | No |
| 7.5 | Listings should be based on sound science. | Comment acknowledged. | No |
| 12.1 | Support the SWRCB's goal of establishing a standardized approach for assigning water bodies to the 303(d) list, including requirements for consistent and statistically valid data evaluations, requirements for data quality and quantity, and implementation provisions. | Comment acknowledged. | No |
| 18.60 | The TMDL Roundtable recommended that the listing process should not describe a process for determining whether water quality standards are appropriate. The draft Listing Policy is consistent with this recommendation, since there is no step requiring review of uses and standards. | Comment acknowledged. | No |
| 20.18, 20.28, 20.19, 80.13 | Eliminate burden on RWQCBs beyond performing the assessment of whether water quality standards are being attained. A number of provisions require the Regions to go above and beyond an assessment of California's surface waters. | The draft FED recommends providing guidance on the listing and delisting factors necessary to assemble the required section 303(d) list of waters that do not currently meet existing water quality standards. Some of the factors are related to the factors listed. While these tasks may be more work for the RWQCBs initially, there would be a savings if problems already being addressed are identified at the beginning of the process instead of when TMDLs are developed. Federal regulation calls for scheduling waters on the list for TMDL development, therefore, this requirement is not avoidable. Monitoring is not required by the Policy per se but the requirements in Policy will influence monitoring efforts throughout the state if the monitoring program is being implemented to determine if a water should be placed or removed from the section 303(d) list. | No |
| 21.11 | SWRCB should work toward developing the financial and other resources to develop site-specific WQSs that are protective without significant unnecessary costs for TMDL implementation (i.e., properly implement the CWA requirements for defining a WQS violation). Rather, the SWRCB is adopting a 303(d) listing approach that will significantly weaken water quality protection by allowing violations of WQSs in California water bodies. | Comment acknowledged. | No |
| 30.3 | As pointed out in the FED, 'the preparation of the list does not require states to reexamine whether...standards are appropriate.' Recommend a scientific review | The Policy provides guidance to assure that the data used to list a water body is scientifically credible. The section 303(d) listing process also provides for | No |

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| | be incorporated into the 303(d) listing and TMDL process. | public review of recommended listings and the data used to list them. A scientific review of the entire listing process every two years would be an enormous and time consuming undertaking and would be largely duplicative of the evaluation of data quality evaluations already required.<br><br>All TMDLs are peer reviewed as required by Health and Safety Code section 57004. | |
| 50.10 | Reevaluations of water quality standards must be subject to legal requirements and public review. | The Policy explicitly states that it is not to be used to 'establish, revise, or refine any water quality objective or beneficial use'; therefore, reevaluations of water quality standards are beyond the scope of this Policy. | No |
| 50.9 | Decisions to delist must be fully transparent to the public and the public must be given the opportunity to participate in any determinations which could affect water quality. | The draft Policy requires fact sheets to be prepared that describe the justification for both listing and delisting waters. Using these fact sheets, any waters added or deleted from the list will be considered publicly by RWQCBs and SWRCB. | No |
| 71.7 | Recommend, for those cases where a standards review prior to listing is infeasible, that SWRCB's approach, detailed in the document, 'A Process for Addressing Impaired Water in California,' December 2003, of evaluating the appropriateness of water quality standards prior to the development of a TMDL. | Evaluating the appropriateness of water quality standards is beyond the scope of this Policy. | No |
| 73.4 | Supports the policy direction being provided through the draft policy to narrow the scope of the list slightly. | Comment acknowledged. | No |
| 76.29 | In light of the State's current budget situation and the two-year cycle for adopting 303(d) Lists, appreciates the SWRCB's preference to incorporate guidance on listing/delisting factors only. | Comment acknowledged. | No |
| 76.30 | A third alternative should be included in the Issue 1 discussion that would incorporate aspects of Alternatives 1 and 2 while facilitating the completion of 303(d) lists on the two-year cycle currently mandated by federal regulations. This Alternative could provide guidance to assure that future listings are consistent with 40 CFR 130.7 and the existing listings were reviewed for compliance. It could also partially address the 2001 recommendations of the NAS committee concerning development and refinement of use designations prior to TMDL development. This Alternative should include guidance that the adoption of Implementation Plans for TMDLs be delayed until the applicable use designations and water quality objectives are reviewed and refined, if necessary. Such a procedure could be incorporated into the Implementation Plan chapters of the water quality control plans (basin plans) adopted by the various RWQCBs and into statewide plans such as the Ocean Plan. Incorporation of the procedures into the water quality management plan would be consistent with CWA section 303(d) and with CWC section 13242. The CWA does not require Implementation Plans be adopted with TMDLs, and CWC section 13242 does | The alternative described is virtually the same as alternative number 2. The Policy is focused on compliance with CWA section 303(d). The scope of the Policy is to develop a list of water quality limited segments using existing standards.<br><br>The proposed Policy focuses on the development of a narrowly defined section 303(d) list that includes only those waters that do not meet water quality standards and a TMDL is needed to resolve the pollutant problem.<br><br>Re-evaluation of existing standards is usually accomplished under CWA section 303(c)(1) and implementing regulation (40 CFR 131.20). During the triennial review the RWQCBs hold public hearings for the purpose of reviewing water quality standards and as appropriate, modify or adopt new standards. | No |

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| | not mandate the contents of the program of implementation for achieving water quality objectives. Another policy guidance that could be included in Alternative 3 would be direction to the RWQCBs to correct their beneficial use designations to be consistent with CWC section 13241(a) to consider 'probable future beneficial uses' not 'potential' beneficial uses. The potential beneficial use category found in today's basin plans is consistent with State law and has resulted in listings based on uses that do not exist and are highly improbable in the future. | | |
| 206.4 | Water quality standards are the backbone of CWA and to the extent that the TMDL process is removed from that in terms of there isn't an identified pollutant and there isn't an established criteria for what the appropriate pollutant is in that water body than the TMDL process is going to be delayed and take more time and resources. | Federal regulation requires that TMDLs be developed for the pollutants, including toxicity, identified on the section 303(d) list. USEPA has determined that all of the pollutants are suitable for TMDL development. | No |
| 216.2 | The gentleman from Dominguez channel said, 'I don't know why we should even bother with any of these channels. There's no beneficial uses.' But that water always ends up in the ocean, somebody fishes in it, somebody swims in it. Not a good thing. | Comment acknowledged. | No |
| **DFED, Issue 2: Structure of the Section 303(d) List** | | | |
| 2.14, 2.2, 10.14, 17.4, 18.29, 18.28, 22.6, 28.4, 38.5, 43.18, 43.16, 43.1, 43.6, 44.13, 47.9, 51.20, 51.117, 56.12, 60.9, 60.62, 60.51, 60.50, 60.27, 60.7, 60.65, 61.8, 64.15, 64.16, 76.14, 76.42, 76.31, 76.3, 84.8, 84.7, 201.2, 205.6, 207.3, 207.7, 207.10, 207.17, 208.1, 210.4, 210.5, 219.6, 219.7, 221.7 | Considers the policy decision on how to structure the State's listing policy to address water body segments identified as not meeting water quality standards to be critical. A number of water bodies were listed on the 2002 303(d) list despite the lack of an identified pollutant. 40 CFR 130.7 states that the 303(d) list is for those impairments for which pollutants have been identified and TMDLs are still required.<br><br>Requests that a new Alternative 6 be prepared incorporating our comments and policy recommendations above about the structure of the CWA Section 303(d) List. We further recommend that the new Alternative become the recommended Alternative. | The proposed Policy focuses on the development of a narrowly defined section 303(d) list that includes only those waters that (1) do not meet water quality standards and a TMDL is needed or (2) do not meet standards and a program is available to resolve the pollutant problem.<br><br>In all cases but one, the draft Policy calls for the identification of the pollutant that will become the focus of the TMDL. Federal regulation allows for developing TMDLs for the identified pollutants causing or expected to cause water quality standards violations (40CFR 130.7(b)((4)). The exception is toxicity. The definition of a TMDL (40 CFR 130.2(i)) allows for 'TMDLs to expressed in terms of either mass per time, toxicity or other appropriate measure.' In order for TMDLs to be expressed in terms of toxicity it is necessary for TMDLs to be developed for toxicity. The Policy allows for the listing of waters for toxicity whether the pollutant is known or not. Therefore, when listing for toxicity, the statement requiring the identification of the pollutant before a TMDL can be developed has been removed. | Yes |
| 18.14, 20.22 | The Regions are also required to make a distinction between impairments that are due to pollutants versus pollution, which may require an evaluation that cannot be readily performed with available information. | Federal regulation (40 CFR 130.7) requires SWRCB and RWQCBs to evaluate all readily available data and information, to identify waters that do not meet standards, and to identify the pollutants potentially causing standards | No |

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| | | exceedances. If certain information is not readily available and the information is required by the Policy, then the waters should not be placed on the section 303(d) list. | |
| 18.93 | Recommendation is that the response to an impairment listing should be consistent with the Impaired Waters Guidance Policy (TMDL Policy). The listing exercise/action may recognize that there are various responses, or remedies, to a listing, but the listing exercise will not assert which response will be exercised. The response to the listing will be separate from the listing itself. The universe of potential responses, as well as guidance on how to select the most appropriate response to a given listing, is contained in the TMDL Policy which is the companion policy to the Policy for the Identification of Surface Waters Not Meeting Water Quality Standards (A.k.a., Listing Policy). The Listing Policy describes how to determine if a water should be included on the section 303(d) List; the TMDL Guidance describes how to address waters already on the section 303(d) list. | The Policy has been revised to refer to the certification process for identifying programs that can be used in lieu of a TMDL. No actions are mandated as a result of listing. The Listing Policy simply recognizes management actions that are already in place. | Yes |
| 56.6 | The SWRCB should revise the Policy to include on the 303(d) list only those waters for which water quality standards are not attained and for which a TMDL is required. | Comment acknowledged. | No |
| 63.5 | Alternative 5 is supportable only if detailed and specific, not general, guidelines are established for each pollutant type. | Comment acknowledged. | No |
| **DFED, Issue 3: Weight of Evidence for Listing and Delisting** | | | |
| 2.3, 56.13, 63.6 | Alternatives 1 and 3 will not result in the consistency desired for the 303(d) process. Alternative 2 is the better choice. | Alternative 2 could potentially lead to some inconsistencies especially when narrative standards are interpreted. The weight of evidence used by individual staff cannot be confidently combined numerically because each individual might overestimate or underestimate a given piece of evidence by distinct amounts. These estimations cannot be reliably captured using a purely statistical weight of evidence approach.<br><br>In Alternative 1, data and information could also be lost when combining lines of evidence; however, if fact sheets contain an assessment of the way lines of evidence were combined, this problem would be minimized. When considering multiple lines of evidence each line of evidence should be evaluated separately to determine whether multiple lines of the evidence for the same water body support the same conclusion. The Policy has been revised to include a brief description of the weight of evidence approach. | Yes |
| 8.2, 40.47, 40.46, 40.12, 51.103, 51.78, 51.25, 110.4 | Suggest that the standard for listing be strengthened from a weight of the evidence test to a clear and convincing evidence standard such that where there exists doubt as to impairment, no listing would occur. Past listings resulted in | The standard of evidence for the Policy as well as for listing or delisting is substantial evidence. Substantial evidence is defined in both the Administrative Procedure Act (APA) and CEQA. APA section 11349.1 | No |

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| | the inclusion of far too many water bodies. The volume of listed water bodies is already far more than can reasonably be addressed, and many of the listed water bodies are listed on the basis of scanty questionable evidence. | defines the necessity standard to mean 'the record of the rulemaking proceeding that demonstrates by substantial evidence the need for a regulation to effectuate the purpose of the statute, court decision, or other provision of law that the regulation implements, interprets, or make specific, taking into account the totality of the record. For purposes of this standard, evidence includes, but is not limited to, facts, studies, and expert opinion.' Public Resources Code section 21082.2 also defines in terms of what is included and what is not. Under this law substantial evidence includes facts, reasonable assumptions predicated upon facts, and expert opinion supported by facts. Substantial evidence is not argument, speculation, unsubstantiated opinion or narrative evidence which is clearly inaccurate or erroneous, or evidence of social or economic impacts which do not contribute to or are not caused by physical impacts on the environment.<br><br>Under the provisions of the draft Policy, waters would only be listed or delisted if substantial evidence is available documenting the decision. Using this approach, substantial evidence is not an unusually large amount of evidence but rather the amount of data and information that a reasonable person might accept as a basis for the decision.<br><br>Doubt regarding the basis for listing and delisting decisions will be present unavoidably in every circumstance. The decision rules proposed in the draft Policy make the decisions more certain but the decisions will never be entirely free from all doubt.<br><br>Some lines of evidence could be sufficient alone without additional lines of evidence for support. Such cases include exceedance of a numerical water quality standard. Other circumstances will require supporting evidence in assessing water quality. These cases include assessing human health, nuisance conditions, adverse biological response, degradation of biological populations or communities and trends in water quality. | |
| 10.13 | The water body must be listed if standards are not met. A TMDL may or may not be the appropriate solution. Should a TMDL be automatic? Again, this goes back to the role of professional judgment, weight of evidence, multiple lines of evidence. Consideration of the above should be acknowledged by language added to this section. | If water quality standards are not met, water bodies will be placed on the section 303(d) list (please refer to section 2 of the Policy). Placement on the list does not automatically mean a TMDL will be completed. The Policy allows placement in another category, if pollution control requirements are reasonably expected to result in attainment of the water quality standard. The RWQCBs are afforded significant flexibility to determine if a water should be listed or delisted using the situation-specific weight of evidence listing and delisting factors. | No |
| 10.6, 42.1, 104.8, 106.7, 106.8, 108.5, 219.4 | The binomial procedures proposed in the Policy override the need for weight of evidence and/or professional judgment. Not all listing criteria can be monitored by devices or in the lab. Reliance on the weight of evidence and professional judgment is necessary. | 'Best professional judgement' depends on the experience and expertise of the person rendering the judgement. Even people with reasonably similar experience could judge similar situations differently. The current section 303(d) list varies substantially between Regions. The intent of the Policy is to | Yes |

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| | | provide a consistent way to develop the section 303(d) list and, at the same time incorporate site-specific information. To do this, fairly specific decision rules are provided that require data to be consistently analyzed. The draft Policy provides significant latitude to RWQCBs to determine the spatial representation, water body segmentation, and temporal representation of the samples used in the analysis. RWQCBs need only to document these factors in the water body fact sheets. This flexibility to use judgement has been emphasized in the draft Policy by inclusion of listing and delisting factors that allow RWQCBs to use the weight of evidence depending on situation- and site-specific considerations. | |
| 10.8, 10.11, 10.12, 10.15, 14.5, 18.16, 18.18, 18.20, 20.7, 27.1, 36.3, 37.7, 40.33, 40.9, 40.32, 40.96, 40.95, 40.81, 40.31, 44.9, 44.8, 51.79, 51.82, 51.122, 51.104, 51.120, 51.81, 51.119, 51.86, 51.80, 51.83, 53.28, 60.42, 76.13, 80.6, 81.1, 101.4, 102.7, 106.6, 107.1, 107.10, 107.3, 108.18, 109.17, 217.17, 221.8, 221.3, 221.1 | The listing and delisting factors in the Draft Policy focuses on the use of a rigid statistical methodology, backed up only by comparably rigid 'alternative data evaluation' methodology, rather than by a true 'weight of evidence' approach for assessing the health of individual water bodies. As a result, the Policy does not comply with the federal CWA that, 'The policy shall include a 'weight of evidence' approach and shall include criteria that ensure that the data and information used for identification and listing of impaired water bodies are accurate and verifiable.' SWRCB should revise the Draft Policy to include a true weight of evidence approach as specific in the federal CWA. | 'Weight of evidence' and 'multiple lines of evidence' as used in the draft Policy are accepted concepts in the scientific literature (e.g., Good, 1985; Smith et al., 2001), and are therefore discussed and promoted accordingly in the draft FED and draft Policy (see Section 3). As a first step, in implementing the Policy these approaches are required to be used in conjunction with the binomial test for numeric sample data. The use of hypothesis or significance testing is one way to weigh evidence (Good, 1985). The draft Policy also allows RWQCBs to recommend listings or delistings based on the situation-specific weight of evidence factors.<br><br>RWQCBs will need to document all listings and delisting decisions in fact sheets and SWRCB shall determine if there is substantial evidence to list or delist.<br><br>The new section in the introduction presents the steps for implementing the Policy's weight of evidence approach. The approach includes the process for data and information preprocessing, data and information processing, and data assessment. The Policy also has weight of evidence listing and delisting factors that allows RWQCB to make recommendations as long as RWQCBs justify its recommendations by:<br><br>--Providing any data or information supporting the decision;<br>--Describing in fact sheets how the data or information affords a substantial basis in fact which the decision can be reasonably inferred;<br>--Demonstrating that the weight of evidence of the data and information indicate attainment status of the water quality standard; and<br>--Demonstrating that the approach used in scientifically defensible and reproducible. | Yes |
| 12.6, 109.11 | The basis and rationale for additional listing decisions is unclear. The commenter supports guidance regarding the requirements for and transparency of listing decision. | The Introduction (Section 1) has been revised to insert a description of the Policy's overall the weight of evidence approach. | Yes |
| 21.61, 21.57 | Support the use of a properly developed Weight of Evidence (WOE) approach | Section 303(d) of the federal CWA requires each state to identify those waters | No |

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| | in evaluation of existence of water quality impairment and its cause. High quality science should be used in listing and delisting, involving a non-numeric Best Professional Judgement which properly incorporates aquatic life toxicity, excessive bioaccumulation, aquatic organism assemblages relative to appropriate reference sites, and chemical information on the cause of adverse impacts- not total concentrations. The use of WOE approach should be through TIEs to identify the cause of toxicity. | within its boundaries for which the effluent limitations required by section 301(b)(1)(A) and section 301(b)(1)(B) are not stringent enough to implement any water quality standard applicable to such waters. In addition, the Listing Policy requires the use of a multiple lines of evidence for human health, toxicity, nuisance conditions, adverse biological response, degradation of biological populations or communities and trends in water quality. Any combination of these conditions can be used to support a listing/delisting decision. The use of TIEs are included in the toxicity section of the FED and Policy to identify the cause of or the contributors to toxicity.<br><br>Using TIEs as the sole basis for substantiating the pollutant is causing or contributing to the standards exceedance is a very high burden of proof. Associations between pollutant concentrations and effects have been used in many scientific studies to link effects with pollutant levels and are appropriate for development of the section 303(d) list. | |
| 32.1 | The policy appears to preserve flexibility for the RWQCBs to work with stakeholders to obtain and evaluate high quality data and to discuss findings in an open, public process. Encourage SWRCB to ensure that such flexibility is preserved in the policy so that determinations on exceedances of water quality objectives are based on a broad array of information and on sound science. In that regard, the policy should promote a wide variety of investigative strategies and avoid the appearance that it endorses or prescribes specific procedures, such as the proposed application of the binomial distribution. RWQCBs should have the discretion to consider all data and interpretations that they and stakeholders deem appropriate as part of a comprehensive, weight-of-evidence approach for determining water quality impairments. | The Policy provides guidance on how to interpret and weigh a wide variety of data and information and provides a process to evaluate data that, if justified, allows for the use of additional data and information. The Policy has been revised to allow RWQCBs wide discretion, if it is needed, to evaluate all lines of evidence that may be available. | Yes |
| 38.4, 43.7, 56.20, 60.52, 64.11, 64.13, 64.18, 76.32 | Supports recommendation of Alternative 1. Use in the 303(d) listing of a weight of evidence approach. | Comment acknowledged. | No |
| 77.1 | Greater clarity is needed in the distinction between Issue 4 (single line of evidence) and Issue 5 (multiple lines of evidence). Toxicity appears under Issue 5, yet it was my impression that toxicity could be used alone for listing (though not for TMDL implementation). It would be helpful to better explain what is meant by multiple lines of evidence. Some of that information appears towards the end of the document, but it would be helpful to have a brief explanation up front when the single vs. multiple issue is first raised. | These sections have been clarified. | Yes |

## DFED, Issue 4: Listing or Delisting with Single Line of Evidence

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| 18.57 | The Listing Policy should use the technical module approach used in the TMDL Guidance. The Listing Policy itself should just define general parameters for | Section 13191.3(a) requires the SWRCB to prepare guidelines to be used in listing, delisting, developing, and implementing TMDLs pursuant to CWA | No |

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| | conducting the 303(d) list assessment. Over time, specific technical modules should be developed that would provide guidance, but not mandates, on how to conduct specific types of assessments (e.g. bioaccumulation; pathogens; nutrients; sediment). There are a wide variety of technical issues that must be considered in performing assessments for different types of pollution. The science in performing such assessments is evolving and should not be mandated within a policy. Guidance, which could be updated prior to each listing cycle, would allow the Regions and SWRCB to use the most current science in evaluating available data and information to determine standards attainment. | section 303(d). Additionally, the Budget Supplemental Report required a weight of evidence approach and the inclusion of criteria that ensure data and information are accurate and verifiable. The Policy follows this mandate by providing guidance on how to conduct specific types of assessments for various pollutants while allowing the use of the most current scientific approaches available. If a non-mandatory 'technical module' approach were taken it is less likely the Policy would provide a consistent listing process. | |

## DFED, Issue 4B: Interpreting Numeric Marine Bacterial Water Quality Standards

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| 2.5, 60.54, 76.34 | Agree with the recommendation. Rules for determining ocean water quality should be a statewide rather than a regional issue. | Comment acknowledged. | No |
| 21.34, 21.1, 21.23, 51.100 | Allowing a 10% exceedance rate plus a confidence level of 90% in a binomial distribution at marine beaches is arbitrary, is not protective of public health, and allows an exceedance rate far higher than the exceedance rates observed at many polluted beaches in California.<br><br>The policy specifies that if the reference system is not used, a marine beach will not be listed unless the observed exceedance rate is 10% or greater with a 90% confidence level using the binomial model. This translates to a 17% exceedance rate at beaches monitored weekly (the most common monitoring plan at California beaches) using Table 3.1 of the draft Policy. This is an extremely high rate of exceedance of California's health-based standards, which are designed to meet the federal marine beach criteria. Clearly, this policy will result in the failure to list beaches that frequently pose a health risk above the USEPA's recommended health risk rate of 19 swimmers per 1,000 for gastrointestinal illnesses and that are not supporting a REC-1 beneficial use designation.<br><br>The recommended 10% threshold is not supported by existing data. For example, data analyses conducted for the bacteria TMDLs for Santa Monica Bay do not support a 10% exceedance rate. Analysis of five years of routine monitoring data at 55 beaches showed that 35 beaches had an average exceedance rate of less than 10% per year. In other words, 61% of the beaches routinely monitored in Santa Monica Bay have an exceedance rate of less than 10%, yet most of these beaches are monitored because they have sources of bacteria nearby such as storm drains. Thus, many beaches with sources of bacteria have a lower exceedance rate than the rate the state is using.<br><br>SWRCB provides no justification for applying the binomial model with a 10% exceedance rate to the assessment of marine beaches for protection of human | The proposed exceedance frequency is very low when compared to the precision of bacteria measurements and is recommended in USEPA guidance documents (e.g., USEPA, 1997c). Bacteria measurements are inherently imprecise. In the SWAMP QAPP (Puckett, 2002), for example, measurement variability must be less than 1,000 times the average of duplicate measurements to be considered acceptable. With this level of acceptable variability it is probable that some measurements exceed standards when in fact standards are not exceeded. If no other exceedance frequency value is available then using a 10 percent value (as an average) is quite small relative to the expected analytical variability in these bacteria indicator tests. If a lower exceedance frequency is justified based on situation-specific factors, the alternate value may be used. | No |

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| | health. The policy fails to explain how this 10% relates to implementation of the health standard. Instead, this percentage is from an outdated recommendation from USEPA for interpreting fecal coliform data. This threshold was not recommended by USEPA in their most recent guidelines for interpreting bacteria data for listing purposes in the May 2002 draft Implementation Guidance of Ambient Water Quality Criteria for Bacteria. In fact, none of the USEPA's most recent guidance documents on management of public health protection or assessment of recreational water bodies recommends this high exceedance rate. | | |
| 31.2 | Recommend that the 4 percent criteria for bacterial impaired water body segments not be used due to possible unrepresentative conditions. This exceedance threshold was based on one location for a limited duration of five weeks. Support using the 10 percent frequency for the number of bacterial water quality objective exceedance, which is consistent with the frequency exceedance rate for pollutants listing in this Policy that have been statistically validated. | The four percent value was recommended by the BWQW and this recommendation represented a broad agreement of scientists who are familiar with bacterial indicators in coastal waters. While the study is limited to Southern California waters, SWRCB staff know of no other study or circumstance that would contradict its application to all coastal waters of the State. The draft Policy allows RWQCBs to use other studies that are more representative of site-specific conditions. If site-specific studies are not available, then it is appropriate to use the four percent value during the AB 411 period. | No |
| 43.9 | SWRCB should consider supporting BWQW recommendation of monitoring stations 25 yards from storm drain discharges. Agree with the staff-recommended Alternative 2. | The decision related to the size of the area where standards are not met should be based on site- and situation-specific factors related to the segment of the water body. Specific guidance would inappropriately limit needed discretion. | No |
| 51.94 | We support the draft Policy's recommendation that a reference system approach should be used to assess marine beach water quality for listing purposes. Comparison to an appropriate reference system is the most scientifically defensible and protective approach to accounting for background levels of bacteria at marine beaches and to prevent further degradation of water quality. This approach is recommended by the State's Beach Water Quality Work Group (BWQWG), which is comprised of microbiologists and scientists from local health agencies, POTWs, stormwater agencies, researchers, and nonprofit groups (Heal the Bay is an active member). Additionally, the reference system approach is used in the Los Angeles RWQCB's bacteria TMDLs for the Santa Monica Bay Beaches, Marina Del Rey, and Malibu Creek, based on the recommendation of a stakeholder technical advisory committee after three years of study and analysis. | Comment acknowledged. | No |
| 51.95, 51.99, 51.93 | The 4% exceedance rate allowed in the policy for assessing dry summer season conditions at beaches in lieu of a reference system is arbitrary.<br><br>The draft Policy allows a 4% exceedance rate during the AB 411 monitoring time period (summer dry weather), which is far too high, based on statewide monitoring data. In the Santa Monica Bay Beaches TMDL, the reference site is a popular beach located in northern Santa Monica Bay. Daily monitoring for | Few locations along California's coastline have been identified as reference beaches. If reference beaches have been identified and the standards allow, reference beaches should be used in the decision to list or not list waters. The fall back position advocated by BWQW was to use 10 percent for data sets from year around sampling and the four percent values for monitoring only collected during the AB 411 period. The study used to substantiate this decision was recommended as the basis for setting this four percent value. No | No |

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| | five years showed no exceedances during summer dry weather at this beach. More significantly, water quality at many beaches in California meet the state's bacteria standards throughout the summer. For example, during the AB 411 time period of 2002, at least 34% of the 420 beaches routinely monitored showed no exceedances of state health standards during the AB 411 timeframe. In fact, most beaches in the South Bay portion of Santa Monica Bay do not exceed the 4% frequency on a year-round basis, let alone for the summer dry weather.<br><br>The 4% exceedance rate was derived from a study of Southern California completed by SCCWRP and others as part of the Bight '98 study. This study was not designed to establish exceedance rates due to background bacterial concentrations. The study did not consider whether anthropogenic sources other than storm drains were potentially contributing to bacteria at the beach; i.e., the study beaches may have been impacted by a wide variety of sources including septic tanks, boats, anthropogenic-related bird and animal wastes, etc. Additionally, the study is a snapshot study, in which sampling was conducted weekly during a 5-week period of one summer. The results are not temporally-representative of unimpacted beaches during the dry season. The draft Policy should not rely on snapshot data when there are years of routine monitoring data available for many California beaches. In summary, the use of this data in the context of assessing marine beaches for impairment is scientifically inappropriate. | data and information to the contrary was provided showing that the study is not being used appropriately. | |
| **DFED, Issue 4C: Interpreting Numeric Freshwater Bacterial Water Quality Standards** | | | |
| 2.6, 43.10, 60.55, 76.35 | Agree with the recommendation. Consistency is needed. | Comment acknowledged. | No |
| **DFED, Issue 4D: Interpreting Narrative Water Quality Objectives** | | | |
| 2.7 | For DFED, Issue 4D either Alternative 3 (recommended) or Alternative 4 would suffice. | Comment acknowledged. | No |
| 8.4, 110.5 | Concerned with adoption of narrative standards and thresholds of concern without public notice. Numeric (not narrative) criteria, adopted by the SWRCB and not the staff, are advisable. | The Policy does not develop new or revise existing water quality standards (i.e., beneficial uses, water quality objectives, or the State's Non-degradation Policy). Evaluation guidelines are used so decisions regarding whether to place waters on the section 303(d) list are transparent. These guidelines are used only for the purposes of the section 303(d) list; no other regulatory use is authorized or allowed. The use of any evaluation guideline requires the staff to present to RWQCBs and SWRCB the reasons for their use. | No |
| 21.48, 21.56, 21.58 | NAS tissue guidelines, chemically based sediment quality guidelines and | These guidelines are technically valid and are used by many RWQCBs as a | No |

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| | sediment apparent effects thresholds from California and other states are not technically valid for any purpose associated with water quality assessment. | benchmark by which exceedances to the standard are compared. To our knowledge, the NAS values have not been withdrawn or superseded by other values and are therefore appropriate to use. The Policy provides the RWQCBs the flexibility to use these guidelines as well as other guidelines or more current data as long as they meet the criteria set in Policy. | |
| 21.59 | Additional information is needed on what is meant by 'toxicity guidelines,' and (Table 1) 'USEPA screening' to determine if the particular guideline is technically valid. | The table contained a typographical error. The correct reference is 'other states toxicity guidelines.' 'USEPA screening' refer to values developed by USEPA using a risk-based method for developing screening values based on a dose-response variable and certain assumptions regarding exposure. | Yes |
| 21.60 | The U.S. Army Corps of Engineers (USACOE, 1997), Environmental Residue-Effects Database (ERED) and the USEPA (Jarvinen and Ankley, 1999) should be used. The NAS tissue guidelines are not technically valid and should not be used for Fish Consumption. | The FED does not recommend the NAS tissue guidelines for fish consumption. The NAS screening values represent levels that are protective of aquatic life. The screening values developed by OEHHA and USEPA represent concentrations in water that protect against the consumption of aquatic organisms containing chemicals at levels greater than those predicted to result in significant health problems. RWQCBs have the option of using the guidelines suggested, provided their use is referenced in the fact sheets. | No |
| 21.62, 21.63 | In order to be scientifically-based, there must be a critical review of the validity of the science used. | In order to select evaluation guidelines, the RWQCBs would have to provide justification and reference for the approach or values used. The required documentation would need to address the quality assurance requirements of the Policy. | No |
| 21.64 | The NAS limits are no longer considered reliable by anyone except the SWRCB staff. Table 2 values are not reliable for estimating critical concentrations in water that lead to adverse impacts. | The NAS guidelines are based on evaluations of tissue residues for several chemicals; the recommendations reflect scientific understanding of the relationship between aquatic organisms and their environment. They are not intended to reflect critical concentrations in water. | No |
| 43.11 | Supports the need for numeric translators. Federal regulations require that pollutants be suitable for calculation before a TMDL is required. Although USEPA maintains that all pollutants are suitable for calculation under proper technical conditions. It is often hard to establish the needed proper technical conditions. Best professional judgment can be one of several rules of evidence but not the sole reason for listing if the SWRCB wants a transparent system. Agree that narrative water quality objectives do not quantify parameters necessary to clearly determine if beneficial uses are being protected. The presence of a pollutant does not automatically translate into impairment of a beneficial use. The use of narrative water quality objectives without numeric translators is often not scientifically defensible because interpretation of impairment becomes subjective. Alter alternative 4 to reflect the requirement that impairments be suitable for calculation. | Alternative 4 has been revised to include the use of 'interpretive guidelines.' | Yes |
| 51.123, 51.131 | SWRCB should remove the following language from requirements on alternative guidelines or methods used to interpret narrative objectives: | The Policy has been revised to incorporate this comment. | Yes |

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| | 'Previously used or specifically developed to assess water quality conditions of similar hydrographic units.' This requirement is nonsensical because it has no bearing on the quality and appropriateness of the guideline in question. For example, a new numeric guideline may be developed as a result of extensive studies to evaluate a specific water quality problem. According to the draft policy, this guideline could not be used in the listing process if is has never been used before or if the developer did not specifically state it's use for certain hydrographic units. | | |
| 51.125 | Federal regulations explicitly require that attainment of narrative water quality standards should be assessed in developing the section 303(d) list. Although '[t]he SWRCB and RWQCBs have used a variety of guidelines or scientifically derived values to interpret narrative water quality objectives,' other narrative objectives defy such interpretation. Consequently, a state's policy for interpretation of these objectives must be flexible enough to provide for interpretation of such objectives.<br><br>The proposed policy does not provide a flexible comprehensive policy for interpretation of narrative water quality standards. Rather, it unlawfully undercuts the basic requirement of section 303(d), which does not limit TMDL preparation or listing to violations of narrative objectives only when they can be translated under certain rules. By imposing these rules, the policy departs not only from the weight-of evidence approach required by state law, but also from the most basic mandates in section 303(d). | The Policy adheres to federal regulations regarding the assessment of narrative water quality standards. Following USEPA CALM guidance (2002a), it is recommended that listings based on narrative water quality objectives be interpreted using a translator. SWRCB staff interprets translator directly from USEPA (2002a) 'A "translator" identifies a process, methodology, or guidance that States or Tribes will use to quantitatively interpret narrative criteria statements. Translators may consist of biological assessment methods (e.g., field measures of the biological community), biological monitoring methods (e.g., laboratory toxicity tests), models or formulae that use input of site-specific information/data, or other scientifically defensible methods.' Under this definition, narrative water quality objectives can be translated using various interpretive guidelines. Additionally, the necessary criteria are provided in the Policy to validate evaluation guidelines outside of those recommended in the Policy.<br><br>Further, the Policy includes a weight of evidence approach for evaluating data and information and has been amended to include a situation-specific weight of evidence listing or delisting process by which RWQCBs can list or delist any water body-pollutant combination even if it does not meet the listing requirements of the Policy as long as the decision can be reasonably inferred from the data and information. | Yes |
| 51.127, 51.148, 51.149, 51.128, 51.126, 51.129, 51.147, 53.7 | There are several types of impairment that cannot be adequately assessed by available numeric guidelines. Most significantly, there are no universal numeric guidelines for impairments such as those associated with nutrients, algae, turbidity, trash, color and oil. Moreover, there are several reliable quantitative methods that assess narrative objectives that do not rely on available numeric guidelines, most notably reference system based approaches and use of translators of all types, as recommended by USEPA. The draft Policy does allow for the use of evaluation guidelines other than those specifically named in the policy. However, the provisions of the Alternate Data Evaluation section so narrowly circumscribe the use of these guidelines that many available numeric guidelines--particularly the reference-system based approaches and translators--would be unusable. Consequently, these restrictions eliminate much of the practical value of narrative water quality objectives. | Several of the Listing Factors have been revised to include the use of interpretive guidelines; this would include the use of models, reference-based or indices approaches, biological assessment methods, and translators of all types. These sections have also been revised to allow the use of reference system approaches when they are appropriate. The Alternate Data Evaluation section has been deleted and replaced with listing and delisting factors allowing RWQCBs to weigh data and information and make decisions to list or delist based on the merits of the site- and situation specific data and information. | Yes |

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| 51.132, 51.124 | SWRCB should remove the following language from requirements on alternative guidelines or methods used to interpret narrative objectives: 'For non-threshold chemicals, risk levels shall be consistent with comparable water quality objectives or water quality criteria.' Risk levels are rarely determined by many scientifically-acceptable methods for evaluating biological and ecological impacts. This is because, in many cases, risk levels can not be conclusively calculated without the use of multiple assumptions that can be easily manipulated. Thus, this requirement could significantly limit the use of data and analysis from peer-reviewed, scientifically-defensible efforts or could force the completion of uncertain, and largely useless, risk assessments. | The Policy provides RWQCBs guidance on the use of peer-reviewed, scientifically-defensible data and analysis that could be used in risk assessments. However, it is also recognized that the calculation of risk assessments include multiple assumptions that can be manipulated. The Policy, therefore, gives RWQCBs the flexibility to interpret data and justify the use of that data in fact sheets. | No |
| 60.57, 60.56, 76.36 | Recommends that Alternative 4 be strengthened and recommended. Urge that the SWRCB recognize the need for impairments to be 'suitable for calculation.' Narrative water quality objectives are insufficient determiners of impairment. The ramifications of a 303(d) listing are too great to allow listings without scientific basis. If this is not done, narrative water quality objectives should require multiple lines of evidence until numeric translators are developed. | The recommended Alternative 3 provides general guidance on interpretive guidelines to assess compliance with narrative water quality objectives. This is intentional to allow the RWQCBs the flexibility to incorporate the most recent versions of guidelines or the most recent applicable research. | No |
| 113.2 | The Policy allows inappropriate interpretation of narrative standards, for example through the health advisories and through bioaccumulation data. These water quality criteria were never officially adopted, and should not be the basis for 303(d) listings. | In order to implement a consistent approach for placing and removing waters from the section 303(d) list, the policy requires that quantitative guidelines be used to help interpret narrative water quality objectives. Without a translator to interpret these standards, there could be multiple and perhaps conflicting interpretations. The draft policy limits the use of these values to the section 303(d) list development process. For example, human health advisories are an acknowledgement that a beneficial use is severely impacted or lost. The only use of health advisories is as an indicator that beneficial uses related to consumption of fish are impacted. | No |
| **DFED, Issue 4E: Interpreting Aquatic Life Tissue Data** | | | |
| 2.8 | For DFED, Issue 4E either Alternative 3 (recommended) or Alternative 4 would suffice. | Comment acknowledged. For clarification, Alternative 4 was the recommended alternative. | No |
| 40.87 | The State should rectify Table 3 in the Policy and use the most appropriate screening value for arsenic in fish tissue—1.2 mg/kg ww for inorganic arsenic (see EPA (2000b) pg. 5-11 and discussion in Newport Bay Toxic Pollutant TMDLs pp. 69-70). | The table has been revised to identify this screening value for arsenic. | Yes |
| 43.12 | Agrees with the staff-recommended Alternative 4 as long as specific pollutants are identified. | Alternative 4 encompasses the use of NAS, OEHHA and USEPA screening values that are based on detected levels of chemicals bioaccumulated in fish tissue. Hence, the pollutant is identified. | No |
| 60.58, 76.37 | Supports the recommended Alternative 4. | Comment acknowledged. | No |

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| 77.2, 77.3 | The text states: 'Bioaccumulation is the uptake and retention of chemicals by living organisms. A pollutant bioaccumulates if the rate of intake in the living organism is greater than the rate of excretion or metabolism resulting in an increase in tissue concentration relative to the exposure concentration in the ambient environment.' This definition is in error. First, bioaccumulation is generally considered to be the uptake from all routes (i.e., food and water, as opposed to bioconcentration which is only from the dissolved phase). A pollutant that is taken up but rapidly metabolized (no retention) still bioaccumulates. Secondly, for all compounds the rate of uptake is initially greater than excretion/metabolism. As the tissue concentration rises, and for some compounds as elimination/metabolism becomes more effective, a steady state balance is reached between uptake and loss. So the definition provided is nonsensical since the balance between rate of intake and rate of excretion/metabolism depends entirely on when during the exposure it is measured. Given enough time and constant exposure conditions, a steady state will be achieved and uptake will equal excretion/elimination. By the definition provided then, everything would be bioaccumulative in the early stages of exposure, and nothing would be bioaccumulative at steady state. | The definition has been revised to conform with USEPA's definition (USEPA 2000d) and reads 'Bioaccumulation reflects the uptake and retention of a chemical by an aquatic organism from all surrounding media (e.g., water, food, sediment). Bioconcentration refers to the uptake and retention of a chemical by an aquatic organism from water only. Both bioaccumulation and bioconcentration can be viewed simply as the result of competing rates of chemical uptake and depuration (chemical loss) by an aquatic organism (USEPA 2000d).' | Yes |
| 77.4 | There is an inconsistency in the statements "merely identifying the presence of a chemical substance in the tissue of an organism is not sufficient information to conclude the chemical will produce an adverse effect' and 'pollutants detected in fish not only indicate pollution impacts on aquatic life and other wildlife. ..'. Potential exposure to piscivorous predators is meant, not impacts, in the second case. | The second statement has been revised with the following: Concentrations in aquatic organisms from highly bioaccumulative chemicals may pose unacceptable human health risks from fish and shellfish consumption and may also biomagnify in aquatic food webs, a process whereby chemical concentrations increase in aquatic organisms of each successive trophic level due to increasing dietary exposures (e.g., increasing concentrations from algae, to zooplankton, to forage fish, to predatory fish) (USEPA 2000d). | Yes |
| 77.5 | In all the tables of tissue guidelines provided, in this section there is no indication of whether these values are on a wet or dry tissue basis. | The screening values are based on wet tissue samples. This has been added to the tables as a footnote. | Yes |
| 77.6 | It is claimed that the FDA action levels were developed to protect human health from consumption of seafood involved in interstate commerce. It is unclear how these levels would not be appropriate for the protection of human health if the seafood was consumed locally. The rationale for this distinction is unclear. | In their 'Guidance for 2004 Assessment, Listing and Reporting Requirements Pursuant to Sections 303(d) and 305(b) of the Clean Water Act (2003b), USEPA stated 'Finally, some fish and shellfish consumption advisories and NSSP classifications are based on Food and Drug Administration (FDA) action levels as opposed to EPA's risk-based methodology for the protection of human health. FDA action levels are established to protect consumers of interstate shipped, commercially marketed fish and shellfish rather than fish and shellfish caught and consumed within a State. FDA action levels also include non-risk-based factors (e.g., economic impacts) in their derivation, while WQC must protect the designated uses without regard to economic impacts. EPA has therefore concluded that FDA action levels do not provide a greater level of protection for consumers of fish and shellfish caught and consumed within the State than do human health criteria. In such instances, or where water bodies have a fish or shellfish consumption advisory, they need not be listed as impaired under Section 303(d) unless there are water-specific data (and the | No |

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| | | data were not considered during the development or review of a non-precautionary NSSP classification), showing nonattainment of Section 101(a) uses.' Staff incorporated this recommendation into the alternative. | |
| 77.7 | The preferred alternative (number 4) is unclear. The text either reiterates basic information given previously on why one would want to look at contaminants in tissues, or says nothing at all. The text does not clearly state what Alternative 4 is, and what little description there is makes it sound no different than Alternative 2. | Alternatives 2 and 4 are very similar. The basic difference is that Alternative 2 bases bioaccumulation data on a site-by-site condition without a process that would allow for consistency among the Regions. Alternative 4, however, provides guidance on the various measures available to interpret chemical residue concentrations in tissue. Under this alternative, RWQCBs would be able to compare site specific data sets to the most appropriate measure using a consistently applied and scientifically valid listing methodology. | No |
| 77.8 | Bottom-feeding fish are said to accumulate contaminants from direct contact with contaminated sediment. This is unlikely as fish skin and scales are very effective barriers. Uptake is more likely through consumption of benthic invertebrates on which the fish feed. The distinction between 'bottom- feeding fish' and 'predator fish' which forms the basis for this paragraph is unclear. A bottom-feeding fish can be a predator fish. | The sentence has been revised; the words 'from direct contact with contaminated sediment or' has been deleted. The distinction between bottom-feeding fish and predator fish was meant to emphasize the effect of food web structure on bioaccumulation, i.e., the effect of species with different dietary preferences; specifically, bottom feeding fish species (trophic level three) and on top predator species (trophic level four). This distinction has been clarified. | Yes |
| 77.9 | The last sentence of paragraph 4 of alternative 4, states that 'tissues from appropriate target species permit comparison of fish and shellfish contamination over a wide geographic area'. Not sure what is trying to be said here. If it is that one can compare data between sites, that is hardly a quality unique to tissue concentrations. | While the comparison of data between sites is not a quality unique to tissue concentrations, the point that tissue samples from appropriate species have a wide geographical applicability is an important one. With the small sampling budgets that most RWQCBs work with, the ability to accurately broaden the applicability of fish tissue sampling is a central consideration of where to allocate resources. | No |
| **DFED, Issue 4F: Interpreting Data on Trash Impacts to Water Bodies** | | | |
| 2.9, 43.13, 60.59, 76.38 | Support the recommended Alternative 3. | Comment acknowledged. | No |
| 109.13 | Concerns about trash as a pollutant not being covered in the draft Policy. | The Draft FED addresses trash as a pollutant. Please refer to Policy sections 4.7.2, 3.1.7, and 3.1.7.2. Please also refer to Draft FED Issue 4F: Interpreting Data on Trash Impacts to Water Bodies. | No |
| **DFED, Issue 4G: Interpreting Nutrient Data** | | | |
| 2.10 | Agree with the recommendation. Alternative 3 is OK, but Alternative 2 should be substituted when RTAG/STAG report is ready. Phosphorus is misspelled (as phosphorous) in a couple of places in this Section (p.82, paragraph 2 line 3 and p.83, paragraph 3 line 3). | Alternative 3 is written in such a way that once the RTAG/STRAG nutrient criteria is developed it can be used. Phosphorus misspellings have been corrected. | Yes |
| 43.14, 60.60, 76.39 | Create a new alternative 4 to require placement of water segments on a Pollutant Identification List and not the 303(d) List before RTAG/STRTAG criteria have | Alternative 3 provides guidance upon which to base nutrient listings in lieu of the RTAG/STRTAG criteria. The concept of a Pollution Identification List, | No |

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| | been established. | Monitoring List, or Planning List has been considered and is addressed in responses related to the List Structure. The structure of the list has been narrowed to two categories: a water quality limited segment and those waters not meeting standards where the attainment problem is being addressed. Waters without adequate information or that are clean would be acknowledged in the fact sheets but no judgement would be made on their disposition. This information will be used in the section 305(b) report. | |
| 51.108, 51.105, 51.106, 51.107 | Agree with the overall approach of Alternative 3. In particular, support the following '...RWQCBs should use models, scientific literature, data comparisons, to historical values or to similar but unimpacted streams, Basin Plan objectives, or other scientifically defensible methods to demonstrate that nutrients are to blame for the observed impacts.' However, the draft Policy seems to contradict this recommendation by strictly requiring the use of numeric guidelines that meet the requirements of Section 6.2.3 in conjunction with the binomial model. Section 3.1.7.1 of the draft Policy states that '[f]or excessive algae growth, unnatural foam, odor, and taste, acceptable nutrient-related evaluation guidelines are exceeded as described in section 3.1.1.' Section 3.1.1. specifies listing requirements when numeric water quality objectives are exceeded (specifically, the use of the binomial model), and Section 6.2.3 requires the use of numeric guidelines for narrative objectives. | Section 3.1.7.1 is intended to reflect the applicability of models, scientific literature, data comparisons to historical values or to similar but unimpacted streams, numeric Basin Plan objectives, or other scientifically defensible methods to demonstrate that nutrients are to blame for the observed impacts; this section has been revised to support their use. Additionally, the section of the Policy that describes an evaluation guideline process was not meant to rely exclusively on numeric evaluation guidelines; numeric has been deleted from this section. | Yes |
| 51.109, 51.110 | To assess nutrient-related impairments, use of a reference system approach is a quantitative method that is scientifically sound and technically defensible. This approach is consistent with Alternative 3 in the FED. Therefore, we urge SWRCB to:<br><br>Remove the language in Section 3.1.7.1 of the draft Policy that is nutrient-related and add in language from the FED Alternative 3, including the following: "RWQCBs should use models, scientific literature, data comparisons to historical values or to similar but unimpacted streams, Basin Plan objectives, or other scientifically defensible methods to demonstrate that nutrients are to blame for the observed impacts."<br><br>Emphasize the use of a reference system approach for identifying impairments related to nutrients and algae as a defensible and technically-sound approach.<br><br>Delete the language in the FED Issue 4G regarding the use of nutrient ratios, since there is no scientific bases for determine nutrient limitation in freshwater systems based on nutrient ratios alone. | The language cited in Section 3.1.7.1 has been revised as suggested. The intent of this section is to evaluate the widest possible array of information supporting decisions regarding nutrients. While nutrient ratios may not be useful alone they should be considered when evaluating nutrient concentrations in water bodies. The Policy has been revised to state: 'If listing for nitrogen or phosphorus specifically, RWQCBs should consider whether the ratio of these two nutrients provides an indication of which is the limiting agent.' | Yes |
| 63.8 | Alternative 2 is the preferred option. In lieu of that, Alternative 3 is acceptable with some caveats:<br>- Models for nutrients have drawbacks (e.g., aerial deposition).<br>- Guidance is needed for how to work with aerial deposition of nitrates and | While the comment is applicable to TMDL development, it is beyond the scope of the Listing Policy to provide detailed guidance on the impact of aerial deposition. Since the appropriate method for applying a nutrient model may vary from site to site, it is not possible to adequately address this subject in the | No |

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| | ammonia.<br>- Along with those factors, pH and temperature must be considered. Weight of evidence should also be required. | FED. It will likely be necessary to consider pH and temperature but the extent to which that is needed is best determined by the chosen model. | |

## DFED, Issue 4H: Impacts of Invasive Species on Water Quality

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| 2.11, 60.61, 76.40 | Supports the recommended Alternative 3. Support USEPA's assertion that a pollution list would be an appropriate place for water bodies listed for invasive species. | Waters proposed for listing for invasive species will be acknowledged in fact sheets but no judgement will be made on their disposition. This information will be useful in the development of the section 305(b) report. | No |
| 13.2 | Support timely adoption of the proposed Policy in order to promote the rapid recovery of impaired water bodies by focusing resources effectively on water bodies where they are needed. | Comment acknowledged. | No |
| 43.15 | Agree with the staff-recommended alternative 3. Suggest that water bodies previously listed for invasive species should go to a pollution list. | Comment acknowledged. | No |
| 51.23, 108.6 | Disagree with the proposition that only those waters impaired by 'pollutants' shall be listed. Water bodies that are impaired, regardless of the source of pollution, must be listed. Strongly disagree with the FED's recommendation that waters impaired by invasive species not be listed because invasive species are not 'pollutants.' Invasive species clearly fit the definition of 'pollutant' under CWA section 502(6). Courts have interpreted the definition of 'pollutant' expansively, stating that it 'encompass substances not specifically enumerated but subsumed under the broad generic terms' listed in Section 502(6). In the definition of pollutant the term 'biological materials' has been interpreted by USEPA and the courts to include harmful organisms, which would include invasive species. For example, in proposing revisions to the TMDL regulations, USEPA stated that 'all microbial contaminants that may be discharged to waters of the U.S. (e.g. bacteria, viruses and other organisms) fall under the term 'biological materials'.' USEPA's finding is consistent with a common sense interpretation of the term 'biological materials" as including organisms, and makes no artificial distinctions as to the location or source of the organisms. USEPA similarly has acknowledged that different biological organisms, such as bacteria (e.g., fecal coliform), algae, dead fish, live fish, fish remains, and plant materials have been considered pollutants under this definition by various courts.' | CWA section 502(6) definition includes 'biological materials' as a pollutant. However, although some courts have determined that some biological materials (bacteria, algae, dead fish, live fish, fish remains, and plant materials) are pollutants (Draft Report: Aquatic Nuisance Species in Ballast Water Discharges: Issues and Options dated September 2001), USEPA has not yet determined whether all aquatic nuisance species are pollutants. USEPA therefore currently believes that impacts from invasive species should not be included on the 303(d) list. During the 1998 303(d) listing process the San Francisco Bay RWQCB listed the San Francisco Bay for impacts due to invasive species. USEPA did not disapprove this listing but stated that neither the state or USEPA had the obligation under current federal regulation to develop a TMDL to address the problem.<br><br>In 2002, USEPA added several water body-pollutant combinations to the State's adopted section 303(d) list. USEPA did not find that invasive species should be added to the section 303(d) list. The information provided regarding Caulerpa taxifolia did not indicate to USEPA that this invasive species was a pollutant or that water quality standards were exceeded.<br><br>Furthermore, beyond issues of current federal regulation and associated regulatory definitions, implementation of a TMDLs may not be the most efficient or appropriate way to address this type of biological problem. This is a natural biological process exacerbated by human activities where natural biological entities are translocated from one ecosystem to another. When an introduced species becomes invasive they can affect some specific designated beneficial uses of water but most documented impacts to beneficial uses due to degraded water quality are not caused by invasive species. Invasive species | No |

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| | | can prevent indigenous organisms from maintaining a 'balanced indigenous population' but this impact is not the result of a water quality parameter being affected. A TMDL attempts to restore degraded beneficial uses of waters by reducing pollutant load amounts from different sources into receiving waters. If the intent is to prevent further introductions of self propagating organisms or to stop introduced species from becoming invasive, then it does not seem appropriate to allow a predetermined load of nonindigenous organisms to be discharged by human activities into receiving waters. | |
| **DFED, Issue 5A: Interpreting Health Advisories** | | | |
| 2.12 | Prefer Alternative 2 for DFED, Issue 5A, unless the health advisory can be shown to be a one shot deal (accident, act of God, etc.). | Comment acknowledged. | No |
| **DFED, Issue 5B: Interpreting Data Related to Nuisance** | | | |
| 2.13 | Agree with the recommendation DFED, Issue 5B. | Comment acknowledged. | No |
| 43.17 | Congratulate the SWRCB because during the 2002 listing process, water segments were not recommended for placement on the section 303(d) list for nuisance conditions related to assessments of color, odor, excessive algae, and scum.<br><br>Many legacy listings related to nuisance remain on the list because they were carried forward from previous listings. These should be delisted and placed on either a pollution list or a pollutant identification list. Waters should not be placed on the 303(d) list unless pollutants identified are suitable for calculation. Suitability for calculation is a benefit of listing based on numeric water quality criteria. Agree with the staff-recommended alternative 3. | Several listings on the current section 303(d) list would not be placed on the list under the provisions of the proposed Policy. If the water body no longer satisfies the requirements to be listed for nuisance conditions these listings should be removed. | No |
| 51.111 | Many of the pollutants characterized as "nuisances" may pose serious threats to aquatic habitat, recreation, fishing, and other important beneficial uses. The FED recommended a nuisance rule that would use both quantitative and qualitative information. The policy should contain a procedure that allows both quantitative and qualitative data and information in the evaluation of nuisance. According to the FED: 'When qualitative information is combined with quantitative data related to pollutants, such as excessive nutrients, multiple lines of evidence provide strong support for placement on the section 303(d) list.' | The Policy has been revised to require the use of both qualitative and quantitative information. | Yes |
| 51.113 | Other types of nuisance conditions, including taste, color, oil, sheen, turbidity, litter, trash and odor -- when they are not related to nutrients -- may be listed when 'there is a significant nuisance condition when compared to reference conditions.' We support the use of reference condition approaches in evaluation | The Policy has been revised to include the use of reference condition approaches for these parameters. | Yes |

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| | of these parameters, and we request that this provision be expanded to include nutrients and nutrient-related nuisance conditions. However, other qualitative approaches may be useful in assessing nuisance conditions as well, which the draft Policy does not appear to provide for the use of. The draft Policy should be modified to explicitly provide for the use of other scientifically-based, qualitative approaches. | | |
| 60.64 | Supports recommended Alternative 3. | Comment acknowledged. | No |
| **DFED, Issue 5C: Interpreting Toxicity Data** | | | |
| 40.112 | Tables 5 and 6 must be updated with these following methods to be consistent with CFR Part 136.<br>- 4th edition freshwater short-term test methods (USEPA 2002a)<br>- 5th edition freshwater and marine acute test methods (USEPA 2002b)<br>- 3rd edition marine and estuarine short-term test methods (USEPA 2002c) | The FED has been revised to include this information. | Yes |
| 40.113 | Under the discussion of toxicity test methods, the text needs to be clarified that the ambient water tests are compared to either standard control waters or uncontaminated receiving water as specified in the testing manuals whereas the sediment tests are compared to a reference condition. | The FED has been revised to incorporate this change. | Yes |
| 40.114 | Reword the sentence on page 103, 'Currently no single toxicity test can adequately characterize the toxicity pollutants may cause in water or sediment.' Change to testing with multiple test species of fish, invertebrates and plant species is important as no one test species is most sensitive to all toxicants all the time (see page 59 of the TSD). | The FED has been revised to incorporate this change. | Yes |
| 40.115 | Under the discussion of assessing significant toxicity, the 2nd paragraph is an approach for the sediment testing scenario. However, for ambient toxicity (see USEPA 2000 section 6.4), should recommend a percent MSD (PMSD) to minimize within-test variability (Denton et al., 2003). As stated on page 108, "The MSD considers lab variation only and is specific to each toxicity test protocol." The MSD provides an indication of within-test variability and smaller values of MSD are associated with increased power to detect a toxic effect (Denton et al., 2003). The minimum significant difference (MSD) represents the smallest difference between the control mean and a treatment mean that leads to the statistical rejection of the null hypothesis (i.e., no toxicity) at each concentration of the toxicity test dilution series. | Calculation of the percent MSD is not necessary for measurements of toxicity on ambient waters. The percent MSD is calculated using a dilution series test. The MSD is more appropriate for ambient water toxicity testing because the results of an ambient water sample is compared directly to a reference or control water. | No |
| 40.116 | Denton and Narvaez 1996 is cited as finding that toxicity measurements should be obtained quarterly, for three years, to provide a good basis of health of the system, this sentence is taken out of context and needs to be clarified. | This statement has been removed from the FED. | Yes |

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| 40.117 | The section on persistence of toxicity needs to be rewritten to be accurate. Persistence of toxicity is typically examining whether a sample is persistent on the day of collection (baseline toxicity) compared to the sample being re-tested days later after being stored. What is needed is assessing the magnitude and frequency of toxicity. We disagree a higher false acceptance (alpha error) is not acceptable and appropriate for toxicity. The alpha error must be set at the specified level as discussed in the toxicity testing manuals of alpha error rate of 0.05. If any, regulators should be concerned with the beta error, that is not detecting toxicity when toxicity is present (USEPA, 2000). | The Policy has been revise to clarify persistence in water versus sediment. | Yes |
| 51.91 | At its most basic level, the toxicity section of the policy is inconsistent with existing Basin Plan standards, which address toxicity by requiring 'no toxics in toxic amounts.' The section should be revised to be consistent with the Basin Plans. | The provisions of the policy allows a listing for toxicity if there is toxicity alone or if there is toxicity with associated concentrations of pollutants at levels that cause or contribute to toxicity in the water body. This decision rule is consistent with toxicity objectives in the Basin Plans. | No |
| 51.92 | The draft Policy should require the use of lower effects level Sediment Quality Guidelines in addition to the 50% median level currently required when analyzing sediment toxicity for causative pollutants.<br><br>The restriction of using only SQGs that correlate with observing effects in 50% or more of the samples is far too restrictive for evaluation of all contaminated sediments throughout the State. The imprecise predictive capacity of SQGs cited as the reason the policy is restrictive is exactly why it is imperative that the RWQCBs also considered SQGs that represent lower toxicity probabilities in their analysis of causative pollutants. Lower effects level SQGs indicate that toxicity was observed in numerous species, based on rigorous scientific and statistical analysis. For example, NOAA's 'Effects Range Low' (ERL) values were calculated based on observing toxicity in 10% of all test species represented in a nationwide database. According to the researchers who developed the ERL/ERM approach, concentrations above the ERLs indicate possible toxicity. Since exceedances of lower effect SQGs such as ERLs represent statistically significant toxicity observed in a percentage of species, exceedances of lower effect SQGs should be considered as one line of evidence in the analysis of causative pollutants.<br><br>There are numerous situations in which restricted analysis of sediment toxicity to only ERM-equivalent SQGs could result in a failure to identify the pollutants causing the toxicity. For example, in situations where the sediment contains many different pollutants (which is often the case for sediment), if multiple pollutants exceed lower effects levels, it is highly likely these pollutants collectively are contributing to the toxicity, even if ERMs are not exceeded. In fact, SWRCB acknowledges that SQGs are most predictive of toxicity if several values are exceeded. Lower effect levels should also be considered if the toxicity is being observed in species that are particularly sensitive to benthic contamination, or for water bodies with special species of concern. For | ERLs and TELs are not highly or moderately correlated with biological effects in sediments. Only a small portion of the studies available show effects at these chemical concentrations in sediments. The likelihood of biological effects is low at the ERLs and TELs. No evidence is provided by commenter that synergistic effects of multiple low level chemical concentrations cause high levels of toxicity. If multiple ERMs, for example, are exceeded it is much more likely that toxicity will be observed. | No |

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| | example, the proposed ERM-based listing policy would allow sediments toxic to echinoderms (often the most sensitive category of marine organisms) without listing the sediments as impaired, thereby accepting this degraded condition.<br><br>We therefore urge SWRCB to require consideration in draft Policy Section 6.2.3 of exceedances of lower effects level SQGs, including NOAA's ERLs and Florida's threshold effects level (TELs), in addition to the higher effects-level SQGs, for identification of pollutants causing sediment toxicity, and revise the language in Issue 5C of the FED accordingly. | | |
| 57.2 | In many respects, the local 1998 and 2002 303(d) listing processes appeared to border on the capricious, due to pollutant listings that were unidentified (toxicity), the construction and demolition of new lists (watch), wholesale listings and delistings based on scant or dubious data, and conservative water quality objectives (extrapolated CTR standards). The final Policy document should settle much of the confusion that clouds what should be a transparency regulatory process, thereby allowing municipal agencies to concentrate on the most significant and achievable water quality issues. | Comment acknowledged. | No |
| 63.9 | Agree with the choice of Alternatives 2 and 3 in concert. However, the cause of toxicity should be rapidly identified in order for the problem to be solved. | Comment acknowledged. | No |
| 64.17 | Disagree that fewer exceedances are acceptable to support a listing for toxicity. | Comment acknowledged. | No |
| 77.10 | Four approaches are listed that may be used to determine which pollutants are responsible for observed toxicity. A lengthy discussion is provided for the first 2 approaches (TIE and SQG), a brief discussion is provided for the third (correlations), but no text is provided explaining the fourth (measures of toxicological response). Explanatory text is needed for this approach since 'measures of toxicological response' is particularly cryptic. Also, a toxicity unit analysis can be used to establish probable causality, but I am not sure this is among the list of 4 approaches provided. | The FED has been revised to remove the fourth section and to rely on the TIEs, sediment guidelines, or correlations to establish association between pollutants and toxicity or other impacts on organisms. | Yes |
| 77.11 | Table 11 does not indicate the literature source for the 'other sediment quality guidelines' given for lindane and total PAH. | The FED has been revised to include the source of this information. | Yes |
| 77.12 | This Issue states 'EqPs were developed for non-ionic chemicals and metals'. This is simply wrong. The EqP approach is totally unsuitable for metals. | The FED has been revised to correct the statement. | Yes |
| | **DFED, Issue 5D: Interpreting Sedimentation Data** | | |
| 2.15 | Agree with the recommendation. This type of pollution is so site/effect specific that a case-by-case consideration is better. | Comment acknowledged. | No |
| 8.15 | Adopt a policy that provides that river systems will not be listed for sediment | Comment acknowledged. | No |

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| | impairment unless there is quantitative scientific evidence that clearly and convincingly shows that the sediment conditions in the subject river are beyond the range of naturally occurring conditions. Existing policies have resulted in rivers with naturally high sediment loads to be listed on the basis that sediment is impairing salmonid reproduction even while these rivers are producing salmonids at what are considered record levels. Where populations have evolved under heavy sediment conditions, they have adapted, and to try to fix such natural conditions is a waste of public and private resources. | | |
| 8.16 | Support Alternative 2 instead of Alternative 1 under sedimentation. Specific guidance should be used in an effort to avoid unnecessary listings. Specific criteria may not be applicable throughout the state, however, the criteria must consider local conditions. | Comment acknowledged. | No |
| 8.19, 8.17, 110.6 | In the DFED, page 119, a mean based on a population of 60 cannot be averaged with a mean based on a population of one. Even if the studies were comparable, an assumption that may not be valid, the average that should be used would be very near to 21, not 15. Had this metric been subjected to public notice and hearing, it is likely an appropriate number would have been used, and perhaps some water bodies would not have been unnecessarily listed. | The studies were included to provide examples of what the RWQCBs have done in regard to sedimentation TMDLs in the past. The incorrect information has been removed from the FED. | Yes |
| 8.23 | If the understanding of sediments and it's effects on aquatic life is poor, a policy should not be adopted that leaves listing to bureaucratic discretion other than science. Necessary scientific efforts should be taken in order to make the appropriate decisions. | Comment acknowledged. | No |
| 10.16, 106.2 | Timber and agricultural proponents do not like the sediment science (thresholds) used [in the 2002 listing process]. This is because they do not like the cost in money to correct and fix problems. The science that was used was more than sufficient - with use of multiple lines of evidence (with biologic and function impairment scientific references) and best professional judgment. There was not a lot of evidence on sediment monitoring in all the files of the listed rivers. But, the multiple lines of evidence and scientific discussion supported the listings. Now, almost 10 years later and with more sediment monitoring and assessment, the monitoring data and science metadata is huge. In fact, if one were to review recent Timber Harvesting Plans (THPs) (Coast Cascade Region/North Coast Rivers) in any sediment listed watershed, the evidence can be in almost any THP that the watercourses and major drainages are suffering from ongoing impacts (sediment accumulation, loss of habitat, pool filling) from historic and near-recent timber harvest operations. | Comment acknowledged. | No |
| 13.11 | Bedrossian and Custis (2002) concluded that natural/background rates of sedimentation for North Coast watersheds range from 300 to 3000 tons/square mile/year in Franciscan terrain. This wide range in sediment | The requested change is too vague to be easily implementable. However, the public process required by the Policy will bring out those situations when inappropriate extrapolations or methods are proposed. While the Policy | No |

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| | generation makes it very difficult to take absolute values from peer reviewed papers in one area and extrapolate them to another area. In adopting the proposed policy, the SWRCB should state that it is not the intent of the Board that inappropriate extrapolations or inappropriate methods be used in formulating sediment quality guidelines. | provides RWQCBs significant flexibility in selection of sedimentation guidelines, the guidelines used must be justified in fact sheets. | |
| 43.19, 60.66 | Staff-recommended Alternative 1 seems reasonable. Given the complexity and variability of sedimentation, general guidelines are appropriate. | Comment acknowledged. | No |

## DFED, Issue 5E: Interpreting Temperature Water Quality Objectives

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| 2.16 | Agree with the recommendation for DFED. Flexibility is needed to deal with case-by-case specificity. | Comment acknowledged. | No |
| 8.18 | Concerned with the evaluation of temperature data, in most cases, the input of thermal energy to water is not the result of human activity, cannot be controlled and should not be considered a pollutant unless artificially heated water is being discharged into the State's waters. Despite these concerns, it is recognized that it is impossible to determine whether most water bodies are affected by temperature pollution because there exists no evidence of the historic temperatures. This raises serious doubts as to the validity of a listing based on temperature. Even so, if the Policy is going to use evaluation of beneficial uses to determine thermal pollution, the adapted Policy should establish numeric objectives based on application of scientific, peer reviewed research that considers the differences in temperatures based on drainage area, stream size, geographic location, climatic conditions, elevation and other relevant factors. Numeric criteria must be based on an understanding of the needs of organisms that have evolved in the climates where we intend to regulate. The costs of listing should not burden this state based on inference and assumption about how cool the water in California used to be. | Comment acknowledged. | No |
| 43.20, 60.67, 60.68, 76.44 | In most circumstances, natural receiving water temperature is not defined. The water temperature of streams varies greatly. Also, flood control channels should not be subject to a temperature requirement. Concerned about what sort of waterbody this would apply to; it should not apply to intermittent streams, effluent-dominated waters, or flood control channels.<br><br>Alter recommended alternative 2 to state that a water segment may only be placed on the 303(d) list if a specific thermal discharge is identified. If no specific thermal discharge is identified, a water segment may be place on a Pollution List. | Basin Plans identify waters where water quality objectives for temperature apply. In virtually all waters, 'historic' or 'natural' temperature background data are not available. Alternative approaches are proposed to make sure potential impacts of increased water temperature are addressed in the Policy. It is too limiting to require that a specific, presumably point source, would have to be identified before listing could occur. Nonpoint sources may cause or contribute to temperature-related impacts. The identification of water quality limited segments is not based on the source of the pollutant but rather on whether water quality standards are attained in the water body. | No |
| 51.89 | The listing factors in the draft guidance should be revised to include the following statistical decision rule for temperature and dissolved oxygen: | The recommended decision rule provides an approach that appears to contradict Basin Plan water quality objectives for temperature. The Policy is | Yes |

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| | Ordinarily, water segments shall be placed on the section 303(d) list when numeric water quality objectives for temperature and dissolved oxygen are exceeded in more than one seven-day average of daily maximum (for temperature) or minimum (for dissolved oxygen) measurements.<br><br>Temperature and dissolved oxygen vary on an annual cycle, and cause impairment only when there is too much or too little in the water. Water quality standards are designed to address the highest temperatures of the year and the lowest dissolved oxygen levels of the year, which generally occur during summer months, or sometimes fall months for dissolved oxygen. Therefore, any assessment decisions should be based on the highest and lowest measurements of these pollutants, respectively. When continuous monitoring data are available, the seven-day average of daily maximum (for temperature) or minimum (for dissolved oxygen) measurements should be assessed. When continuous monitoring data are not available, but data are available from at least seven days in any 30-day period, the average of the highest (for temperature) or lowest (for dissolved oxygen) measurement on seven consecutive days on which measurements were taken should be assessed.<br><br>Sometimes, the data available for a water segment will be inadequate to properly evaluate temperature and dissolved oxygen under this approach. When data are available from fewer than seven days in any 30-day period, the highest (for temperature) or lowest (for dissolved oxygen) single measurement within that period should be assessed. A water segment should be placed on the 303(d) list for temperature or dissolved oxygen when these data show a violation of the water quality standard on at least one day in at least three different years.<br><br>Under the water quality standards, a measurement of temperature (or other pollutant) in excess of a standard is not a violation of the standard if the exceedance results from natural conditions. In the case of temperature and dissolved oxygen, when natural conditions exceed the standard, listings will be based upon human contributions in excess of natural background. All relevant natural conditions issues relating to temperature and dissolved oxygen for which data or other evidence are available, such as peak hourly temperature increases and extreme air temperatures should be considered. The hottest days or years should not automatically exempt a water segment from consideration for listing based on temperature. | not intended to address revision of any water quality standard but, rather, to interpret the standards as they are presented in Basin Plans, statewide Plans, and regulation.<br><br>The RWQCB Basin Plans water quality objectives for temperature and dissolved oxygen should be used. The Policy provides additional guidance in the Implementation section to assess impacts on beneficial uses related to increased water temperature. This section compliments the Basin Plan objectives and provides an approach that may be more straightforward to document than exceedance of water quality objectives based on background temperature conditions.<br><br>Revisions have been made to the Policy to incorporate the suggested approach for using the minimum dissolved oxygen conditions. The use of the 7-day average for temperature is incorporated in the MWAT approach already included in the Policy. Using this averaging period when allowed by the standards, helps to make the measurements more independent. The suggested rule for small data sets conflicts with the intent of balancing errors described in the response to comments related to statistical testing and, therefore, has not been used. | |
| 63.10 | Temperature varies with the shallow nature of Southern California streams that may have nothing to do with discharges, but are the natural condition of arroyo type systems. This natural condition could result in erroneous exceedances, and define a critical condition. Please consider providing specific guidance on the topic of temperature in dry streams for southern California streams that have low flows naturally at certain times of the year and in conflict with the critical | The suggested change seems to be focused on changing water quality objectives for temperature to better address intermittent or shallow water conditions present in many southern California streams. Modifying or developing new water quality standards is beyond the scope of the Listing Policy. | No |

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| | conditions. | In general, Basin Plans describe allowable changes in water temperature. For example, the Los Angeles RWQCB Basin Plan water quality objective for temperature states 'the natural receiving water temperature of all regional waters shall not be altered unless it can be demonstrated to the satisfaction of the Regional Board that such alteration in temperature does not adversely affect beneficial uses. Alterations that are allowed must meet the requirements,' in the Basin Plan. The key provision that must be evaluated by RWQCB is what is considered to be natural receiving water temperature. Since low flow conditions are so prevalent, these must be considered by RWQCBs. | |

## DFED, Issue 5F: Interpreting Data Related to Adverse Biological Response

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| 2.17 | Agree with the recommendation. This is too complex for use of a simplified approach. | Comment acknowledged. | No |
| 43.21, 60.70, 60.69, 76.45 | In 2002, listings for adverse biological responses were not recommended. These should be on another list. Water bodies should not be listed for a condition without identification of a pollutant. Adverse biological response may be an indication that there is a problem, but the pollutant is not identified.<br><br>Disagree with the staff-recommended alternative 1. A Pollutant Identification List is the appropriate list for water segments for which no pollutant has been identified. | The Policy does not allow listings related to this factor unless the pollutant is identified. The general guidance recommended for interpreting biological response requires the comparison endpoints to reference conditions, the identification of pollutants suspected of causing or contributing to the adverse response, and to associate the pollutant with an adverse response. | No |
| 51.164 | The Policy does allow the use of a reference system approach for evaluation of adverse biological response (Section 3.1.8). This type of approach, along with other scientifically-accepted methodologies should be allowed by the draft policy for consideration of listing related to sedimentation and degradation of biological populations and communities, in addition to adverse biological response. | The draft Policy and FED has been revised to allow the use of reference system approaches for assessments of biological populations and communities and for impacts related to sedimentation. | Yes |
| 56.22 | Support the requirement to assess multiple lines of evidence for this listing factor, and urge the SWRCB to exercise caution when evaluating adverse biological response, because, as acknowledged in the draft FED, 'These types of data are typically water body-specific; often are not collected using standard procedures: are usually the result of research projects; and are not part of major ambient monitoring programs.' | Comment acknowledged. | No |
| 63.11 | The Policy does not take a sound scientific approach to the issue of Interpreting Data Related to Adverse Biological Response. The SWRCB should adopt Alternative 2. Specific guidance and evaluation tools to interpret this data are needed. | The data and information used to interpret adverse biological response is diverse, therefore, it is very difficult to provide specific guidance. Many types of data and information could be used to determine the biological effect (e.g., reproduction, histopathology, growth, etc). If specific guidance was used it would eliminate potential sources of data to address and assess the impact. General guidance provides the flexibility necessary to address a variety of | No |

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| | | circumstances. | |
| 77.13 | The title is awfully vague. This issue seems to be a 'catch-all' section addressing responses ranging from individual growth rates to carcinogens. Agree as the text points out, that with measurements of this type it is particularly important that there be strong evidence that the adverse effect is due to a pollutant before these data are used in 303(d) listing. | Comment acknowledged. | No |

## DFED, Issue 5G: Degradation of Biological Populations or Communities

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| 2.18 | Agree with the recommendation. | Comment acknowledged. | No |
| 43.22, 60.71, 76.46, 76.47 | Disagrees with the recommended Alternative 4, as well as the other three Alternatives. While bioassessments provide important information about water quality, they are not sufficient for listing. These sorts of assessments should be used in developing 305(b) reports. Pollutants must be identified to justify listing on the 303(d) list. | The FED does not recommend bioassessment as a lone listing factor. The FED recommends that proposed listings using bioassessment data need multiple lines of evidence; association with water or sediment concentrations of pollutants is required. | No |
| 56.23 | Support SWRCB's requirement to use bioassessment data and information only if it is associated with water and sediment measurements. However, the assessment of water bodies based on these listing factors can still be problematic due to the reliance on comparison of the response or community structure to that of a reference condition. Although, the draft FED provides some guidance on reference site selection and use, the selection of appropriate reference sites is difficult (e.g., highly urbanized watershed), yet critical to the determination of impairment. | Selection of appropriate reference sites is critical to the determination of standards attainment. The FED provides only general guidelines on reference site selection which may provide assistance to the RWQCBs in the development of their bioassessment programs. | No |
| 56.24, 64.20 | The FED provides some guidance on selection of reference sites. Concerned that: a determination may need to be made that a reference site represents the best attainable condition, how will this be determined? Comparison to reference sites may be difficult because ecologically more differences (due to factors not accounted for) could be found as sample size increases. | "Best attainable condition" refers to the selection of a reference site using the judgement of RWQCBs based on the site-specific factors present in a water body. Specific guideline cannot be proposed because of the diversity of water bodies in the State. The effectiveness of biological monitoring programs rest on choosing biological attributes that provide consistent and reliable signals about the resource condition. A successful biological monitoring program demonstrates that an attribute has a reliable empirical relationship--a consistent quantitative change--across a range, or gradient, of human influence. Comparison to reference sites is difficult but RWQCBs can optimize their comparisons by focusing on sampling design prior to the initiation of sampling and culminating with the use of indexes to compile and evaluate large amounts of biological data for evaluation. Sampling design will largely be determined by the region-specific needs of the RWQCBs but will include a determination of the site-specific or potential problem, the monitoring objective, and the availability, quality and applicability of information. A good sampling design also considers seasonal and spatial variation in the water body, sample representativeness, and variations in magnitude, duration, and frequency. | No |

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| | | Further, RWQCBs will select appropriate water quality indicators based on the potential for impacts on specific beneficial uses of water. | |
| 56.25 | Reference sites may be difficult to determine because the site may be changing independently from the test site, due to factors other than water quality, however it may appear that the test is impaired due to the difference between it and the reference. | The general guidelines in the Policy should provide assistance in the selection of reference sites. However, reference site selection is dependent on many site-specific factors that cannot be adequately captured in the Policy (e.g., identification of least disturbed areas). Once reference sites are selected, biological surveys are necessary to evaluate the biological integrity of the site. Establishing the reference site condition provides the necessary information for making comparisons and for detecting impacts on beneficial uses. Monitoring of the reference site should remain a part of the bioassessment program; in which case, changes in the biological integrity of the reference site would be noted before comparisons would be made to test sites. | No |
| 64.19 | Supports the requirement to use bioassessment data and information only if associated with water and sediment measurements. | Comment acknowledged. | No |
| 77.14 | Benthic Macroinvertebrate Index discussion is ubiquitous. The text is referring to the macroinvertebrates and not the index. | The text has been revised to refer to the macroinvertebrates and not the index. | Yes |
| 77.15 | Alternative 4 is given as the preferred alternative, but it is not clear what alternative 4 is. The title of the alternative implies there has to be some linkage of bioassessment data with simultaneously collected chemistry data, yet there is never any mention of this linkage throughout the discussion. Similarly, the title indicates some requirement to do 'association assessment', but there is no further discussion of this assessment. Instead, the entire text is dedicated to how to choose a reference site and a listing of the type of biota that one might want to assess. | The alternative failed to clearly establish the link with Issues 5C (Toxicity) and 5D (Sedimentation). These issues contain the full discussion of chemistry data in water and sedimentation. Alternative 4 has been revised to make this link and discuss the importance of association assessment. | Yes |
| 77.16 | Alternative 4 discussion is an over-emphasis on superficial primary issues on how to do environmental assessments. I question whether this basic information is relevant to the question of what data can be used for 303(d) listing. Certainly one would want to use bioassessment data that included an appropriate reference site, but does this document need to spend pages describing how to pick that reference site? It is possible to go too far in describing how to do the assessment, and this document has done so. Its length could be substantially reduced if it assumed the reader had a greater a priori understanding of environmental assessments or let the reader obtain such information from other sources. | The information on the selection of reference site and indicator species was presented to provide RWQCBs with a reference on environmental assessments. There is not yet one environmental assessment method adopted in California and many RWQCBs approach bioassessment using different methodology. This information was presented in the interest of capturing available approaches in one place. | No |

## DFED, Issue 5H: Trends in Water Quality

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| 1.14, 1.13, 30.9, 57.7, 202.7, 212.8 | The discussion on trend analysis should be expanded to consider trends in meteorological conditions, such as extended droughts or increasing temperature | These factors are already required under the data quantity assessment section of the Listing Policy. Data and information to substantiate the decline of water | No |

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| | regimes, which may exacerbate or improve contaminant concentrations. There are no widely accepted approaches for documenting trends, and the data is often difficult to interpret. | quality require the application of non-standard trend analysis approaches to account for such factors as seasonal or weekly systematic variations, autocorrelation of the data due to interventions, or sampling procedural changes. There are many widely accepted trend analysis approaches available but the use of any specific approach will depend on the data available for analysis or specific characteristics associated with the data. Providing specific guidance may not allow the use of the most appropriate trend analysis approach. For this reason only general guidance on how to address trends in water quality has been provided. | |
| 2.19 | Agree with the recommendation. | Comment acknowledged. | No |
| 5.10, 9.3, 12.10, 18.95, 19.11, 21.27, 29.8, 39.4, 40.17, 40.104, 41.8, 41.7, 43.24, 47.11, 51.55, 51.59, 60.72, 60.28, 64.10, 64.8, 67.3, 68.3, 74.5, 76.15, 76.48, 208.7, 212.7 | The use of trends in water quality as a basis for listing water segments is opposed. The use of such a basis allows water segments to be listed in the absence of information that water quality standards are exceeded or that beneficial uses are impaired. | The Policy provides general guidelines for listing waters due to declining water quality. Waters that currently meet water quality standards but where a declining trend in water quality can be substantiated should be listed when a second line of evidence (e.g., adverse biological responses, degradation of biological populations and/or communities, or toxicity) supports determination of water quality impacts. The Policy does not allow listing waters with declining water quality by itself unless there is additional evidence showing that beneficial uses of such waters are being impacted. This is consistent with the provisions of the federal antidegradation policy.<br><br>When substantiation of a declining trend in water quality or the second line of evidence cannot be established the information remains recorded in fact sheets but no judgement will be made on their disposition. This information will be useful in the development of the section 305(b) report. | No |
| 10.24, 13.5, 18.31, 19.10, 21.28, 40.106, 40.105, 40.103, 40.18, 51.60, 71.17, 108.10 | The requirement that adverse biological response, degradation of biological populations or toxicity is observed is too onerous because most water quality monitoring does not include these more expensive and sophisticated tests. Under this policy, many water bodies with declining water quality would not be listed because these tests were not conducted. Importantly, there would be a disincentive to perform these tests or assessments. The end result of this policy would be a severe impact must be observed before the State can determine that antidegradation requirements are being violated. This is unacceptable and in violation of the antidegradation requirements of the CWA and State policy, and as a result the requirement that staff must '[d]etermine the occurrence of adverse biological response, degradation of biological populations and communities, or toxicity' must be removed from the list of requirements the RWQCBs must meet to list a water body for declining trends in water quality. | The Policy requires that any decline in water quality be supported with data and information confirming that beneficial uses are being impacted. A declining trend in water quality is usually caused by the gradual increase of one or more pollutants in the receiving waters. However, it is possible to detect an increasing trend in pollutant concentration, and consequently a decline in water quality, without a water quality objective exceedance. In the absence of a water quality objective exceedance it is important that additional evidence is used to document that water quality impacts are actually occurring. The substantiated decline in water quality plus associated data and information pertaining to either adverse biological response or evidence of degradation of biological populations and/or communities helps list such waters in a more consistent, scientifically defensible manner.<br><br>The approach proposed in the Policy is consistent with federal antidegradation requirements. Federal antidegradation policy applies to situations where existing water quality may be changed. These situations include: establishment or revision of water quality objectives, changes in water quality objective implementation procedures, permit and waste discharge requirement decisions, | No |

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| | | some cleanup and abatement orders, remedial action plans, waivers or exceptions from Plans, and water right decisions. Where the antidegradation policy applies, it does not absolutely prohibit changes in water quality. The application of the policy depends on the conditions existing in water bodies. The antidegradation policy (40 CFR 131.12) lays out a three-tiered approach for the protection of water quality. 'Tier I' (40 CFR 131.12 (a)(1)) of antidegradation maintains and protects existing uses and the water quality necessary to protect these uses. 'Tier II' (section 131.12(a)(2)) protects the water quality in waters whose quality is better than that necessary to protect 'fishable/swimmable' uses of the waterbody. Outstanding national resource waters (ONRWs) are provided a high level of protection under the antidegradation policy ('Tier III').<br><br>The focus of the Listing Policy provisions related to trends is focused on determining compliance with Tier I or Tier III. In general, States must assure protection of beneficial uses, including aquatic life. Reductions in water quality (declining trends) should not be allowed if this change would result in serious harm to any species found naturally in the water. Water quality must be maintained at levels that results in no mortality or significant growth or reproductive impact of resident species. If numeric water quality standards are met but there is a declining trend (the prohibited change in water quality) and beneficial uses are impacted, the antidegradation portion of standards is not met.<br><br>Tier II waters are not addressed under the Listing Policy because (1) no action or activity is being proposed that would require a finding that the lowered water quality is necessary to accommodate important economic or social development in the area in which the waters are located, (2) beneficial uses are not impacted, and (3) numeric water quality objectives are achieved. | |
| **DFED, Issue 6: Statistical Evaluation of Numeric Water Quality Data** | | | |
| 1.21 | To address inherent sample bias, a note should be added to indicate that the sample population is representative of the criterion being measured. | The FED has been revised to incorporate this change. | Yes |
| 2.20, 43.23, 60.73, 76.49 | Agree with the recommendation. | Comment acknowledged. | No |
| 10.7, 18.4, 20.5, 20.10, 21.10, 21.14, 37.6, 51.75, 53.20, 53.6, 66.2, 101.7, 104.5, 106.4, 221.2 | Under the SWRCB's draft Policy, it will become extremely difficult, if not impossible under the current level of funding for water quality monitoring in the State, to develop the necessary information to list water bodies or waterbody segments that are truly impaired - i.e., do not meet water quality standards. | The provisions of the draft Policy identifies the data and information needed to create a credible section 303(d) list. The draft Policy was not developed considering the existing levels of monitoring efforts available to SWRCB and RWQCBs because the level of funding for SWAMP and other monitoring efforts fluctuates from year to year. The requirements of the draft Policy set the target for the kinds and amounts of monitoring and the statistical | No |

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| | | procedures that are necessary to ensure that the decisions made, based on inferences from sample data, are as error free as possible to support placement or removal of waters from the section 303(d) list. These statistical tools help increase the confidence and power of the available data and information evaluated to make section 303(d) listing decisions. | |
| 13.9, 51.166, 104.7, 218.5, 218.4, 218.2, 218.3 | Volunteers sampled the San Gabriel River for contamination and found elevated levels of zinc. They found 4 out of 26 samples contained zinc at dangerous levels. And zinc is a toxin. It poisons aquatic wildlife. Under the proposed guidance policy, you would need six samples of zinc exceedances to meet the requirements of the binomial approach. So again, we have an example of a waterway that is clearly contaminated, has a lot of community investment, yet it would never have been put on the list to get cleaned up in the first place and is in danger of falling off the list if the suggested revisions are implemented. | Several comments focused on the specific data in creeks and the amounts of data available for these waters. These comments are based on the unfounded premise that the water body in question is impaired. How can the commenter know this with assurance? In contrast, the proposed Policy lays out a scientifically-defensible procedure to establish if a water body is not meeting water quality standards. Other valid, albeit less preferable, alternatives are possible and have been discussed in detail in the draft FED. But until a valid procedure is applied, the conclusion that a water body does or does not meet water quality standards is premature.<br><br>Concerning the San Gabriel River example, the draft Policy requirement has been revised. At least three exceedances out of a sample of 26 needs to be seen in order to list the water body, this requirement is statistically valid. It ensures that on the average over five percent of possible water samples from the River will exceed the zinc standard with at least 80 percent confidence. A decision to list based on a sample with four exceedances would meet the desired level of assurance. | No |
| 20.4, 21.7, 21.6, 21.8, 21.16, 21.9, 40.67, 40.2, 40.16, 40.7, 102.9, 104.3, 105.6, 109.5, 109.19, 109.1, 222.2 | The Policy ignores water quality standards, especially with respect to toxicity and the CTR toxic pollutants. It violates USEPA regulations that require the state to develop existing and readily available data. | SWRCB has been criticized by USEPA and others for not interpreting toxics WQC consistent with the expressed frequency of the criteria. Specifically, USEPA has said 'acute and chronic standards are not to be exceeded more than once in every three consecutive year period.' SWRCB staff reviewed the provisions of the CTR (40 CFR 131.38(c)(2)(iii)) and the exceedance frequency is stated as:<br><br>1. For acute criteria: 'CMC ... is the water quality criteria to protect against acute effects in aquatic life and is the highest in stream concentration of a priority toxic pollutant consisting of a short term average not to be exceeded more than once every three years on the average.'<br><br>2. For chronic criteria: 'CCC ... is the water quality criteria to protect against chronic effects in aquatic life and is the highest in stream concentration of a priority toxic pollutant consisting of a 4-day average not to be exceeded more than once every three years on the average.'<br><br>The CTR appears not to be expressed as a maximum not to be exceeded value but rather as an average. USEPA documentation related to the development of the CTR and water quality standards in general acknowledge that the exceedance frequency is 'on the average' (USEPA, 1999c; USEPA, 1991f; | Yes |

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USEPA, 1994d). Guidance documents related to the section 303(d) listing process describe the frequency portion of the WQC as a maximum (USEPA, 2003b; USEPA, 2002a; USEPA, 1997c).

Exceedance frequency is not amenable to averaging like continuous data. However, exceedance frequency can be averaged as a proportion. The binomial distribution works well with these kinds of data. The average of a binomial distribution is the number of samples times the proportion of samples exceeding the value. To get an average of 1 with n = 3 (years), p has to equal 0.33. One exceedance each year over the 3-year period would be allowed. A water would be listed if more than three hits are observed during a 3-year period.

Another way to interpret the 'on the average' phrase is that the 'once every three years on average' is based on the recovery time for various aquatic life organisms. The USEPA Technical Support Document (TSD) (1991f) describes that macroinvertebrates may recover in less than two years; whereas, fish may require two or more years to recover.

Alternatively, once every 3-years on the average might be extended to mean three times in nine years is acceptable, using this scenario--three exceedances occur in the first 3-years and followed by no exceedances during the next six years, thus the aquatic life has recovered sufficiently. If the scenario is reversed, that is three exceedances were to occur in the most recent years (out of 9), then this would be considered impaired water quality conditions at present and sufficient reason to list the waterbody.

Thus one exceedance is allowed per 3-year period and multiple 3-year periods are necessary to determine the average.

Neither of these interpretations are particularly clear cut. The TSD seems to say that more than one excursion during the average period is acceptable and the only averaging period mentioned is 3 years (i.e., Appendix D (p. D-4): 'The purpose of the average frequency of allowed excursions is to provide an appropriate average period of time during which the aquatic community can recover from the effect of the excursion....') 'Excursions' seems to acknowledge that more than one is acceptable. Other parts of the TSD (p. 124) says that more than one violation of a effluent limit is allowed on a shorter time frame: '...EPA recommends that monthly average limitation violations be reviewed ... whenever two or more violations occur in a 6-month period. Seven-day average and daily maximum violations should likewise be reviewed if a minimum of two or four, respectively, occur during the course of 1 month.' Effluent limits are different than WQC but it seems impossible for effluent limits to be exceeded more frequently than WQC and still be in compliance

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| | | with a once-in-three-year maximum.<br><br>The TSD also acknowledges that most excursions will be minor and will be difficult to detect. The TSD states: 'These data indicate that as a general rule, the purpose of the averaging frequency of allowed excursions will be achieved if the frequency is set at once every 3 years on the average.' (Appendix D, p. D-5). An averaging frequency is not an average unless there is more than one value and 'excursions' seems to indicate that more than one excursion is needed.<br><br>For section 303(d) listing purposes the sensible, workable, practical, and logical interpretation is to use the available data collected in usually relatively short time frames (<3 years) to make decisions on whether to place waters on the list. Perhaps the most clear way to resolve this matter is to use one of the CALM guidance (USEPA, 2002a) approaches for statistical guidelines to interpret chronic and acute criteria. In Table 4-3 of the guidance, USEPA compares acute and chronic criteria, associated exceedance frequencies, and example statistical approaches for analyzing chemical data. For these criteria, USEPA recommends using the binomial test with a 5 percent exceedance frequency and a 15 percent effect size where alpha and beta errors are held at <0.15. Presumably, this analysis corresponds to the USEPA-derived averaging frequency for acute and chronic criteria.<br><br>This approach should be used to determine compliance with CTR and similar chemical water quality objectives. The FED and Policy have been revised to include the CALM guidance recommendation regarding error balancing. The response related to balancing errors is more thoroughly presented in Issue 6 of the FED. | |
| 21.67 | Emphasis on developing statistical evaluation of data is wrong. Most statistical manipulation of water quality data does not properly reflect how chemicals impact aquatic-life-related beneficial uses of water bodies. Toxicity is based on a concentration of toxic chemical forms-duration of exposure relationship for a particular chemical and type of organism. The USEPA national criteria and state standards based on these criteria are designed to be protective in all types of waters and for most organisms types. | Reliance on statistical inference is a valid approach to take when dealing with water quality sample data. Without complete knowledge of the water body in question, investigators must rely on samples. This introduces uncertainty. Only statistical analysis gives investigators some quantifiable level of assurance in conclusions based on samples. | No |
| 22.3, 22.1, 25.3, 38.10, 44.1, 47.3, 48.2, 60.45, 63.2, 64.6, 71.14, 71.23, 71.19, 71.20, 72.3, 72.1, 72.5, 72.2, 76.28 | Strongly supports the use of a standardized statistical approach for data analysis as well as a requirement to clearly document the weight of evidence that is needed to list and de-list a waterbody. Historic listings have at times been made with less than adequate documentation of an actual impairment. | Comment acknowledged. | No |
| 38.9, 59.2 | The precautionary principle mentioned by other commenters during the | Comment acknowledged. | No |

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| | hearings is an extreme precaution that fails to base environmental threat or harm on evidentiary standards or procedural criteria. | | |
| 47.5 | The 303(d) list developed by the final listing policy should only contain water segments with real water quality problems. Rather than maintaining an approach where virtually 'anything and everything' is placed on the TMDL list, regardless of the technical or objective merit for doing so, it is vital that the SWRCB establish a credible 'triage' approach that achieves the most benefit for the resources dedicated. | Comment acknowledged. | No |
| 51.48, 105.4, 217.5 | The bias in the Policy is evident in every statistical option chosen (in the FED)--in selection of the confidence internal, the so-called critical exceedance rate, the null hypothesis, the binomial method, and minimum sample size. For all of these decisions for which an array of choices is available, the policy always picks the choice that will reduce the chance of not listing unimpaired water bodies over the chance of failure to list impaired water bodies. | As outlined in the FED, the statistical alternatives proposed are intended to, if at all possible, reduce the chance of incorrectly listing a water body that is truly meeting water quality objectives. The second type of error, that of failing to list a truly impaired water body, can be controlled with larger sample sizes, larger effect sizes, or greater type I error rates. The Policy has been revised to include an approach for balancing the statistical errors. | Yes |
| 51.56, 51.58, 51.57 | The FED readily admits that the statistical method of establishing the 303(d) list will remove currently listed water bodies from that list without any new information that demonstrates that water body is not truly impaired. The resulting abandonment of TMDLs and their attendant waste load allocations for these previously listed water bodies would, or at least could potentially, result in an increase in mass emissions of pollutants to these water bodies over and above what would be allowed with a TMDL was in place. This increase in emissions is sufficient to trigger the state's antidegradation policy. | The Policy, as revised, would likely result in fewer listings. However, the provisions of the Policy on the section 303(d) list have no effect on existing permits. Consequently there would be no change in discharges if waters were not placed in the section 303(d) list. Antidegradation requirements apply independently of the Policy. Nothing in the Policy allows greater or less mass emission from point sources. Placement on the section 303(d) list does not control or prevent pollutant discharge. | No |
| 51.73 | The methodology is virtually impossible to administer from a practical perspective. As noted in the NRC report, 'water quality standards must be measurable by reasonably obtainable monitoring data.' Data-hungry models cannot be the sole method by which water quality is assessed in situation where the state lags in monitoring. The NRC Report agrees, stating that government 'should not advocate detailed mechanistic models for TMDL development in data-poor situations. Either simpler, possibly judgmental, models should be used or, preferably, data needs should be anticipated so that these situations are avoided.'<br><br>The draft Policy appears to assume that California has a database of surface water quality information capable of supporting numeric calculation requirements such as those set forth in the Policy. This is not the case. California currently relies upon anarchy as a data management strategy for surface water quality information. Because of this fact, the draft Policy as written cannot be implemented on a consistent statewide basis.<br><br>One step California must take in order to begin to implement numeric requirements associated with a Policy of this type in a defensible fashion is to | The process described in the Listing Policy for summarizing data and information was implemented by SWRCB staff during the development of the 2002 section 303(d) list. During that process over 1,000 fact sheets were developed using a variety of information.<br><br>Work to develop a database to hold all data continues through SWAMP. Storing other information has been challenging and is continuing to be addressed in revisions and updates of the Geo-spatial Water Body System.<br><br>A data system that holds absolutely all data and information is not necessary for SWRCB and RWQCBs to implement the statistical provisions of the Listing Policy. Data evaluation can occur on a case-by-case basis depending on the decision rules of the policy. The NRC comments on the types of modeling to use for TMDL development are not relevant to the concepts presented in the Listing Policy which is focused exclusively on the development of the section 303(d) list. | No |

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| | follow the lead of other states that utilize the *USEPA STORET* water quality data management system. SWAMP is moving forward to implement STORET compatibility, but this will solve only a portion of the problem; better integration of other available data will be necessary before the state can begin to even consider a statistical methodology as data-hungry as the one proposed. | | |
| 57.6 | The statistical methods identified in the draft Policy are probably the most important aspect of this document. They have the potential to eliminate the perception that some listings have been set arbitrarily, or that delisting is overtly onerous and subject to political decisions that cannot be rationally objectified. With this in mind, we encourage the SWRCB staff to carefully review the descriptions and clarify their meanings to the greatest degree possible. The final policy should include additional language with respect to analytical limitations and the confusion resulting from matrix effects, detection/quantification limits and the impact of dubious data for one parameter (hardness) on the standards applied to other correlated parameters (metals). | Comments acknowledged. | No |
| 84.1 | Support the SWRCB's goal of establishing a standardized approach for assigning water bodies to the 303(d) list, including requirements for consistent statistically valid data evaluation, requirements for data quality and quantity, and implementation provisions. | Comment acknowledged. | No |
| 102.4 | The FED does not explain the methodology by which the proposed binomial model was developed, its implications, and the policy decisions behind it. The documentation does not show how this statistical model actually identifies impaired bodies because it does not do so. | The FED presents in detail the rationale and alternatives for the proposals made in the Policy. In FED section 6 the choice of whether to analyze numeric data is discussed. The FED then goes on to examine how data should be analyzed by looking at the initial hypothesis to analyze, the statistical test to use, the level of statistical confidence and power desired, the rate of exceedance judged critical for listing or delisting, and the minimum sample sizes required. The FED presents a transparent outline of the issues and procedures involved in analyzing numeric water quality data. | No |
| 107.6 | Use of scientifically defensible procedures for measurements and assessments provide a level of confidence equal to that for the listing factors in Section 3.1 and the proposed use of the 'standard' null hypothesis (i.e., water is not impaired). Statistical testing of a null hypotheses is not the only method of human reasoning. It can be problematic in many situations. | Statistical analysis is a recognized and objective way to analyze numeric information so that a level of assurance can be identified and quantified. | No |
| 111.7 | Based on a recent District Court opinion in the Florida case, the binomial approach is not a revision of water quality standards. | Comment acknowledged. | No |
| 202.6 | Encourage review of the statistical methods to clarify their meaning to the greatest degree and provide additional language to clarify any analytical confusion to the matrix effect, detection quantification limits, and impact of core data about one parameter or another. | Effort has been made to satisfy this comment in the draft Policy and FED. Several revisions have been made to clarify the descriptions of the statistical tests and concepts behind the tests used. A Definitions section has been added to the Policy in response to this comment. | Yes |

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| **DFED, Issue 6A: Selection of Hypotheses to Test** | | | |
| 2.21 | No comments. The details of statistical analysis are outside my area of expertise. | Comment acknowledged. | No |
| 3.1 | Discussion conforms to standard statistical theory. | Comment acknowledged. | No |
| 10.1, 10.2 | It is important for the management water resources that waters that do not meet water quality standards are listed, promptly, so that the planing process for protecting and restoring these resources may commence, and the heath, safety, and welfare of the citizens of California are protected. | Comment acknowledged. | No |
| 18.59, 40.57, 51.47, 51.64, 51.162, 51.35, 102.13, 102.14, 102.3, 103.1, 103.4, 108.11 | The Draft Policy chooses as the statistical null hypothesis to be tested that a water body meets water quality standards. This alternative is counter intuitive and inconsistent with other water quality programs such as the Surface Water Ambient Monitoring Program and TMDL Guidance. It creates a disincentive for the regulated community to monitor because less monitoring will likely to result in fewer listings.<br><br>The alternative premise, that a water body does not achieve water quality standards, is most appropriate when there is information indicating there is or may be impairment. Its use does not mean that all waters in California are assumed to be impaired. Use of the hypothesis should be restricted to situations where there is some information indicating impairment. Its use will create incentives to monitor and is consistent with the TMDL Guidance. | To apply the exact binomial test to analyze dichotomous water quality sample data (i.e., the sample either does or does not satisfy pertinent standards), investigators must start with one of two initial premises to be tested. The starting null hypothesis can be either:<br><br>1. The water body under consideration is assumed to satisfy the pertinent water quality standard; or<br><br>2. The water body is assumed not to satisfy the water quality standard in question.<br><br>The null hypothesis represents an assumption that has been put forward, either because it is believed to be true or because it is to be used as a basis for argument, but has not been proved. Once data have been analyzed in an attempt to reject a null hypothesis, the null hypothesis is rejected only if the evidence against it is sufficiently strong. The alternative hypothesis on the other hand, is a statement of what a statistical hypothesis test is set up to establish.<br><br>If it is concluded that the null hypothesis cannot be rejected, it does not mean that the null hypothesis is true, it only suggests that there is not sufficient evidence against it in favor of the alternate hypothesis.<br><br>The form of the null hypothesis recommended in the Policy is appropriate because the intent of the Policy is to establish the section 303(d) list by using data and information that shows the water does not meet standards. Using the 'reversed' hypothesis would establish only which water meet standards. The distinction between the different null hypotheses is reduced if statistical errors are balanced (Smith et al., 2001). | Yes |
| 40.55 | The policy discusses the null hypothesis yet it does not clearly define the state's definition of the null hypothesis for listing waters (which is buried in the FED). This is especially critical for the de-listing section of the policy. | The null and alternate hypotheses have been included in the tables of values used to list and delist waters. | Yes |

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| 43.25, 47.6, 60.74, 76.50 | Agree with the staff-recommended alternative 1. | Comment acknowledged. | No |
| 51.1, 103.2 | The consequences for listing unimpaired waters are insignificant. Legal developments in California in recent years have essentially eliminated any negative consequence of a mistaken listing (i.e., including a 'clean' water on the 303(d) list).<br><br>Given the undisputed fact that section 303(d) functions as the last effective regulatory approach to remedying threatened or impaired waters, it is clear that the implications of not listing an actually impaired waterway are far more severe than those attendant to any improper listing of a non-impaired waterway. | The impact of listing a water body that actually meets water quality standards is that the costs of developing a TMDL will be expended unnecessarily. The costs of failing to list a water body not meeting standards include potential threats to the environment and to human health. Both potential costs are significant.<br><br>The costs associated with missing real water quality problems can be alleviated by expending resources to monitor more thoroughly. Presumably, significant water quality problems will be identified with sufficient monitoring efforts. The FED has been revised to discuss this more clearly and to include the estimated costs to avoid these errors. | Yes |
| 51.5, 51.7, 51.8, 51.9, 105.5, 219.1 | The Precautionary Principle is intended to deal with uncertainty. It expresses the 'safe' way of handling uncertainty. The draft Policy takes an anti-precautionary approach and tolerates a high level of potential harm before taking action. It uses uncertainty as a rationale for inaction. It adopts the position that a water body is clean until proven dirty. It creates disincentive for dischargers to contribute to additional, much-needed monitoring, because such monitoring might be used to build the case that the water segment is, in fact, impaired. | Several comments were received stating that the development and content of the draft Listing Policy and FED do not comply with the provisions of the Precautionary Principle (PP). The process undertaken to develop the Policy, the draft Policy itself, and the FED embody the spirit of the PP.<br><br>The PP was developed in 1992 at the Rio Conference on the Environment and Development. The so-called 'Rio Declaration' was adopted at the conference. One of the principles of the Declaration (Principle 15) states: ' ...in order to protect the environment, the precautionary approach shall be widely applied by States according to their capability. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation.'<br><br>'States' refer to World Trade Organization countries. The PP is a provision of international law. PP as stated in the Rio Declaration is a very general statement; the Commission of European Communities (CEC) (2000) has developed guidelines for implementing PP to find the correct balance so that proportionate, non-discriminatory, transparent and coherent actions can be taken. The CEC process also links PP implementation with a structured decision making process with detailed scientific and other objective information.<br><br>The relationship between the CEC guidelines for applying PP and the draft Listing Policy is presented below.<br><br>1. 'Recourse to the precautionary principle presupposes: [a] identification of potentially negative effects resulting from a phenomenon...; [and b] a scientific evaluation of the risk which because of the insufficiency of the data, their | No |

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inconclusive or imprecise nature, makes it impossible to determine with sufficient certainty the risk in question.' The draft Listing Policy requires the assembly of all readily available data and information before decision are made to place waters on the section 303(d) list. Absolutely all data and information are to be considered.

2. 'The appropriate response in a given situation is thus the result of a political decision, a function of the risk level that is acceptable to the society on which the risk is imposed.' SWRCB needs to make several policy decisions in order to develop a consistent listing process in California. Policy decisions that have to be made are which hypothesis to test, which statistical approaches to use, confidence, power, critical exceedance rate, meaningful sample sizes, etc. In each of these cases the reasons for the decision is presented in the FED and has been discussed at workshops and hearings.

3. 'The implementation of an approach based on the precautionary principle should start with a scientific evaluation, as complete as possible, and where possible, identifying at each stage the degree of scientific uncertainty.' The draft Policy creates a structured approach to evaluate data and information that may be available for waters of the State. This evaluation is required to be as complete as possible in order to select the most appropriate course of action. Consequently, additional information such as sources of pollutants is necessary to be included in the evaluation. Uncertainty is quantified through statistical data analysis.

4. 'An assessment of the potential consequences of inaction and of the uncertainties of the scientific evaluation should be considered by decision makers when determining whether to trigger action based on the precautionary principle.' The draft Policy presents the level of desired confidence, power, acceptable effect size, and acceptable exceedance frequency. All of these factors have been developed transparently though workshops and hearings. Most of the problems related to pollutant are reversible hence they are candidates for TMDL development.

5. 'All interested parties should be involved to the fullest extent possible in the study of various risk management options that may be envisaged once the results of the scientific evaluation and/or risk assessment are available and the procedure be as transparent as possible.' The provisions of the draft Policy were developed through small meetings of stakeholders including USEPA, RWQCBs, the environmental community, and the regulated community; through larger meetings of the AB 982 PAG; and at SWRCB hearings.

6. 'Measures should be proportional to the desired level of protection.' The measures for listing presented in the Policy are proportional to the types of

information available to make decisions. All measures of water quality are inherently variable and subject to uncertainty. Implementation of the Policy will miss some water quality problems; the Policy is not aimed at establishing zero risk. But as new information is developed, problems will be identified and addressed by the TMDL program. The types of problems addressed by the Policy are long-term exposures to pollutants; shorter-term or periodic problems may not be caught but those are also not addressable by TMDLs (e.g., intermittent spills, etc.). TMDLs are best focused on problems that are reversible.

7. 'Measures should not be discriminatory in their application.' The Policy requires that comparable situations to not be treated differently. The Policy also has provisions that allow different situations to not be treated in the same way, unless there are objective grounds for doing so (e.g., the situation-specific weight of evidence listing and delisting factors). Further, there are provisions that allow RWQCBs to request additions to the list even if the conditions are not allowed by the provisions of the Policy.

8. 'Measures should be consistent with the measures already adopted in similar circumstances or using similar approaches.' The provisions of the draft Policy are consistent with many States (but not all) listing processes.

9. 'The measures adopted presuppose examination of the benefits and costs of action and lack of action. This examination should include as economic cost/benefit analysis when this is appropriate and feasible.' The impact of alternative actions are presented in the FED and the recommended approach is to balance the various kinds of errors and costs associated with those actions.

10. 'The measures, although provisional, shall be maintained as long as the scientific data remain incomplete, imprecise or inconclusive and as long as the risk is considered too high to be imposed on society.' The Policy will be used to create a list that will be reviewed every two years; consequently the provisions of the list are provisional and subject to change depending on the availability of scientific data and information.

11. 'Maintenance of the measures depends on the development of scientific knowledge, in the light of which they should be reevaluated. This means that scientific research shall be continued with a view to obtaining more complete data.' Monitoring data is key to implementing the provisions of the Policy. Monitoring must be continued and incorporated into the section 303(d) decision making process. Monitoring data can come from State programs as well as programs operated by others.

12. 'Measures based on the precautionary principle shall be reexamined and if

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| | | necessary modified depending on the results of the scientific research and the follow up of their impact.' CWC section 13143 allows SWRCB to periodically review and revise policy for water quality control. If provisions of the Policy they can and should be revised.<br><br>13. 'Measures based on the precautionary principle may assign responsibility for producing the scientific evidence necessary for a comprehensive risk evaluation.' The Policy provisions allow interested parties to develop and prepare fact sheets so RWQCBs and SWRCB can consider additions and deletions to the list. When necessary RWQCBs have authority to require the preparation of reports of water quality conditions (CWC section 13267). | |
| 51.84, 51.85, 51.161, 105.9, 108.12, 217.8 | The draft Policy should rely on the following statistical decision rule:<br><br>Water segments shall be placed on the section 303(d) list as impaired for conventional pollutants other than temperature and dissolved oxygen unless the numeric water quality objectives for conventional pollutants are exceeded in less than 10% of samples with a confidence level of 90 percent using a binomial distribution (Table 2).<br><br>This recommended alternative adopts SWRCB's proposed statistical method in all respects but one: the null hypothesis has been reversed. Under this alternative, the null hypothesis is: 'the water segment is impaired' in contrast to the null hypothesis under SWRCB's recommendation: 'the water segment is clean.' | Using fixed significance approach (SWRCB, 2003c), this recommendation would place California water bodies on the section 303(d) list using very small numbers of exceedances.<br><br>The 'standard' null hypothesis is the more cautious against incorrectly labeling a water body as not meeting standards, but at the expense of failing to identify all truly polluted waters. This null hypothesis choice is considered more appropriate when economic or social consequences are deserving of protection.<br><br>The 'reversed' null hypothesis effectively guards against the error of overlooking polluted waters, but with a high likelihood of incorrectly listing unimpaired water bodies. This choice is considered fitting when ecological or public health consequences are deserving of protection.<br><br>Both choices are statistically valid and would result in transparent listing/delisting procedures. The decision to use either form of null hypothesis is a policy choice. Balancing of decision errors minimizes differences between these hypotheses and the differences in the number of exceedances needed. | No |
| 104.11, 107.7 | Contrary to common dogma, the use of the null hypothesis has little utility in science. Binomial methodology is highly controversial. There are hundreds of peer reviewed papers questioning the indiscriminate and inappropriate use of that statistical hypothesis test. | There are two basic procedures in statistical inference to base decisions on: hypothesis testing and confidence intervals. Both procedures arrive at the same conclusions and are, at their foundations, mathematically similar. Hypothesis testing is a valid and appropriate means to make decisions based on samples of quantitative information. | No |

## DFED, Issue 6B: Choice of Statistical Tests for the Evaluation of Water Quality Data

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| 2.22 | No comments. The details of statistical analysis are outside my area of expertise. | Comment acknowledged. | No |
| 3.2, 43.26, 60.75, 71.22, 76.51 | Recommendation of exact binomial test seems reasonable. | Comment acknowledged. | No |

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| 3.3, 51.118 | Major shortcoming of exact binomial test is that it does not take magnitude into account. | Because of the nature of the TMDL program, and because other water quality programs exist to deal with other problems not handled by TMDLs, magnitude of an exceedance of an objective is not a critical issue for listing/delisting. Instead, the number of times a water body is seen to exceed, or not, an objective is the more crucial factor. In addition, magnitude as a factor is already built in to water quality objectives. For these reasons, use of the binomial model is adequate for section 303(d) listing/delisting purposes. Furthermore, RWQCBs are not prevented from using magnitude if justified using the situation-specific listing and delisting factors. | No |
| 3.4 | Figure 16 lacks information on the Critical Exceedance Rate used to model the rates of Type II error for the binomial and Raw Score approaches. | This has been corrected. | Yes |
| 10.5, 14.4, 20.8, 51.50, 104.12 | Use of binomial model is not tempered - spatial and/or temporal distribution problems may not fit with or work well with the model. If a pollutant has a seasonal variation, use of binomial model can not account for this - monitoring may miss a pollutant if done in the wrong time or season. Pollutant spatial concentrations can not, or are not likely to be taken into account - or missed entirely. | Nothing in the draft Policy prevents investigators from using data from certain limited times of the year in order to capture temporary or sporadic impacts to beneficial uses. If designed properly, water quality sampling, in conjunction with binomial analysis, will be adequate to locate true water quality problems. | No |
| 18.84 | The TMDL Roundtable recommended that a water body should be listed if any one of three recommended criteria is met. The draft Listing Policy is partially consistent with this recommendation. The draft Listing Policy allows the use of the screening values and guidelines suggested in this recommendation. The draft Listing Policy uses the binomial method with a 10% exceedance rate, rather than the mean or median as was originally recommended. | A more applicable, nonparametric statistical procedure was selected precisely because parametric statistics would not always be valid, especially for small samples based on non-normal populations of data. The binomial is the most readily applicable and most efficient statistical choice for dichotomous data from large populations (e.g., a water body such as a river or lake). Use of the median or arithmetic mean as an exceedance frequency is not sufficiently protective (50% exceedance frequency). | No |
| 40.56, 43.29, 51.88, 51.101, 56.16, 56.14, 63.7, 104.13, 105.3, 105.1, 108.13, 203.4, 217.6, 217.7 | USEPA guidance and professional literature recommend that Type 1 and Type 2 error rates should be balanced if there is no clear agreement that one form of error is more important than the other, as a policy matter, in that state (see USEPA, 2001; USEPA, 2003a; and Smith et al ., 2001.) | This recommendation has been incorporated into the Policy and FED, use of a test with 'balanced' statistical errors is now the recommended procedure for use in the statistical test in the Listing Policy. The following is a description of the technique used.<br><br>Statistical error balancing using the exact binomial test attempts to 'balance' or make equal estimates of the two types of possible decision-making error that may result at each sample size. Precise equality between the two error rates is not actually possible for many sample sizes. Instead, Type I and Type II error rates are calculated at various exceedance frequencies to be as close to one another as possible with both at or below a critical maximum error rate.<br><br>A key difference between the non-balanced procedure recommended in the December 2003 version and the balanced procedure is that two, not one, exceedance rates are employed. An exceedance rate stands in for the unknown true exceedance rate in the water body. Because the likelihood that a sampled allotment of water in a water body will exceed a pertinent water quality | Yes |

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| | | criterion cannot be known, a maximum rate of exceedance, a highest tolerable rate above which a water body should definitely be listed, is chosen for binomial error rate calculations.<br><br>In the previous draft Policy, one exceedance rate was used. However, for the balanced procedure, a second, higher exceedance rate is also needed. The lower exceedance rate is used as an estimate of the lowest quality acceptable as an average. This lower value is an estimate of the likelihood of making a Type I error (in the Policy, the error of incorrectly listing a water body). The higher exceedance rate is the highest frequency that would be allowed in a single sample. The higher value is used to calculate the likelihood of Type II error (the error of failing to list a water body). This second exceedance rate must be higher than lower exceedance rate in order for the two error rates 'balance' at an acceptable level. If the same exceedance rate (e.g., 10%) is used for both error rate calculations, balancing occurs at a mutual error rate of 50%.<br><br>To 'balance' Type I and Type II error rates, the (a) critical number of exceedances (k) that must be observed in order to list the water body and (b) standard error rates at each likely sample size are first calculated using the lower exceedance rate to determine the estimated Type I error rate and higher exceedance rate to calculate estimated Type II error rate. Next, the absolute difference between Type I to Type II error rate is minimized by adjusting k up or down. When the two error rates are as close as possible, the modified k used to achieve this 'balance' is used in place of the original k.<br><br>The FED has been modified to include a description of the balancing procedure with two examples provided by USEPA. | |
| 43.60 | In developing 303(d) policy, the SWRCB should address the following question: What is the statistical method on which to base 303(d) listings? | This issue is addressed in detail in the draft FED Section 6. | No |
| 51.2, 51.3, 51.54 | The current draft Listing Policy is inconsistent with both the clear mandate of section 303(d) and Congressional policy and intent underlying section 303(d) in a number of ways. For example, the Listing Policy's binomial approach fails to accurately assess impaired water bodies. Thus, the listing policy's binomial approach is contrary to section 303(d)'s clear mandate to identify waters in California where effluent limitations are not stringent enough to implement any water quality standards. | Assessments of the results of water quality samples are used to determine if a water body should be listed. The exact binomial test is one valid tool that can be used to analyze sample results and to quantify the likelihood of decision-making error. The alternatives for this task are outlined in FED Section 6.B. The use of and results from the binomial procedure do not violate federal or State laws. | No |
| 71.21 | The FED presents a thorough review of different statistical methodologies that were considered for use in testing compliance with a water quality standard (Table 12). | Comment acknowledged. | No |
| 71.29 | The SWRCB should incorporate the use of a statistical test or, at the very least, simple graphical methods to identify outliers or anomalous data, and that those | The exact binomial test, with its use of transformed data (i.e., numeric data is transformed into counts of nominal, 'yes' or 'no' information) addresses the | No |

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| | outlying data points be closely examined for validity and usefulness in the analysis. Even with sound QA/QC procedures, anomalous data will occasionally pass through the data quality screen. | problem of outliers. High and low values will not influence results unduly; as used in the Policy, there is no 'mean' to be greatly affected. | |
| 102.5 | The Policy is not scientifically defensible. Therefore, claims in the FED that the Policy does not have significant adverse environmental impacts are untrue. One of the problems is the effort by the Policy to be consistent by using the binomial model. The validity of the whole Policy really hinges on the proposed binomial model being appropriate. But the binomial model can not validly be applied across all pollutants, all stressors, and all streams throughout the state. | More sophisticated statistical procedures are available. The exact binomial test is a modest, yet appropriate, first attempt to introduce scientific validity into section 303(d) listing/delisting decision-making, other tests can be used if warranted. | No |
| 207.16 | What is the statistical method on which to base 303(d) listings? | As explained in the draft FED, the exact binomial test, a statistical procedure intended for use in analyzing dichotomous data, is proposed for use in evaluating 303(d) listing data and for listing and delisting decisions. This procedure is valid because water quality sample data either does or does not satisfy applicable water quality objectives. Once certain key variables are selected (exceedance rate(s) and a desired level of statistical confidence or power), the binomial test generates the critical number of exceedances that must be observed in a sample of a particular size in order to accurately decide whether or not to list a water body. | No |
| 217.9 | Another alternative is to consider using a simpler approach that doesn't assume a 10 percent exceedance rate in order to counter for variability, uncertainty, and error. A simple T test in which the samples compared to the standard with a certain confidence limit can be used and would account for variability, uncertainty, and error. | As the draft FED shows, the Student's t-Test alternative was considered. However, parametric tests perform more poorly than non-parametric tests (e.g., the exact binomial test) when sample sizes are small and in cases where the population of data is not normally distributed. The simple and efficient binomial test was the best overall choice for section 303(d) data analysis. This test is not precluded from use; the t-test may be used if warranted. | No |
| **DFED, Issue 6C: Selection of Statistical Confidence Level** | | | |
| 2.23 | No comments. The details of statistical analysis are outside my area of expertise. | Comment acknowledged. | No |
| 3.5, 3.7, 3.6 | The statement, statistical confidence is the probability that a hypothesis is true., is not literally true except for Bayesian statistical testing. | The language in question has been revised. | Yes |
| 3.8, 43.27, 76.52 | The selection of the preferred a level appears to be justified. | Comment acknowledged. | No |
| 51.66, 51.41 | Under the draft Policy's binomial approach, the level of confidence required to reject the null hypothesis is too high. One consequence of requiring this level of confidence before the hypothesis can be rejected is that the data must not only demonstrate difference from the hypothesized condition, they must demonstrate significant difference. In the case of SWRCB's binomial approach, the evidence required is practically unattainable. | A desired 90 percent confidence is a commonly-accepted level in scientific studies; 80 percent is also acceptable if the preliminary findings are followed up with more research or monitoring (Hahn and Meeker, 1991). Many scientists insist on even higher confidence levels in order to reject a starting, null, hypothesis (e.g., 95% or even 99%).<br><br>The Policy has been revised to use a lower yet justified level of confidence. | Yes |

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| 51.87 | SWRCB's proposed approach ('standard' null hypothesis) is 81 to 362 times more likely to fail to list an impaired water body than it is to list a clean one. We believe that this preference flies in the face of the precautionary principle and does not reflect the water quality priorities of Californians or those expressed in the CWA. A better policy would err in favor of listing, thereby minimizing the possibility of leaving impaired water bodies off the list and minimizing the attendant risks to human health and aquatic life. The reverse null approach, discussed above, would do this. At a minimum, though, the listing criterion should provide for a more equitable apportionment of these errors. A 'fair' listing criterion would be one for which the probability of making each type of error is equal. | The claim that the non-'balanced' approach with 'standard' null hypothesis is 81 to 362 times more likely result in a Type II than Type I error is not accurate. These claims are too high. The statistical probabilities presented by the commenter are the sum of all possible statistical errors over all possible alternate exceedance rates. This unnecessarily changes the error estimates for the binomial test using a fixed significance level. The use of a ratio to compare errors is also misleading. With real sampling data, it is impossible to have both types of errors occur simultaneously.<br><br>While there are differences in the details of how Type I and Type II error rates should be presented, the concept of balancing a priori the two types of errors to attempt to equally avoid the errors has merit. The Policy and FED have been revised to include options for balancing statistical errors. | Yes |
| 60.76 | Supports recommended Alternative 3. | Comment acknowledged. | No |

## DFED, Issue 6D: Critical Rate of Exceedances of Water Quality Standards

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| 2.24 | No comments. The details of statistical analysis are outside my area of expertise. | Comment acknowledged. | No |
| 3.12 | The case for using a greater than zero critical exceedance rate is clear when considering measurement error, sample unit definition, and averaging period. | Comment acknowledged. | No |
| 3.9, 3.11, 3.10 | The discussion confuses the concept of proportion of samples between the proportion within a water quality sample and the hypothetical proportion within the population of all possible water samples. | The language in question has been revised. | Yes |
| 14.3, 14.2, 18.5, 20.6, 21.12, 21.38, 21.13, 21.39, 21.2, 21.30, 21.22, 21.33, 40.15, 40.66, 40.68, 40.60, 40.73, 40.82, 40.72, 40.65, 40.54, 40.74, 40.71, 40.59, 40.61, 40.14, 40.69, 40.75, 40.64, 40.58, 40.76, 51.49, 51.90, 51.38, 51.65, 51.42, 51.53, | Although, the binomial method with a 10% acceptable exceedance rate is an approach that would provide consistency in how standards are evaluated, it is inconsistent which how standards are written. Few standards are written with a 10% allowable exceedance rate. | The first step in applying the provisions of the Policy is to assess if standards are met based on the terms of the standard. The second step would be to apply the binomial statistical analysis, in order to determine the level of confidence and power that exists in the decision that the data have shown an exceedance of a water quality standard occurred.<br><br>The actual proportion of water in a water body that truly exceeds applicable water quality objectives cannot be known with 100 percent assurance. Therefore, statistical analysis must be performed on data to establish with some quantifiable level of certainty how to make valid decisions on sample data. As detailed in the draft FED, this rates proposed have been proposed by USEPA (2002a) and as presented are considered by USEPA to provide a decision rule for assessing compliance with standards. Consequently, this approach is consistent with water quality standards as written. Some level of exceedance greater than zero must be seen in order to account for sampling and analytical uncertainty. | No |

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| 51.52, 51.51, 80.4, 80.3, 103.3, 104.10, 106.9, 107.2, 109.7, 109.6 | | | |
| 21.65 | The statement, 'The critical exceedance rate is the proportion of samples that exceed an applicable water quality criterion providing overwhelming evidence that a water segment fails to meet water quality standards for the particular pollutant is biased against listing and water quality protection. | The language has been revised for clarity. | Yes |
| 43.28, 60.77, 76.53 | Agree with the staff-recommended alternative 4. Although we would prefer the 15 percent exceedance data in alternative 3, we note that other states using the exact binomial test are using a 10 percent critical rate of exceedance. | Comment acknowledged. | No |
| 51.160 | The binomial model, as implemented in the FED, is framed in the following way: 'given that the true exceedance rate is 0.1, 90% of samples of size N will contain k or fewer exceedances; thus, if we observe k+1 or more exceedances, we have cause for concern.' The problem with this framing is that it assumes that the true exceedance rate is both knowable and known, and fixes it at 0.1. Since the exceedance rate is what we would like to know, this framing puts the cart before the horse. In fact, we don't actually know what the exceedance rate is. | The Policy and FED follow standard statistical protocols in using the binomial test (acceptance sampling by attributes). The commenter is correct that the true exceedance rate is unknowable. It is for this reason that a exceedance rates are used in calculations in place of the true exceedance rate. This rate is pre-selected and is a policy decision. It is the rate above which policy-makers have significant concern that the water body should be listed. For listing, the important question is related to whether the exceedance rate is below or above critical levels. The actual level is of interest but it is not necessary to determine the precise value before listing or delisting can occur.<br><br>Language in the Policy and FED have been revised for clarity on this issue. | Yes |
| 51.39 | USEPA stated plainly that the reliance on the 10% exceedance rule is based on an incorrect reading of USEPA guidance concerning allowable water quality exceedance rates. USEPA recommended criteria development approaches based on a 95% compliance rate for conventional pollutants and a more stringent compliance rate for toxic pollutants of 'at least 99%' in the context of a binomial method, or 'where 2 or more samples exceed the [CTR rule standards for aquatic life] in any 3 year period.' USEPA also criticized the use of the model's arbitrary selection of five exceedances for sample sets less than 20, finding that 'there is no technical rationale for this decision.' | As detailed in the draft FED, many viable alternatives for exceedance rate choices were considered. The ten percent option for conventional pollutants may, now, be disavowed by various authorities. But as the draft FED shows, its use for water quality analysis has been widespread and well-established.<br><br>The Policy has been revised to use one of the statistical approaches related to interpretation of the CTR criteria (please refer to CALM at table 4-3) (USEPA, 2002a). The approach listed in the comment is also suggested in the CALM guidance as a non-statistical approach for determining compliance. In developing the Policy it was assumed statistical approaches would be used (please refer to Issue 6 of the FED). | No |
| 104.9 | The reverse null hypothesis or a balanced probability approach are not necessarily protective. The 10 percent rule may be protective and comply with water quality standards. In Florida the binomial method lead to the delisting of a large number of waterways, which USEPA promptly put back on their list.<br><br>I urge the Board to direct staff to convene a facilitated process that involves the RWQCBs, USEPA, the PAG, and interested parties to develop an approach that | There is admittedly more than one valid way to accomplish the goal of section 303(d) listing/delisting. The draft Policy presents an approach that is functional, protective, and transparent.<br><br>A new 'facilitated process' is unnecessary. The SWRCB has worked with regulated and environmental community representatives (through the PAG), the RWQCBs, and interested parties, to craft the draft Policy. | No |

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| | is functional, protective, and transparent. A multi-step, peer-reviewed process that includes bio-statisticians is needed. | | |
| **DFED, Issue 6E: Minimum Sample Size** | | | |
| 1.19, 1.4, 1.8, 1.12 | For conventional pollutants, suggest a minimum sample size of 30 representative samples for a valid listing. | Although a minimum sample size of 30 would help decrease Type II error somewhat, the advantage would be minimal. A better way to address error rates is a balanced approach. | No |
| 2.25 | No comments. The details of statistical analysis are outside my area of expertise. | Comment acknowledged. | No |
| 3.14, 3.13 | The last paragraph under Alternative 3 is not quite right in detail, although it is in spirit. By calculation, if a=0.10 and n=22, the decision to list would require five or more exceedances, while the decision to delist would require zero exceedances, when the exact binomial test is used. If the sample size were less than 22, it would be impossible to conduct an exact binomial test to delist with a=0.10. | The language in question has been revised. | Yes |
| 10.4, 40.83, 40.40, 40.41, 40.62, 51.67, 71.28, 72.4, 106.5 | Use of binomial statistical inference does not work well with small data sets. Small sample sizes will show no reliable effect or small data sets can not reliably show presence or absence. | Decision making with small data sets is difficult no matter what test is used. One of the reasons to use the binomial test is that it can be used if sample size is relatively small (Lin et al., 2000). If a great amount of data is available, one is more sure of the conclusions compared to situations where little data are available (Hahn and Meeker, 1991). Relatively small samples can be used if the level of confidence and power needed is not excessively high. High confidence is needed when the immediate outcome of a decision is to build a new facility to treat water or some expensive remedial action. With respect to the section 303(d) list, the outcome of the decision is to develop a planning document (a TMDL) that will ultimately address the standards exceedance. Lower confidence and therefore smaller sample sizes are appropriate because there is opportunity to perform additional research and monitoring to characterize the water quality problem during the development of the TMDL. Using a relatively low confidence in the statistical test (such as 80 percent) is supported because it is likely that when the TMDL is developed the initial conclusions to place waters on the section 303(d) list will be corroborated. | No |
| 11.7, 19.7 | The number of samples exceeding the evaluation guideline required for listing is inconsistent with Table 3.1; this statement allows for inclusion with only 3 samples. The use of a sample population of 20 may be more appropriate to place waters on the 303(d) list. | There was no inconsistency. As described in Table 3.1, three exceedances must be observed in order to list a water body. The FED has been revised to describe the rationale for using this value when sample populations are small. | Yes |
| 13.13 | The recommended minimum samples may work well for chemical pollutants, parameters with high variability like sediment, require many more samples. The proposed policy should state that highly variable parameters like suspended sediment and turbidity require larger sample sizes, and that sample size should | No justification is provided to require larger sample sizes for turbidity and sediment. No change is indicated. | No |

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| | be appropriate to the variability of parameter being monitored. | | |
| 40.63, 71.25, 71.26, 109.9 | In the proposed draft Policy, a small sample size is defined as fewer than 10 or 20 samples to list and fewer than 22 samples to delist. These are reasonable definitions of small samples, since statistical tests based on samples of smaller size will have less power than larger samples for making sound and reliable decisions. It is appropriate for listing purposes to set the lower limit for sample size at 10 or 20 samples, since raising the minimum sample size will most likely prevent listing decisions for intermediate-sized samples. It is also necessary, as shown by calculation associated with the binomial test, that the minimum size to delist must be 22 samples. | When Type I and II errors are balanced using the approaches proposed in the CALM Guidance (USEPA, 2002a; Smith et al., 2001), the lowest sample sizes with acceptable errors range from 21-26 samples. Rather than use these sample sizes as minimum the Listing Policy is focused on the minimum number of exceedances that are allowed for listing and delisting. For example, if the threshold for listing is 3 or more samples above the standard then the sample size could be as low as 3 to support the decision to list because the listing threshold has been reached.<br><br>The FED has been revised to include the rationale for listing with small sample populations. | Yes |
| 40.80 | The policy should more clearly explain how data would be evaluated in cases in which fewer than 4-5 samples are available in any particular month. We are concerned that exclusion of data from further consideration simply because the minimum monthly sample sizes are not available could result in incorrect conclusions that the objectives are attained. | If water quality objectives call for the evaluation of duration through a short term average the policy allows for the interpretation of standards using the available data and information. The policy does not prevent the interpretation of data and information based on the absolute number of samples available for the evaluation. | No |
| 51.44, 51.46, 51.43, 51.37, 51.45, 51.40, 104.6, 106.1, 107.4, 219.5, 219.3, 219.2, 220.3 | The minimum sample requirements can only encourage dischargers to oppose increased monitoring budgets or lead them to structure sample collection to avoid toxic pulses; in other words, to arrange for the majority of the sampling to occur when there is not a problem. | There is nothing in the Policy to prevent investigators from scheduling monitoring to collect samples when toxicity is present. The binomial-based procedures with the minimum sample sizes are an appropriate choice for analysis of sampled data. By balancing errors, incentives to monitor would increase. | No |
| 60.78, 76.54 | Supports recommended Alternative 4. It provides target sample sizes while satisfying USEPA guidance. | Comment acknowledged. | No |
| **DFED, Issue 6F: Quantitation of Chemical Measurements** | | | |
| 2.26 | Not sure which of Alternative 2 or 3 is the better for DFED. Alternative 2 gives less wiggle room but I do not know if it is better from a statistical point of view. | Comment acknowledged. | No |
| 2.27, 3.15, 60.84, 76.59 | One of the advantages of the exact binomial test is that there is no ambiguity in how to treat measurements below the quantitation limit, so long as that limit is less than the water quality objective. When the quantitation limit is larger than the water quality objective, measurements between the two are indeed difficult to interpret. The labeling of Figure 22 is incomplete (the upper horizontal line should be labeled QL and the lower WQO). | The FED has been revised to clarify the figure. | Yes |
| 43.30, 60.79, 76.55 | Agree with the staff-recommended alternative 2. Guidance is needed to promote consistency. | Comment acknowledged. | No |

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| 63.12, 204.2 | A third alternative, that non-detects should only be interpreted as unknowns, should be added to this issue. | This alternative is not needed because it is already addressed under Alternative 1. Nondetect values are not known but if the water quality objective is above the quantitation level it is known that the standard is achieved. | Yes |
| 63.13 | If more sensitive/expensive tests are desired, then the results of these tests should be used even if compliance monitoring costs go up. The stakes are too high to assume that pollutants are present when they may not be. | Comment acknowledged. | No |
| **DFED, Issue 7A: Review of the Existing Section 303(d) List** | | | |
| 2.28, 43.44, 60.47 | If just the recommended Alternative 2 section 303(d) list, is done and the Board staff situation remains the same you will also be behind in the task and it will get worse and worse as time goes by. Why not use a combination of Alternatives 1 and 2 in which a certain number (or a certain fraction) of the existing list that does not have new data/information is revisited in each cycle. In this there would be a chance of eventually catching up. | The FED has been revised to include an analysis of this alternative. | Yes |
| 7.11, 7.13, 7.10, 7.12, 7.16, 7.14, 9.1, 47.12, 47.2, 60.63 | It is both reasonable and fair to examine and adopt a third option that would allow review of existing segments upon submittal of a request showing why the listing was improper without requiring the data or information to be new. | This new option has been included in the FED. | Yes |
| 43.31, 60.80, 64.4, 76.56 | Disagrees with recommended Alternative 2. Recommend that an Alternative 3 be developed. This Alternative should include delisting of all listings for which pollutants have not been identified and creating a schedule to review the remainder of the water segments listed prior to adoption of the Policy. Priority should be given to reviewing water segment-pollutant combinations listed prior to 2002. The July draft provided for reviewing existing listings over three listing cycles. Three two-year listing cycles would be acceptable, but not three four-year listing cycles. The new Alternative 3 should address the possibility that the length of the listing cycle could be changed. | Delistings should be based on substantial evidence in the record. If it is found that an analysis of the water body indicates that it does not meet the requirements of the Listing Policy, the water should be removed from the list. RWQCBs should be given the ability to delist if no new information is available but a delisting is warranted.<br><br>The draft Policy and FED have been revised to allow RWQCBs to remove waters from the list if the provisions of the Policy are not met. | Yes |
| 56.10 | The SWRCB should adopt Alternative 1 in reviewing existing listing of the draft FED, and incorporate a requirement to revise the existing list so it is consistent with the Listing/Delisting Policy. Support the SWRCB's recommendation to establish an application process, whereby an interested party can request that an existing listing be reassessed under the provisions of the draft Listing Policy. | Comments acknowledged. | No |
| 60.81 | SWRCB needs to ensure that the proper documentation occurs for each of the listings (past, present, and future) so that the history and rationale for each listing is preserved. If past listings do not have proper documentation they need to be questioned instead of simply carried forward. | The draft Policy and FED have been revised to include a requirement to carry forward the summary of data and information even if it does not support the finding that the water should be placed on the list.<br><br>This information is needed to develop the CWA section 305(b) report. | Yes |

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| 63.14, 204.3 | Add a third alternative: prior to developing a TMDL, the listing data should be evaluated with the new criteria. This is needed to take unnecessary TMDLs off the list, reduce the RWQCB/SWRCB time burden, and establish quality assured data sets that will reduce TMDL timelines. | This comment is addressed by the TMDL Guidance Policy. | No |
| **DFED, Issue 7B: Defining Existing Readily Available Data and Information** | | | |
| 2.29 | Agree with the recommendation, but add that a review of current appropriate literature published in archival journals should be reviewed. This could be a task prepared by a contractor for all RWQCBs. | Comment acknowledged. | No |
| 11.3, 19.3 | Requests the inclusion of annual Municipal Separate Storm Sewer System (MS4) monitoring report data as a source of information for listing decisions and can also serve as additional data that can be used to re-evaluate listed waters. | This change has been made. | Yes |
| 21.41, 51.24, 51.26, 60.43, 76.26, 76.2, 102.15, 109.10 | The body of regulations and guidance that bear on 303(d) listing are unambiguous about the information that should be considered in making listing decisions: all of it. USEPA's rules with respect to the use of data in listing decisions could not be clearer: All readily available information should be considered; Data should not be discounted solely on the basis of age; and use of minimum sample sizes are not appropriate. | All readily available data and information shall be reviewed when the section 303(d) list is developed. All data and information includes everything available from whatever source whether it identifies pollutants or not. The process of defining existing readily available data and information includes two phases. One is defining all the sources where the data and information can come from, the other is whether the data and information gathered is acceptable for listing. The FED discussed two alternatives and includes a non-inclusive list of possible sources for the data and information, and recommends that readily available data and information should be in written or in electronic form. In specifying the type of data and information to be solicited, the Policy establishes a preference for data and information that are documented on paper or in electronic form. Otherwise readily available data and information should be requested from all sources of whatever quality. The FED and the policy have been revised; data age and minimum sample size requirements have been removed from the Policy. | Yes |
| 43.32, 60.82, 63.15, 76.57 | Supports recommended Alternative 2. | Comment acknowledged. | No |
| **DFED, Issue 7C: Process for Soliciting Data and Information and Approval of the List** | | | |
| 2.30 | Agree with recommendation number 3. Use the greatest possible number of resources to collect data! This will help reach the most informed decision. | Comment acknowledged. | No |
| 43.33 | Recommend that fact sheets be developed for 1998 listings that were carried forward to the 2002 list, indicating when they were originally listed. Agree with the staff-recommended alternative 3. | New fact sheets will be developed in accordance with the approved Policy when existing section 303(d) listings are reevaluated. | No |

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| 60.83, 76.58 | Supports recommended Alternative 3 with one change. RWQCBs should be required to consider the listing recommendations at workshops or hearings. | The RWQCB would evaluate all readily available data and information, prepare fact sheets on all pertinent information for each potential water body-pollutant combination and then hold public meetings to consider listing or delisting based upon the identified information. | No |
| **DFED, Issue 7D: Documentation of Data and Information** | | | |
| 2.31 | Agree with the recommendation but add a catch-all section. Other Considerations/Information to include possible points that may not fit any of listed categories. | Comment acknowledged. | No |
| 43.34 | Agree with the staff-recommended alternative 2, but we advocate revising it to separate pollutants and pollution. Pollutant and type of pollution should be separated. | Comment acknowledged. | No |
| 50.2 | Standardizing the listing/delisting process should not be so inflexible as to preclude data, analysis, and monitoring if it does not meet some standard format. To do so would result in a significant impact that would have to be evaluated and mitigated. | Comment acknowledged. | No |
| **DFED, Issue 7E: Data Quality Requirements** | | | |
| 2.32 | Agree with the recommendation. Obvious choice if data are to be defensible. | Comment acknowledged. | No |
| 43.35, 60.85, 76.60 | Agree that we need to know the quality of the data. Agree with the staff-recommended alternative 2. | Comment acknowledged. | No |
| 51.36 | Whether data was correctly collected, analyzed and reported - is addressed at the monitoring and analysis stage, for which the draft Policy sets 'data quality requirements.' QAPPs developed according to either the federal or SWAMP guidelines will contain assurances against erroneous laboratory procedures, systematic error sources, extraction and instrument error, and data transfer protocols to protect against transfer errors, and transcription, calculation, and input errors. These assurances substantially mitigate the possibility of operator and instrument error, and create a very high level of confidence that samples under these programs were properly collected, analyzed, and reported. The application of statistics in the manner proposed would duplicate the error-management mechanisms of QAPPs. | QAPPs only manage error, quality assurance processes do not remove the error. Sometimes monitoring programs allow substantial error because the only available cost effective procedures are inherently variable. The application of statistics is an acknowledgement that error in decision making is ever-present and that these errors should be considered transparently. The use of statistics along with the requirement of QAPPs (or equivalent) in the Listing Policy does not create a duplication of error management. | No |
| **DFED, Issue 7F: Spatial and Temporal Representation** | | | |
| 2.33, 43.36, 60.86, 76.61 | Supports recommended Alternative 3. Concur that spatial and temporal representation of water body segments is essential information for use in the | Comment acknowledged. | No |

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| | listing and delisting process. Support the idea that samples can be less than 200 meters apart and still be considered spatially independent if justified in the fact sheet. | | |
| 217.12, 217.10 | The end result of this policy will be that water bodies shown to have exceeded numeric standards through chemical analysis will be easier to list than those water bodies that are exhibiting more severe impacts, which are often caused by low levels of multiple pollutants. | The Policy provides a mechanism to address trends in water quality to assess problems where numeric water quality standards are not exceeded but severe biological impacts are present. | No |
| 220.2 | If the source of the problem is clear and ongoing, as it is in so many harbors and marinas, why should the timing of the samples prevent it from being listed? It is unclear whether samples can be accumulated over the years; the draft guidelines are silent; I can't find clear guidance. | Sampling representation can be either over short or long periods of time. Requirements for spatial and temporal representation can be found in the Draft FED, Issue 7F. The sections of the Policy focused on spatial and temporal representation have been clarified. | Yes |
| **DFED, Issue 7G: Data Age Requirement** | | | |
| 2.34, 8.21, 19.16, 30.10, 43.37, 44.7, 50.3, 63.16 | Age of data per se is not important. The important things to determine are the quality and relevance to the current situation. If data score high on these counts there is every justification to use them even if they are old. | The most important aspect of age of data is its relevance to describing current conditions of the water segment and its quality. Recent data are always more representative of current conditions. However, if only old data are available, it should be used in the listing process. The age of data requirements have been removed from the Policy so that all relevant data and information can be used. | Yes |
| 60.87, 76.63, 76.62 | California should require that the data and information used to justify a listing decision are reasonably current. Other states have such requirements and we assert that this is another necessary method of infusing rationality into the listing process. Agrees with recommended Alternative 1, although we would prefer a shorter time period such as the 7.5 year old data limit used by Florida. | Reasonably current and representative data should always be used. If older data is all that is available it should be used as well. The data age requirements have been deleted to encourage the use of all data and information. | Yes |
| **DFED, Issue 7H: Determining Water Body Segmentation** | | | |
| 2.35 | Agree with the recommendation. This allows better focus on problematic areas and concentrates resources on the real problem. | Comment acknowledged. | No |
| 43.38 | Agree with staff-recommended alternative 1 with modifications to policy section 6.2.5.6 to prevent incremental addition of segments to listed water bodies with only one sample exceeding water quality standards. | The last two sentences in the section have been removed from the Policy. | Yes |
| 50.4 | The Policy should not ignore the need to consider related and connected water body components or segments and the effects of conditions from one segment to the other. | Comment acknowledged. | No |
| 60.88, 76.64, 76.65 | Agrees with recommended Alternative 1. | Comment acknowledged. | No |

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| **DFED, Issue 7I: Natural Sources of Pollutants** | | | |
| 1.2, 18.51, 18.13, 19.20, 30.7, 40.20, 40.19, 43.39, 50.5, 51.98, 203.11 | Inappropriate 303(d) listings due to legacy problems and natural sources are not adequately addressed in the policy. | The Policy has been revised to remove guidance regarding impacts relative to natural sources. This provides the RWQCBs with the flexibility to add, remove, or not list waters due to natural sources. Water bodies recommended for 303(d) listing in the future or existing listings recommended for removal from the 303(d) list due to natural sources will require review and approval by the SWRCB. | Yes |
| 2.36, 8.7, 60.89 | Agrees with recommended Alternative 2. Agrees with staff that waters should not be listed if the pollutant causing them to not meet water quality standards originated from natural sources. | Comment acknowledged. | No |
| **DFED, Issue 8: Priority Ranking and TMDL Completion Schedule** | | | |
| 11.13, 18.15, 18.53, 18.98, 18.73, 18.72, 19.15, 20.25, 20.27, 20.26, 20.24, 21.40, 27.3, 37.5, 37.1, 40.34, 40.110, 40.35, 40.109, 40.100, 40.111, 42.4, 43.50, 43.40, 43.59, 51.157, 51.158, 53.4, 58.15, 60.37, 60.36, 60.90, 76.66, 76.23, 80.12, 80.11, 101.8, 109.15, 207.15, 207.6, 214.1 | Supports the FED Alternative 2 recommendation. The TMDL process should be prioritized based on the factors listed in Alternative 2 in order to result in improved water quality listings. Further, the development of TMDLs should be linked to the priority of the water quality problem. | CWA section 303(d) requires the establishment of a priority ranking for listed waters and the development of TMDLs for such waters in accordance with the established priority. The schedule for TMDL development will identify which TMDLs will be established within the current cycle and the number of TMDLs scheduled to be developed thereafter. The general intent of prioritizing and scheduling is to assist in work planning and to help the public and USEPA understand the priorities for TMDL development. In developing schedules, the RWQCBs need to determine which TMDLs are higher priorities and which are not, but in doing so it is unnecessary to identify each TMDL as high, medium or low if the schedule for each TMDL is established. The Policy has been revised to require the establishment of a schedule for TMDL development as suggested in the 2004 USEPA listing guidance (USEPA, 2003b) and let the schedule in and of itself reflect the state's priority ranking. The Policy has been revised to drop priority-setting requirements to be consistent with the 2004 USEPA listing guidance. | Yes |
| 50.6 | Priority ranking and the TMDL completion schedule should incorporate effective implementation of any TMDL. | It is not possible to incorporate effectiveness of TMDL implementation at the list stage because the TMDL has yet to be developed. | No |
| 50.7 | Consideration for priority should be given, as appropriate, to more than just a singular water body if impairment is documented throughout the watershed or in more than one or two segments. | The Policy has been revised to consider scheduling waters for TMDLs when there could be water quality benefits of activities in watersheds. | Yes |

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| 51.156 | The CWA's TMDL program is a safety net that is designed to induce action on water segments in which water quality objectives are not being met. As such, water segments should be identified and TMDLs should be developed as swiftly as possible. The USEPA Integrated Guidance states that 'TMDLs should be established 8 to 13 years from the date of the original water/pollutant combination listing.' This is hardly an expedited schedule; but the draft Policy's provisions are even more relaxed, stating in Section 5 that low priority TMDLs: 'will be completed in more than 5 years.'<br><br>The 2002 303(d) list tables indicate that approximately 800 TMDLs are required in California water segments. However, according to the 2002 305(b) report, only 18 have been adopted by SWRCB to date, and only nine completed TMDLs currently await adoption by SWRCB, OAL or USEPA. The lack of adequate monitoring also contributes substantially to the delay in TMDL implementation. As discussed elsewhere in this letter, monitoring efforts in the state of California often do not produce adequate data to comply with the minimum sample size requirements the draft Policy, let alone provide for review of already listed segments and development of TMDLs. This delay in implementation of our water quality safety net is unjustified and threatens further degradation in the quality of California's waters. Agree with USEPA that 'the description of medium priority in 5 years and low priority after 5 years needs to be rectified,' and that the state's schedule, which lags far behind what is recommended in the USEPA Integrated Guidance, and should be revised to be at a minimum consistent with the Guidance. | The Policy and FED have been revised to include a requirement for a completion date for all TMDLs. The USEPA guidance (2003a) has not been included that requires TMDLs to be completed in 8 to 13 years because future resource levels can only be predicted one to two years into the future. | Yes |

## DFED, Environmental Effects Section

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| 10.22, 10.23, 51.61 | In the event that CEQA review is mandated for this project, discussion of alternatives (with analysis) may bring some insight to what may or may not help the process work more efficiently from both the environmental objective point of view and organizational policy. | The process the SWRCB used to develop the Policy has been certified by the Resources Agency to be functionally equivalent to the CEQA process. The FED fulfills the requirements of CEQA for preparation of an environmental document. The FED discusses alternatives for each issue. | No |
| 18.54 | The Alternatives Analysis in the FED should be revised to provide a rationale for each alternative that is chosen. Currently, the FED describes different alternatives and identifies the preferred alternative, but provides no apparent rationale for the choice of alternative. This approach does not appear to be consistent with CEQA requirements. | The alternatives analysis for each issue follows CEQA requirements by providing the pros and cons for each alternative; the rationale for the chosen alternative is contained within the pro argument. For each major section of the Policy, the FED describes how the Policy addresses the issue and briefly explains why the Policy was developed this way. Brief statements of the reason(s) an alternative was selected has been added to the preferred alternative. | Yes |
| 21.68 | The statements in 'Potential Adverse Environmental Effects' and the 'Potentially Significant Adverse Environmental Effects' are in error if the proposed Policy is adopted as proposed, properly defining the water bodies with impaired beneficial uses which need attention will be inadequately addressed. There will be far fewer 303(d) listed water bodies that really exist in accordance with CWA | The analysis of the environmental effects of the Policy focuses on the differences between existing RWQCB listing and delisting practices and the proposed Policy and whether adoption of the Policy would have a significant adverse effect. A significant effect on the environment is generally defined as a substantial or potentially substantial adverse change in the physical | No |

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| | requirements. | environment. Using this definition, the adoption of the Policy will not have a significant adverse environmental effect because the Policy comprises a process by which the SWRCB and RWQCBs will comply with the listing requirements of the CWA and in and of itself does not change the physical environment. In addition, water bodies with impaired beneficial uses will be addressed during the biennial listing process. CWA section 303(d) addresses impaired water bodies. The Policy provides a process, adhering to section 303(d) requirements, to document and list water bodies not meeting water quality standards. The Policy defines the existence of waters that do not meet standards. | |
| 49.5 | The draft Policy should direct the staff to revise the FED to bring it into compliance with SWRCB regulations and the CEQA. | SWRCB staff prepared the draft FED and Policy under the direction of California Water Code section 13191.3(a). The FED is in compliance with this section and meets the regulatory program exemption under section 21080.5 of the Public Resources Code requirements to prepare an EIR under CEQA and with other applicable laws and regulations. As such the FED and Policy comply with SWRCB regulations and the requirements of CEQA. | No |
| 50.1 | Baseline conditions described in the FED lacks evidence of current conditions and does not take into account that implementation plans for TMDLs languish. | The baseline conditions comprise the existing practices and procedures currently employed by the SWRCB and the RWQCBs for assessing the surface water bodies of the state in compliance with CWA section 303(d). The baseline is the process that occurred in the listing and delisting of water quality limited segments in the absence of the proposed Policy. However, the FED has been revised to include the type of water body, pollutant, and estimated area affected that were placed on the list as a result of the baseline process used by the SWRCB and RWQCBs that occurred in the listing and delisting of water quality limited segments in the absence of the proposed Policy. Implementation plans for TMDLs are addressed in the Draft Water Quality Control Policy for Addressing Impaired Waters: Regulatory Structure and Options (SWRCB, 2004). | Yes |
| 51.167 | The Policy will cause a demonstrably higher level of pollution with consequent human health and environmental impacts. These effects are adverse and significant. Consequently, the FED must identify, analyze and mitigate for them. In the absence of such identification, analysis and mitigation any approval of the policy violates CEQA. | The adoption of the Policy will not result in human health and environmental impacts and meets CEQA requirements by identifying the issues, analyzing alternatives and selecting the superior alternative. The analysis of issues is based on the impacts due to the adoption of the Policy. Adoption of the Policy does not result in a higher level of pollution, consequences to human health or environmental impacts. The Policy provides guidance in methodology to be used to list, not list, or de-list water bodies. Identification and mitigation of significant adverse impacts due to pollutants in water bodies is part of the TMDL development process; identification, analysis, and mitigation for significant and adverse impacts will be addressed at that time. | No |
| 51.62 | The FED fails to identify, analyze and mitigate numerous significant and potentially significant adverse environmental effects of the project. The FED summarily concludes that there will be absolutely no impact from this sweeping | The analysis of the environmental effects of the Policy focuses on the differences between existing RWQCB listing and delisting practices and the proposed Policy and whether adoption of the Policy would have a significant | No |

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| | and dramatic policy change, not even a 'less than significant impact.' Potentially adverse environmental effects are disposed of in a series of curt and conclusory paragraphs with no analyses whatsoever. Potentially significant adverse environmental effects are afforded only a single word of discussion -- the word 'None.' These findings are not supported by any evidence in the record and are in fact contradicted by numerous other findings and evidence set forth in the FED. Since the draft Policy applies to virtually every regulated pollutant, and determines whether discharges of these pollutants will be reduced in the future, it is self evident that the policy will impact the quantities of these pollutants being released into the environment. | adverse effect. A significant effect on the environment is generally defined as a substantial or potentially substantial adverse change in the physical environment. Using this definition, the adoption of the Policy will not have a significant adverse environmental effect because the Policy comprises a process by which the SWRCB and RWQCBs will comply with the listing requirements of the CWA and in and of itself does not change the physical environment. Additionally, the Policy provides guidance on using scientific data and information to document standards attainment to a water body and whether the impact warrants placement on the section 303(d) list. The Policy itself does not determine whether pollutant discharges will be reduced; the implementation of a TMDL deals with allocation and reduction of pollutant loads. | |
| 51.63 | The FED fails to identify, analyze and mitigate significant adverse impacts to impaired waterways that will not be listed or will be removed from the list. The Policy guarantees that numerous impaired water bodies will not be listed (or will be delisted) including: water bodies whose impairment is periodic or episodic; water bodies whose impairment is recent, even if the data shows a clear trend over time toward the current exceedance of standards; water bodies whose impairment is supported by older data even in the absence of more recent counter-indicative data; water bodies in which an impairment is not uniformly distributed in the water body; impaired waterways in which only a moderate number of samples have been taken; water bodies impaired with toxic chemicals whose sampling does not satisfy the 'Critical Exceedance Threshold' set forth in the Policy; water bodies whose impairments are not amenable to statistical testing; water bodies impaired by pollution rather than pollutants; water bodies impaired by exotic species; water bodies impaired by natural sources; and water bodies impaired by toxicity where no pollutant has been identified. | The analysis of the environmental effects of the Policy focuses on the differences between existing RWQCB listing and delisting practices and the proposed Policy and whether adoption of the Policy would have a significant adverse effect. A significant effect on the environment is generally defined as a substantial or potentially substantial adverse change in the physical environment. Using this definition, the adoption of the Policy will not have a significant adverse environmental effect because the Policy comprises a process by which the SWRCB and RWQCBs will comply with the listing requirements of the CWA and in and of itself does not change the physical environment. In addition, the Policy does not guarantee that numerous water bodies will not be listed or will be de-listed. The Policy provides guidance on the listing factors mentioned based on scientifically credible data and information and provides a process to evaluate data using a situation-specific weight of evidence listing factor. The Policy provides the methodology to assess all available data; as well as a process to validate data. | No |
| 51.69 | The FED fails to adequately consider and mitigate the cumulative impacts of the policy. No effort is made to analyze impacts that may result from individual or repeated failures to list impaired waterways. This contravenes CEQA's requirement that cumulative impacts be considered and mitigated. No effort is made in the FED to analyze impacts that may result from individual or repeated failures to list impaired waterways when combined with the impacts of other policy decisions such as the recently adopted waivers for agricultural and silvicultural waste in the Central Valley, the proposed California Non-Point Source Plan, the proposed amendments to the Ocean Plan, the ongoing NPDES permitting program or numerous other SWRCB water projects. Likewise no effort has been made to identify, analyze or mitigate the health impacts that arise from the repeated exposure of humans to the pollutants and pollution resulting from this policy when combined with other sources such as from air sources, food sources, workplace exposures, etc. Nor has a similar analysis of the cumulative ecological effects of these pollutants and this pollution when | The analysis of the environmental effects of the Policy focuses on the differences between existing RWQCB listing and delisting practices and the proposed Policy and whether adoption of the Policy would have a significant adverse effect. A significant effect on the environment is generally defined as a substantial or potentially substantial adverse change in the physical environment. Using this definition, the adoption of the Policy will not have a significant adverse environmental effect because the Policy comprises a process by which the SWRCB and RWQCBs will comply with the listing requirements of the CWA and in and of itself does not change the physical environment.<br><br>In addition, in the alternatives analysis for the various issues, the FED addresses the impacts of listing and delisting decisions as compared to the baseline condition - decisions made without a Policy. Staff selected the alternative that best complies with the listing requirements of the CWA and | No |

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| | combined with that of other sources been conducted. This contravenes CEQA's requirement that cumulative impacts be identified, considered and mitigated. | establishes a standardized listing approach. This Policy applies only to the listing process methodology used to comply with CWA section 303(d). The Policy is not intended to be used to determine compliance with any permit or waste discharge requirement provision; establish, revise, or refine any water quality objective or beneficial use; or translate narrative water quality objectives for the purposes of regulating point sources. The adoption of the Policy has no impact on health impacts from the sources cited nor does the adoption of the Policy result in ecological impacts; the potential for these types of impacts will be addressed during the TMDL development process. The adoption of the Policy will not result in a cumulative impact and under CEQA guidelines would result in a de minimus impact. | |
| 51.71 | The Policy does not make clear what legal significance the FED will have after adoption of the policy. Among the measures set forth in the FED which do not appear in the Policy are: a weight of evidence alternative listing procedure; a weight of evidence approach to determine the pollutants(s) that may cause toxicity; a procedure for listing nutrients which allows the use of 'models, scientific literature, data comparisons, to historical values or to similar but unimpacted streams, Basins Plan objectives, other scientifically defensible methods' in making a listing decision; a procedure, which allows 'both quantitative and qualitative data and information in the evaluation of nuisance.'; a case-by-case interpretive approach to the listing of sedimentation providing that 'general guidelines to trigger listing' and stating that a water body can be listed if any one of the following conditions are met: beneficial use impairment caused by increased sediment loads; evidence that beneficial use impacts are caused by sediment; nuisance caused by sediment loads, or exceedances of turbidity objectives. The FED repeatedly describes a robust alternative listing procedure that relies on a weight of the evidence test. The Policy does not contain such a procedure. Instead sections 3.1.11 and 4.10 of the Policy set forth a procedure that is no less restrictive than the binomial hypothesis statistical test. The procedure excludes qualitative information and other non-quantitative tools. The weight of evidence language in the FED appears to be both inaccurate and misleading. To the extent these measures are not a binding part of the Policy, a decision by SWRCB based upon the FED violates CEQA. The FED inaccurately describes the project and its mitigation measures. This is misleading to the public and defeats the central purpose of the statute. Additionally, the failure to incorporate these measures into the policy invalidates the FED's finding of no significant impact. Moreover, many of these policy provisions constitute mitigation measures, which lessen the policy's impact on the environment. CEQA mandates that such requirements be carried out contemporaneously with the project. | The draft FED supports the Policy by exploring various alternatives, providing options and recommendations, and evaluating the environmental impacts of the Policy guidelines. SWRCB regulations require that such a document, equivalent to a CEQA document, accompany a policy proposed for adoption. In addition to supporting the Policy adoption process, the FED provides the rationale for provisions of the Policy and in some cases, more detailed information to guide the future implementation of the Policy.<br><br>The process the SWRCB used to develop the Policy has been certified by the Resources Agency to be functionally equivalent to the CEQA process. The FED fulfills the requirements of CEQA for preparation of an environmental document. The FED discusses alternatives for each issue.<br><br>'Weight of evidence' and 'multiple lines of evidence' as used in the draft Policy are accepted concepts in the scientific literature (e.g., Good, 1985; Smith et al., 2001), and are therefore discussed and promoted accordingly in the draft FED and draft Policy (see Section 3). As a first step, in implementing the Policy these approaches are required to be used in conjunction with the binomial test for numeric sample data. The use of hypothesis or significance testing is one way to weigh evidence (Good, 1985). The draft Policy also allows RWQCBs to recommend listings or delistings based on the situation-specific weight of evidence factor.<br><br>RWQCBs will need to document all listings and delisting decisions in fact sheets and SWRCB shall determine if there is substantial evidence to list or delist.<br><br>The new section in the introduction of the Policy presents the steps for implementing the Policy's weight of evidence approach. The approach includes the process for data and information preprocessing, data and information processing, and combining lines of evidence. The Policy also has weight of evidence listing and delisting factors that allows RWQCB to make recommendations as long as RWQCBs justify its recommendations by: | No |

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| | | --Providing any data or information supporting the decision;<br>--Describing in fact sheets how the data or information affords a substantial basis in fact which the decision can be reasonably inferred;<br>--Demonstrating that the weight of evidence of the data and information indicate attainment status of the water quality standard; and<br>--Demonstrating that the approach used in scientifically defensible and reproducible. | |
| 51.72 | Adoption of the Policy as written will result in numerous significant and unmitigated adverse environmental impacts. In this circumstance, the agency must balance the economic benefits of the project against its environmental harm to determine if the project should proceed. This 'statement of overriding considerations,' as the last step in the analysis, provides critical information to the public to fulfill the law's public disclosure requirement - that the [functionally equivalent document] function as 'a document of accountability' and 'informed self government.' However, CEQA requires that the agency first identify the adverse effects of the proposed project before it exercises that power.<br><br>No statement of overriding considerations is presented in the FED. Moreover, the FED repeatedly rejects mitigation measures and selects alternatives, which favor economic and cost factors and increase the risk of adverse environmental impacts. The Policy's choices regarding the statistical test, in particular, demonstrate a desire to sacrifice human health and environmental concerns in order to 'protect against the unnecessary expenditure of funds' involved in erroneously listing a waterway. These choices are not permissible in the absence of a statement of overriding considerations. | The analysis of the environmental effects of the Policy focuses on the differences between existing RWQCB listing and delisting practices and the proposed Policy and whether adoption of the Policy would have a significant adverse effect. A significant effect on the environment is generally defined as a substantial or potentially substantial adverse change in the physical environment. Using this definition, the adoption of the Policy will not have a significant adverse environmental effect because the Policy comprises a process by which the SWRCB and RWQCBs will comply with the listing requirements of the CWA and in and of itself does not change the physical environment.<br><br>Additionally, a statement of overriding considerations is included in a final EIR, in conjunction with making findings upon project approval, when the benefits of the project outweigh the unavoidable adverse effects. For the Listing Policy, there are no adverse impacts. Adverse impacts are measured against baseline conditions at the time the FED was written; baseline conditions are the decision-making process that went into previous section 303(d) lists.<br><br>Section 21080.5 of the Public Resources Code provides that a regulatory program of a state agency shall be certified by the Secretary for Resources as being exempt from the requirements for preparing EIRs, Negative Declarations, and Initial Studies if the Secretary finds that the program meets the criteria contained in that code section. The draft Policy meets this exemption and, therefore, is not required to prepare an EIR which would contain the statement of overriding considerations. An statement of overriding considerations is not need because there are no impacts. Further, the FED analyzes alternatives for each of the identified issues and has selected the superior alternative, per CEQA requirements. | No |
| 51.77, 58.16 | The relative ease with which we found these waters belies the draft Policy's assertion that "no issues [in the draft Policy] were found to have the potential for significant adverse environmental effects," and illustrates the need for significant modifications to the Policy in order to ensure that similar, yet-unidentified waters are not left behind. | The analysis of the environmental effects of the Policy focuses on the differences between existing RWQCB listing and delisting practices and the proposed Policy and whether adoption of the Policy would have a significant adverse effect. A significant effect on the environment is generally defined as a substantial or potentially substantial adverse change in the physical environment. Using this definition, the adoption of the Policy will not have a | No |

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| | | significant adverse environmental effect because the Policy comprises a process by which the SWRCB and RWQCBs will comply with the listing requirements of the CWA and in and of itself does not change the physical environment. | |
| 55.1 | SWRCB has complied with the State Clearinghouse review requirements for draft environmental documents, pursuant to the CEQA. | Comment acknowledged. | No |
| 60.91 | This section of the FED will also need to be revised. Recommend that you carefully consider all policy recommendations that you receive and make required changes to the FED. | All public comments on the draft Policy and FED have been carefully analyzed. Changes to the policy and FED were made where merited. | No |
| 65.1 | All segments of the coalition are potentially impacted by the draft Policy, including construction employees who rely on jobs in the State, landowners within the State's boundary and potential builders attempting to satisfy the ever-growing demand for housing. | There is nothing in the Policy that requires property to be used in a certain way or prohibits property from being developed. Adoption of the Policy would not affect housing or population growth. | No |
| 102.8, 105.7 | The proposed policy will violate antidegradation requirements by allowing significant degradation of state waters. The proposed binomial model will over counts errors and allow for significant lack of information about impaired waters. It will therefore allow impaired waters to continue to degrade rather than identifying them for clean up. | The Listing Policy does not allow degradation but rather identifies which waters do not meet standards, the pollutants contributing to or causing the standards exceedance (in most cases), which of these waters still need TMDLs, and the schedule for developing TMDLs.<br><br>The binomial model does not overcount errors but rather identifies the errors that may be made given exceedance frequency, sample size, and other factors related to the decision. | No |
| 105.2 | If the RWQCBs and SWRCB implement a TMDL for every listed water body, pollution will be reduced when impaired water bodies are listed. That sounds to me like a significant adverse environmental effect. | It is true that the reduction of pollution and associated management measures required for the implementation of a TMDL may represent a significant environmental impact. However, the significance of the impact is reviewed during the implementation of the TMDL; pollution is not reduced when an impaired water body is listed. Impacts will be analyzed as a part of the TMDL implementation process. The implementation of the Policy itself does not result in a decrease in pollution in a particular water body; hence, the Policy does not result in a significant environmental impact. | No |
| 105.8 | To implement the Policy, a statement of overriding considerations (SOC) is required. The SOC is designed to reveal exactly the kind of policy assumptions being made in the draft Policy--that economic consequences are more important than ecological consequences. The Policy should mitigate this significant environmental impact. | Section 21080.5 of the Public Resources Code provides that a regulatory program of a state agency shall be certified by the Secretary for Resources as being exempt from the requirements for preparing EIRs, Negative Declarations, and Initial Studies if the Secretary finds that the program meets the criteria contained in that code section. The draft Policy meets this exemption and, therefore, is not required to prepare an EIR which would contain the statement of overriding considerations. A statement of overriding considerations is not needed because there are no impacts. Further, the FED analyzes alternatives for each of the identified issues and has selected the superior alternative, per CEQA requirements. | No |

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| **Draft Policy, Section 1: Introduction** | | | |
| 10.3 | A consistent listing process should be sought for many reasons including but not limited to:<br>- economic efficiency,<br>- reliance,<br>- error limitation,<br>- reasonable confidence levels.<br><br>These goals will all go down the drain if the policy fails to address the overriding goal of protecting and rehabilitating the state's water resources.<br><br>Policy must take into account vast differences in water bodies, pollutants, biologic function, chemical interactions, drainage area, geology, and long term effects on these resources. Creating a consistent process (policy) with all of these variables is difficult, at best. The goal of consistency should not limit effectiveness of process to accommodate appropriate listing of impaired waters. | Comments acknowledged. | No |
| 18.21 | Language regarding how the Policy is not to be used in section 1 should be deleted. The purpose of the Policy is already described, so it is unnecessary to identify how it shall not be used. | This information is necessary because the provisions of the Policy could possibly be used for purposes other than developing the section 303(d) list. It is, for example, inappropriate to use the provisions of the Policy in order to translate narrative water quality objectives into numeric effluent limits or receiving water limits using the Policy. | No |
| 23.3 | NRC recommendations are based on a recognition that listing decisions may be based on outdated or inappropriate data. | Comment acknowledged. | No |
| 40.8 | It is unclear how many policy elements will actually be interpreted and applied by SWRCB and RWQCB staff because they are not explained clearly in the draft policy. The policy is inconsistent in its description of assessment methods as requirements or as discretionary guidelines. | All elements of the Policy will be implemented by SWRCB and RWQCBs. | No |
| 43.42, 60.19, 60.18, 60.17, 76.8, 76.7 | Section 1 should be expanded by no more than a page to provide a more complete explanation of the legal and regulatory framework for 303(d) listing. Paragraph 2 of the introduction should be expanded to provide more thorough descriptions of both CWA section 303(d) and 40 CFR 130.7. | The explanation of the section 303(d) listing process is contained in the FED. Brief descriptions of section 303(d) and 40 CFR 130.7 have been included to enhance clarity. Repeating large portions of the CWA or federal regulation is not necessary and may not be in compliance with APA section 11349(f). The objective of the Policy has also been expanded to enhance the description of SWRCB's intent. | Yes |
| 53.5 | The introduction to the Listing Policy should state that the SWAMP program is intended for general assessment of statewide water quality. SWAMP is mandated as an ambient monitoring program, and the Report to the Legislature that laid the foundation for SWAMP specifically directs that RWQCBs shall not focus SWAMP resources exclusively on sites with known or suspected | SWAMP data will be used to help implement the Policy as will the data from many other monitoring programs. This statement does not clarify the section 303(d) list requirement, decision rules, or implementation procedures presented in the draft Policy. | No |

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| | problems. Listing under the proposed Listing Policy guidelines will require additional monitoring resources that are not currently available through SWAMP. | | |
| 76.9 | The Introduction should also include the statement from the Notice of Public Hearing that specifies that the Section 303(d) list must include water quality limited segments, associated pollutants, and a priority ranking of the waters for the purpose of developing total maximum daily loads (TMDLs) in the next two years. | The draft Policy describes explicitly the decision rules and procedures to be used for placement and removal of waters from the section 303(d) list. The statement would be duplicative of descriptions already contained in the Policy. | No |
| 222.1 | Proactive approaches need to be used by the cities of the dischargers rather than spending the time to go back. We hope you are not going back to the 1998 listing. | The process proposed in the draft Policy is very different than the 1998 process. | No |
| **Draft Policy, Section 2: Structure of the List** | | | |
| 1.1, 19.6 | The distinction between waters to be placed on the 'Water Quality Limited Segments Category' (section 2.1) and waters to be placed in the Enforceable Program Category (section 2.3) is not clear and seems circular. | The Policy has been revised; the Enforceable Program Category (section 2.3) has been redefined and is now encompassed in section 2.2 Water Quality Limited Sections Being Addressed category which also includes TMDLs that have been developed and approved by the USEPA. | Yes |
| 5.7, 7.2, 7.4, 7.3, 7.8, 9.2, 11.6, 11.4, 12.4, 17.1, 18.96, 18.50, 18.65, 18.22, 19.4, 22.2, 23.7, 24.4, 25.6, 25.7, 25.5, 28.2, 29.2, 29.15, 38.3, 38.7, 39.2, 40.25, 43.54, 43.43, 43.46, 43.55, 44.3, 47.8, 47.1, 47.7, 56.9, 56.7, 56.5, 57.4, 57.3, 59.3, 60.24, 60.5, 60.29, 60.23, 60.15, 60.22, 60.20, 61.6, 61.5, 64.2, 65.6, 65.5, 67.2, 68.6, 70.2, 70.3, 71.5, 71.12, 71.13, 71.27, 72.6, 74.2, 76.16, 76.18, | Strongly support the concept of dual lists, and encourage the SWRCB to re-instate the use of dual lists in its final listing/delisting policy. Use of a planning list would be appropriate for impairments with undetermined causes, for use when insufficient data exist to determine a water body impairment status, or for cases where water quality standards may be inappropriate. | The focus of the Listing Policy is to provide the requirements for the development of the section 303(d) list; guidance on other lists is not included in the Policy. The Policy has been revised to focus on those waters still needing TMDLs and to identify those waters where TMDLs or other regulatory actions have been completed. In all cases but one, the Policy calls for the identification of the pollutant that will become the focus of the TMDL. Federal regulation allows for developing TMDLs for the identified pollutants causing or expected to cause water quality standards violations (40 CFR 130.7(b)((4)). The exception is toxicity. The definition of a TMDL (40 CFR 130.2(i)) allows for 'TMDLs to expressed in terms of either mass per time, toxicity or other appropriate measure.' In order for TMDLs to be expressed in terms of toxicity it is necessary for TMDLs to be developed for toxicity. The draft policy allows for the listing waters for toxicity if the pollutant is known or not.<br><br>The section 303(d) list now has two categories: Water quality limited segments and those waters not meeting standards where the attainment problem is being addressed. Waters without adequate information or that are clean would be acknowledged in fact sheets but no judgement would be made on their disposition. This information would be used in the development of the section 305(b) report. | Yes |

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| 76.10, 79.2, 80.7, 84.3, 84.6, 108.9, 111.6, 114.6, 114.5, 115.3, 116.4, 116.2, 116.3, 117.2, 118.2, 201.5, 201.4, 202.4, 203.2, 205.2, 205.3, 206.3, 207.18, 207.23, 207.11, 207.12, 207.21, 207.25, 207.20, 207.24, 208.3, 211.4, 211.2, 213.3, 213.5, 213.4 | | | |
| 8.20 | Assessments based on narrative standards or other qualitative assessments should be added to the list of excluded assessments. The Policy should allow for listing only where there is clear and convincing quantitative scientific evidence that human activity has caused impairment that can be reasonably remedied. | Federal regulation requires that narrative water quality standards be evaluated and that waters be placed on the section 303(d) list if these waters exceed these narrative standards. | No |
| 14.7, 18.62, 18.12, 20.20, 20.23 | Recommend that the policy should not describe the actions to be taken as a consequence of listing. The draft Listing Policy is not consistent with this recommendation. The 303(d) list would include priorities and schedules for the development of TMDLs for all listed waters. The Enforceable Programs Category specifies the types of actions that must take place for waters to be considered an Enforceable Program. These required actions may be in conflict with the Impaired Waters Guidance being developed. | The appropriate response can and should be developed after the water body is listed. It is also appropriate that if the SWRCB and RWQCB can determine the appropriate action at the beginning of the process, these processes should be allowed to continue without an intervening step to determine what action is necessary to address the problem. The Policy should require the identification problems at the listing stage and, to the extent possible, actions that address these problems. It seems to be a duplication of effort to develop a TMDL or to even start the TMDL development process if an existing permit, program, or enforcement action will completely address the water quality problem.<br><br>The Policy has been revised to allow RWQCBs to certify if a program can be used to address a pollutant-related water quality problem in lieu of a TMDL. | Yes |
| 18.58 | Recommended that the listing policy should address all assessed surface waters not attaining water quality standards. Water quality standards include numeric criteria, narrative criteria, beneficial uses, and antidegradation considerations.<br><br>The draft Listing Policy is not consistent with this recommendation. The draft Listing Policy would fail to identify water quality problems related to invasive species, habitat degradation, flow modification, or other non-pollutant sources. Only those waters not meeting standards due to pollutants (e.g. pesticides, nutrients, sediment, etc) would be identified. | Creating an 'impaired waters' list goes beyond the requirements of state law in developing the listing and delisting policy. SB 469 requires the SWRCB to prepare guidelines to be used by the state board and the regional boards for the purpose of listing and delisting waters and developing and implementing the TMDL program and total maximum daily loads pursuant to section 303(d). Developing a master list of all problems in state waters would be a difficult and controversial task that would reach far beyond the scope of the TMDL program. Federal regulation requires states to develop a list of waters that do not meet water quality standards and where TMDLs are still needed. The draft | No |

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| | | Policy addresses waters impacted by pollutants that do not meet water quality standards and where TMDLs are still needed. The Policy also requires listing of waters where standards are not met and a TMDL has been completed or another program is available to correct the identified pollutant related problem. | |
| 18.92, 18.91, 18.94, 42.3 | The TMDL Roundtable recommends that the 303(d) list should be an all-inclusive list of Impaired waters and not just a list of those waters USEPA determines to need a TMDLs. Establishment of an all-inclusive list of impaired waters include waters that do not currently meet water quality standards. Attainment of water quality standards is the only factor that is used to determine if a water should be listed. If a water is not attaining water quality standards, a separate and subsequent analysis is needed to determine the most appropriate regulatory remedy to address the impairment. Determination of the appropriate remedy is not part of the listing process as there is typically insufficient information to do so. | This recommendation is very similar to the structure of the section 303(d) list as adopted in 1998 and is included in the FED as one alternative. The 1998 list included all waters that were identified as not meeting standards. The expectation at that time was that the RWQCBs would develop TMDLs for all waters on the 1998 list. Many of the listings are not amenable to TMDL development for a variety of reasons including the standards exceedance not due to a pollutant, additional research and monitoring is needed to identify pollutants causing adverse conditions, etc.<br><br>This recommendation also goes beyond the mandate of SB 469 which requires the SWRCB to develop a listing and delisting policy for the purposes of implementing the CWA section 303(d). This recommendation would create a list of all problems not just those required by the section 303(d) and 40 CFR 130.7. | No |
| 23.1, 24.1, 28.1, 29.1, 39.1, 49.1, 59.1, 71.8, 71.9, 207.1, 211.1 | Fully supports SWRCB's goal of a standardized approach for listing, consistent and statistically-valid data evaluations, requirements for data quantity and quality, and implementation provisions. | Comment acknowledged | No |
| 39.9 | The most recently completed section 303(d) list should form the basis for any subsequent lists. | Comment acknowledged. | No |
| 43.41 | The current draft policy reverts back to considering the 303(d) list a list of all impaired waters, rather than a list of water quality-limited segments still requiring TMDLs, pursuant to 40 CFR 130.7, and that two of the separate lists proposed in the July draft are now inappropriately considered part of the 303(d) list. We request that the SWRCB adopt a listing policy that is generally consistent with USEPA's Guidance for 2004 Assessment, Listing, and Reporting Requirements Pursuant to Sections 303(d) and 305(b) of the Clean Water Act. No water segment should be listed on the 303(d) list unless specific pollutants are identified. | The proposed list structure is predicated on the assumption that if water quality standards are not met, the exceedance is due to a pollutant (the exception is toxicity), and a TMDL is still required, then waters should be placed on the section 303(d) list. If standards are not met and a TMDL has been completed or there are other cleanup program addressing the problem then a TMDL is not needed. SWRCB is combining the 4A, 4B, and 5 Categories provided in USEPA guidance (USEPA, 2003b) because water quality standards are not met. When standards are met after implementation of a TMDL or other program these waters will be removed from the section 303(d) list. | No |
| 43.56, 43.45, 48.4, 49.2, 58.2, 60.25, 60.13, 60.16, 60.21, 60.10, 60.11, 60.14, 60.12, 61.4, 76.5, 76.11, 76.6, 202.3, | The revised draft policy appears to have abandoned the concept of an Integrated Water Quality Report consistent with the 2001 EPA memorandum that provides guidance for integrating the development and submission of Section 305(b) water quality reports and Section 303(d) lists of impaired waters. The use of multiple assessment categories July 2003 Draft Policy was consistent with EPA guidance and would have provided a much needed mechanism for focusing appropriate resources and attention on the State's waters. Because resources are | California is required to comply with the requirements of CWA section 305(b) as well as the requirements for section 303(d). The draft Policy and CWC section 13191.3(a) require SWRCB to develop guidelines for listing and delisting related to the section 303(d) list. The Policy is narrowly focused on addressing the section 303(d) list requirements. SWRCB is still bound by CWA to develop the section 305(b) report. The USEPA guidelines for developing the 2004 section 303(d) list and the integrated water quality report | No |

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| 207.19, 211.3 | limited, cost-effective means must be used to address standards that are not met. | can be used when SWRCB develops the section 305(b) report. | |
| 51.19 | The State must list waters impaired by 'Pollution.'<br><br>Section 3.1 of the draft Policy similarly states that water segments for which standards exceedances reflect 'pollution' (e.g., 'physical alteration of the water body that cannot be controlled') shall not be placed on the 303(d) list. This position is reiterated in Section 2.1, which limits listing to waters impaired by 'a pollutant or pollutants.' We disagree with this proposition, and maintain that water bodies that are impaired by any source of pollution must be listed. This position is supported both by the plain language of section 303(d)(1)(A) and by legal opinions interpreting it, and has been supported by the RWQCBs as well in testimony and elsewhere.<br><br>This position is also supported by the NRC, which found that the TMDL program 'should encompass all stressors, both pollutants and pollution, that determine the condition of the waterbody.' The NRC found this step to be important because 'activities that can overcome the effects of 'pollution' and bring about water body restoration -- such as habitat restoration and channel modification 'should not be excluded from consideration during TMDL plan implementation.' | The State must list waters for pollutants in compliance with 40 CFR 130.7(b) in order to identify and schedule TMDLs for water quality limited segments still requiring TMDLs. USEPA Guidance (2003a) holds that 'pollution' problems should be placed in separate categories from those waters that need TMDLs. This Policy is consistent with that guidance from USEPA.<br><br>The Listing Policy does not limit listings to particular pollutant sources. Rather the policy requires listing of all waters that do not meet standards due to pollutants (the exception is toxicity). 'Pollution' like habitat modification, flow restrictions, etc. should not be included on the section 303(d) list. | No |
| 56.8 | Unclear what will happen to waters that are currently listed on the 2002 Monitoring List. | The information on the 2002 Monitoring List may be used to develop the section 305(b) report. | No |
| 60.8 | The December 2003 draft is not consistent with 40 CFR 130.7(a) and 40 CFR 130.7(b), which specify that the State is to identify those water quality limited segments still requiring TMDLs. It is for this reason that USEPA's Guidance (2003b), separated waters that are 'impaired or threatened and a TMDL is needed' from other waters that are 'impaired or threatened but a TMDL is not needed.' | All water quality limited segments not meeting water quality standards still requiring TMDLs should be placed on the section 303(d) list in accordance with the Policy and in compliance with 40 CFR 130.7(a) and 40 CFR 130.7(b). If toxicity is identified, the water will be placed on the list whether the pollutant is identified or not. | No |
| 210.3 | When listings are evaluated, maybe some waters may come off the 303(d) list in cases where impairments are undetermined, whether cause of impairment is unknown, or in cases where data is insufficient in order to determine if an impairment exists. Those are the reasons to establish a monitoring list. Waters for where there is this type of uncertainty should not be on the 303(d) list. | The draft Policy is focused exclusively on the development of the section 303(d) list. SWRCB is not precluded from developing a monitoring list as part of the development of the CWA section 305(b) report. | No |
| 217.4 | One of our concerns is that all too often the current approach results in sort of an approach of when in doubt, take it out, or don't list the water body at all. And one example that I heard, that this is much better than a watch list approach, which will never lead to a cleanup, I can't imagine any approach where anything on a watch list would actually get cleaned up. | Comment acknowledged. | No |
| 221.5 | This draft of the policy is much improved over the previous one because there is | Comment acknowledged. | No |

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| | less lists. There are two lists, the 305(b) and the 303(d); the 305(b) is the planning list. | | |
| 221.6 | If there were a planning list, you might title it the section 13267 list because it is the only place you are going to get the resources to get the sample counts. | Comment acknowledged. | No |
| **Draft Policy, Section 2.1: WQLS Category** | | | |
| 60.6 | If specific pollutants have not been identified, how can the SWRCB certify that a water segment is not expected to meet applicable water quality standards, even after application of applicable technology-based effluent limitations? Further, if we do not know the pollutants causing the impairment, we cannot know the applicable technology based effluent limitations. | The Draft Policy requires the identification of the pollutant prior to listings made on the 303(d) list, with the exception of toxicity. | No |
| **Draft Policy, Section 2.2: TMDLs Completed Category** | | | |
| 207.22 | Recommend that the California Impaired Water List contain a TMDLs Completed List consisting of water quality limited segments for which TMDLs have been completed. | The Policy has been revised to focus on those waters still needing TMDLs and identify those waters where TMDLs are being addressed either through other regulatory actions or a TMDL has been developed and approved by USEPA. | Yes |
| **Draft Policy, Section 2.3: Enforceable Program Category** | | | |
| 17.2 | The Enforceable Programs Category should be separate from the section 303(d) list. Separation from the 303(d) list acknowledges that alternative programs are an acceptable way to address impaired water in a timely matter without the need to devote additional resources to TMDL development. | The Policy has been revised to include a category that allows for attainment of the water quality standard through pollution control requirements other than TMDLs. | Yes |
| 41.9 | The Enforceable Programs section of the Policy (Section 3.3) should be moved and instead addressed solely in the Implementing Policy section. Support the Enforceable Programs approach presented in the documents, but believe it is best to address this important issue in a single document to avoid confusion and differing interpretations. | The Enforceable Programs component of the section 303(d) list has been revised. | Yes |
| 44.16, 76.41, 208.2, 208.4, 213.8 | Legacy pollutants should be addressed through some other enforceable program. | The section 303(d) list, addresses waters that do not meet water quality standards and identifies the pollutant(s) that are the likely cause of the standards exceedance. The problems identified on the section 303(d) list should be addressed by mechanisms that most easily and completely address the problem. If legacy pollutants are better addressed by another program then they should be addressed that way. | No |
| 51.10 | The Enforceable Program list still remains in effect an 'off-ramp' list that must be integrated completely into the 303(d) list. Section 2 of the draft Policy makes the Enforceable Programs list a subset of the 303(d) list. | The Enforceable Programs component of the section 303(d) list has been revised and incorporated into the Water Quality Limited Segments Being Addressed category and acknowledges when pollution control requirements are | Yes |

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| | The FED makes clear that the intent of the draft Policy is to allow impaired waters on the vaguely defined and often unenforceable 'Enforceable' Program list to specifically avoid TMDLs. In effect, then, these waters are not 'listed' waters, a point that must be corrected. | reasonably expected to fix the identified problem. This section of the list is not an off-ramp because the waters will be addressed by the certified program in lieu of a TMDL and within an adopted time frame. | |
| 51.11 | Strongly oppose SWRCB's proposal to create the Enforceable Program list for the following reasons:<br><br>There is absolutely no basis under the CWA for failing to list any impaired water body, as that term is defined under section 303(d), on the section 303(d) list and preparing a TMDL for that water body. The proposed list will therefore seriously undercut the state's TMDL program. | The Enforceable Program Category has been revised. All waters in the Water Quality Limited Segments Being Addressed section of the list are on the section 303(d) list. | Yes |
| 51.12 | Strongly oppose SWRCB's proposal to create the Enforceable Program list for the following reason:<br><br>The proposed Enforceable Program list is inconsistent with the plain text of section 303(d). Section 303(d) expressly requires each State to identify waters within its boundaries for which 'the effluent limitations required by section 301(b)(1)(A) and section 301(b)(1)(B) of this title are not stringent enough to implement any water quality standard applicable to such waters.' 33 U.S.C. §1313(d)(1)(A). Thus, waters are to be listed, and TMDLs developed, whenever the effluent limits described in section 301(b)(1)(A) and (B) are insufficient to attain and maintain water quality standards.<br><br>In contravention of the clear dictates of the CWA, staff have proposed to exclude impaired waters from the section 303(d) list for a variety of improper reasons, including the alleged availability of a remediation planning documents, unenforceable Nonpoint pollution best management practices, storm water permits, and enforcement actions.<br><br>The draft Policy is proposing that the exercise of enforcement prerogatives can constitute a basis not to list an impaired waterway. This proposed 'out' is beyond the scope of section 303(d).<br><br>Similarly, SWRCB has proposed to de-list or has refused to list several water segments for trash based on coverage by municipal storm water permits. Yet again, this exception exceeds the language of the CWA.<br><br>More disturbingly, the draft Policy proposes to place on an Enforceable Program list impaired waters for which no enforceable program exists! None of these 'justifications' for failing to list impaired waters can be squared with the statute. | The Policy has been revised; waters in this category are now included in the Water Quality Limited Segments Being Addressed category of the section 303(d) list. As certified by RWQCBs, waters in this new category will have programs in place to address the problem. These programs should be allowed to be implemented. If these programs do not work within the adopted time frame, TMDLs should be developed and implemented. Waters in this category are already on the 303(d) list.<br><br>USEPA guidance (2003a) allows waters to not be listed if a program is addressing the water quality problem. The Policy goes beyond this by requiring waters to be placed on the section 303(d) list. | Yes |
| 51.13 | Strongly oppose SWRCB's proposal to create the Enforceable Program list for | The Policy has been revised to include these waters where action are underway | Yes |

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| | the following reason:<br><br>The language of section 303(d), when read in the overall context of the CWA as well as section 301, clearly indicates that Congress intended the TMDL program to coexist with other enforcement and clean up programs under the Act. There is no indication that Congress intended the operation of the CWA as a whole to disable any specific element of the Act. Yet, this would be the effect of the Enforceable Program list. Such an impact cannot be countenanced. | in the Water Quality Segments Being Addressed section of the section 303(d) list. The purpose of this new category is to allow coexistence of programs and to avoid duplication of program efforts. | |
| 51.14 | Strongly oppose SWRCB's proposal to create the Enforceable Program list for the following reason:<br><br>The proposed Enforceable Program list contravenes the USEPA's 2004 Integrated Water Quality Monitoring and Assessment Report Guidance ('2004 Integrated Guidance'). While the 2004 Integrated Guidance is also inconsistent with section 303(d), SWRCB's proposal goes beyond even what is contemplated by the 2004 Guidance. Specifically, the 2004 Integrated Guidance describes an alternative category of waters for which other pollution control requirements are stringent enough to implement any applicable water quality standard. On their face, the enforcement actions and clean up programs proposed by SWRCB do not fall within the ambit of 'other pollution control requirements.' Further, the 2004 Integrated Guidance states that 'these requirements must be specifically applicable to the particular water quality problem' and that 'monitoring should be scheduled ... to verify that the water quality standard is attained as expected.' The Guidance also requires that the water quality standard must be expected to be attained within a short amount of time. The FED instead expands this to allow the waters to remain without a TMDL unless there are 'unreasonable delays' (again, undefined). | SWRCB is not implementing the portion of USEPA guidance (Category 4B) that says waters that have an enforceable program should be placed on a separate list and not on the section 303(d) list. It is proposed that waters not meeting standards will be placed on the section 303(d) list. | No |
| 51.15 | Strongly oppose SWRCB's proposal to create the Enforceable Program list for the following reason:<br><br>The legitimacy of an Enforceable Program list is severely undercut by the timing of this proposal. The requirements of section 301 are over 25 years old, while many of the programs, permits, or enforcement options that would serve as bases to exclude waters from the section 303(d) list are also years if not decades old. California's patent inability to resolve water quality problems over the years through the use of the very same options it now touts as definitive solutions underscores that these programs are not, in fact, necessarily 'solutions' to the identified impairments. If they were, the waters at issue would be in attainment by now. Aside from the other legal problems discussed above, it is simply too late at this juncture to use the specter of section 301(b)(1)(A) and (B) effluent limits enforcement, municipal storm water permits, or any other program, such as BPTCP, as a basis to end-run section 303(d). This conclusion is also supported by the fact that impaired waters were required to be listed and | Comment acknowledged. | No |

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| | TMDLs developed and implemented pursuant to section 303(d) over 20 years ago. California's own delay in establishing TMDLs cannot now open the door to the use of later-developed alternatives to further limit the operation of the already delayed TMDL program. Because the proposed Enforceable Program list ignores SWRCB's own experience with the 'alternatives' to 303(d) listing and the temporal intent of section 303(d), it is unlawful and unwise. | | |
| 51.16 | Strongly oppose SWRCB's proposal to create the Enforceable Program list for the following reason:<br><br>We are concerned that the proposed Enforceable Program list will create a circular feedback loop whereby numerous impaired waters will never be properly listed and subject to a TMDL that will ensure the water body will be restored. For instance, under the proposed program, SWRCB may elect to place a water body on the Enforceable Program list due to the existence of an "alternative enforceable program" during any given listing cycle, with very little justification or assurance that water quality standards will be met. Then, at the next listing cycle, even if the water body is still impaired, SWRCB may again elect to place the water on the Enforceable Program list based on the same alternative program. This may continue indefinitely under the program as proposed by SWRCB. The result of such an indefinite feedback loop will be that numerous waters that are impaired will remain impaired. This is completely at odds with the intent of section 303(d).<br><br>We urge SWRCB to eliminate the unimplementable and illegal Enforceable Program list. | The Draft Policy has been revised and the Enforceable Program category has been replaced with the Water Quality Limited Segments Being Addressed category. The methodology for placement in this category states that, 'Water segments shall be listed placed in this category...If a RWQCB certifies under the provisions of the Water Quality Control Policy for Addressing Impaired Waters: Regulatory Structure and Options, that pollution control requirements other than TMDLs are reasonably expected to result in the attainment of the water quality standard within an adopted time frame. Waters shall only be removed from this category if water quality standards are attained or pollution control mechanisms are not effective. If the certification is removed a TMDL must be completed. | Yes |
| 217.19 | If there is an enforcement program, then the pollutant can't be listed on the 303(d) list. That's throughout the document, and it's very, very confusing in a lot of places. Instead, it gets put on the enforcement list. | Waters that do not meet standards due to pollutants (except for toxicity) are recommended for placement on the section 303(d) list. | Yes |
| **Draft Policy, Section 3: Listing Factors** | | | |
| 8.8 | Support the exclusion of visual assessments or other semi-quantitative assessments as the sole basis for a listing. The Policy should allow for listing only where there is clear and convincing quantitative scientific evidence that human activity has caused impairment that can be reasonably remedied. | Comment acknowledged. | No |
| 18.36, 20.14, 48.6, 51.112 | The proposed Policy unnecessarily repeats the same information on the application of the binomial method. In the context of certain water quality information (e.g., bioassessments, nuisance), the repeated reference to the binomial method either does not make sense (how can it be applied to qualitative information? (see section 3.1.7) or raises more questions than it answers (i.e., different listing criteria are applied to the sediment quality | Sections 3.1.6, 3.1.7, and 3.1.9 have been clarified. The repetition of the application of the binomial model references was included to allow SWRCB the widest possible opportunity to consider alternate exceedance frequencies and confidence levels for the various parameters listed. To the extent that clarity of the section is not reduced, the repetition of the binomial model language has been summarized. | Yes |

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| | guidelines (see section 3.1.6 vs. 3.1.9). | | |
| 18.71 | Recommended delisting or not listing factors as follows:<br><br>(a) Readily available data and information indicates that water quality standards are being attained.<br>(b) Some data and information indicate past non-attainment of water quality standards, but other information or data indicates that the water quality problem is not recurrent or persistent. Overall, the available information indicates that water quality standards are currently being attained.<br>(c) New data or information indicates that faulty data led to the original listing. Assessment of remaining (credible and non-faulty) data either indicates that water quality standards are attained or is inconclusive. Faulty data include, but are not limited to, typographical errors, improper quality assurance/quality control procedures, or limitations related to the analytical methods that would lead to improper conclusions regarding the water quality status of the segment.<br>(d) Standards have been revised or beneficial use designations have been modified and have received all required State and federal approvals and available data and information indicate that water quality standards are being attained.<br>(e) The RWQCB has made findings pursuant to SWRCB Resolution 68-16 to allow degradation of the high quality of the water body. Data and information indicates that the degradation does not exceed that which is permitted in such a finding.<br><br>The draft Listing Policy is partially consistent with this recommendation. Recommendations (c) and (d) have been incorporated. A binomial distribution method is used to determine attainment, rather than Recommendation (a). Recommendation (b) is partially addressed by section 4.10 of the Draft Listing Policy, but it is unclear how section 4.10 would be applied. Recommendation (e) does not appear to be included in the Draft Listing Policy. | Readily available data and information are used to help make inferences regarding water quality attainment. Statistical procedures such as the binomial model only helps to ensure that the decisions made, based on inferences from sample data, are as error free as possible to support placement or removal of waters from the section 303(d) list. The sole purpose of the statistical tool is to increase the confidence and reliability of the available data and information evaluated to make section 303(d) listing decisions. The Policy also provides a list of factors to consider when removing listed water quality limited segments from the section 303(d) list. The Policy provides guidance in cases where data and information does not fit the conditions listed under sections 4.1 - 4.10 or when the line of evidence does not support removal. The policy also provides a new section, the situation specific weight of evidence factor, to provide the RWQCBs the flexibility to remove waters from the list if applicable water quality objectives are no longer exceeded. | No |
| 18.81 | Recommend that RWQCBs should use the decision processes described by the TMDL Roundtable Figure 1 and 2 to evaluate the attainment of beneficial uses and narrative and numerical objectives in surface waters, and to evaluate compliance with the antidegradation component of water quality standards. The draft Listing Policy is partially consistent with this recommendation. The draft Listing Policy adopts many of the process steps contained in this recommendation. The draft Listing Policy goes beyond in providing prescriptive requirements for many of the process steps in terms of how data should be evaluated, allowable age of data, minimum sample size, and limitations on the temporal and spatial representativeness of individual data points. | Much of the information provided in this recommendation is descriptive of how data can be used and does not specifically establish a process that can be used predictably. The recommended figures do present a consistent process but the tables are so general that the lists generated from the process could be very different from one another simply because of different interpretations of the RWQCB staffs. In addition to the process in the figures it is also important to present clear decision rules. Many of the terms presented in the figures are used without clear definition (e.g., recurrent, interpretative endpoints, persistent, etc.). The decision rules proposed in the draft Policy presents proposals that ensure consistency statewide while preserving the use of RWQCB judgement to establish which data sets or portions of data sets should be used in the section 303(d) assessments. | No |

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| 18.83 | Recommended that the evaluation of aquatic habitat/aquatic life-supporting beneficial uses incorporates several types of toxicity and chemical data including both water column data and sediment quality data. Each type of data may generally be evaluated independently of the others, and listing for non-attainment of the aquatic life use results when an adequate amount of data indicates impaired beneficial use. A determination of impairment should be based on an environmentally-representative number of samples collected over a timeframe reasonably representative of existing conditions. The draft Listing Policy is not consistent with this recommendation. The tiered approach for assessing toxicity to aquatic life is not reflected in the draft Listing policy. | The approach recommended is impossible to assess for several reasons: (1) the listing values for sediment (i.e., TELs and ERLs) are lower than any evaluation guideline used in any California listing process to date, (2) the exceedance frequency is much more stringent than may of the RWQCBs have used (except for Region 5), (3) the phrases used to allow flexibility allow staff to not use the decision rule under all circumstances. It is suggested in the recommendation that the pollutant be identified and correlated to an effect through SQG, TIEs or other evaluation criteria, although, it would not be a requirement in the Policy. | No |
| 18.89 | The TMDL Roundtable recommended that water bodies that have beneficial uses that are impaired due to factors such as lack of flow, degraded aquatic habitat, and physical changes to stream channels should be identified on the List. The draft Listing Policy is not consistent with this recommendation. The proposal is for such waters not to be listed. | The Policy is focused on addressing problems related to pollutants that may cause water quality standards attainment problems. The Policy is not focused on addressing pollution problems such as habitat and physical changes in stream channels. Federal guidance does not require inclusion of problems related to habitat or physical changes in the water environment be included on the section 303(d) list (USEPA, 2003b). | No |
| 40.5 | Appreciate that the policy provides for the evaluation of all data and information types and the application of all numeric and narrative water quality standards in the assessment process. | Comment acknowledged. | No |
| 43.47, 60.30, 70.4, 70.5, 76.17 | This section should be redrafted to eliminate current sections 3.2 and 3.3. The TMDLs Completed List and the Enforceable Program List should not be part of the State's 303(d) list. Sections 3.1.10 and 3.1.11 should also be deleted. As currently drafted it would allow water segments to be placed on the 303(d) list even though water quality objectives were not exceeded and no specific pollutant was identified for water body conditions. This factor is inconsistent with 40 CFR 130.7. | Federal law calls for all waters not meeting water quality standards to be placed on the section 303(d) list. Declining trends in water quality should be included on the list if it is substantiated that there are impacts on aquatic life. | No |
| 44.10 | Impairment listing decisions should not be based on probabilistic data or evaluated data. | As required by federal regulation, all readily available data and information must be used in the section 303(d) listing process. | No |
| 51.74 | Table 3.1 of the draft Policy presents an extremely misleading view of the amount of samples available to RWQCBs. The high sample counts depicted in Table 3.1 are in excess of current resources allocations and are not scientifically necessary to conduct water quality assessments. Monitoring of conventional water quality parameters often takes place on a monthly basis. Monitoring of metals, synthetic organic chemicals, PAHs, bioassessments, and toxicity testing typically take place once or twice a year at a limited number of monitoring sites. The draft Policy's arbitrary minimum sample count requirement appears to prevent a water body that is out of compliance with standards four months out of twelve from being listed. For numerous conventional water quality parameters this is scientifically indefensible. For example, if surface water nitrate concentrations in a stream exceed the drinking water standard for three | Table 3.1 is included in the Policy in order to show the number of exceedances that will cause a water body to be place in the section 303(d) list. Most of the data sets available have less than 50 samples. Conventional pollutants can be greatly influenced by season, weather, and other factors. Having data from multiple seasons and years will only strengthen the case to place a water body on the section 303(d) list. The Policy does not require large sample sizes but rather provides the cut off values for both large and small data sets.<br><br>The sample counts in the Tables have been reduced. | Yes |

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| | months of the year, the water body is most certainly impaired, yet the Policy would not recognize this fact.<br><br>For many analyses, the high sample counts depicted in the Policy are unnecessary for making scientifically sound water quality assessments. Since the SWAMP budget is not likely to increase in the near future, the high sample count requirements could have the effect of either placing an unreasonable economic burden on holders of permits and waivers or, if that burden proves economically (or politically) infeasible, will ensure that impaired waters do not get listed.<br><br>As an example, a typical sampling strategy conducted in a region often involves sampling conventional water quality analyses monthly and conducts other more costly sampling a few times a year at a limited number of monitoring sites. Table 3.1 depicts sample count requirements for a single monitoring site (or single water body), which range as high as 500 samples. For most sampling types, the sample counts depicted in the table are scientifically unnecessary and economically impossible. | | |
| 56.21 | Support the draft Listing Policy's requirement that if adverse biological response or degradation of a biological population is demonstrated, these impacts need to be shown to be associated with water or sediment concentration of pollutants in order to be listed. | Comment acknowledged. | No |
| 60.26, 76.12 | This section should be rewritten to clarify that the only factors to be used to develop the California Section 303(d) list are those factors in Section 3.1. | This section of the Policy constitutes the listing factors to be used in California. | No |
| 73.2 | Waters should not be listed because of isolated or temporary incidents that may have no adverse impacts and for which development and implementation of a TMDL would be meaningless, and perhaps even impossible, given the transitory nature of the excursions. | Comment acknowledged. | No |
| **Draft Policy, Section 3.1: WQLS Factors** | | | |
| 8.6, 18.25, 18.9, 20.15 | There are concerns regarding limitations put on the use of information from a spill, violation of a permit or WDRs, and visual information. These limitations are not justified or necessary. Any information and data on the conditions of a water body must be considered regardless of the source. It appears that the intent is to preclude listing a water body if the cause of nonattainment water quality standards is due solely to a spill or violation. This concept may be appropriate under certain scenarios such as when the nonattainment is short lived and/or remediated via corrective action. When there is a spill or violation in conjunction with other discharges and/or spills or violations, it would make no sense to limit use of information or data associated with the event to assess to | Data on spills, violation of permit or WDRs and visual information can be used in conjunction with other data to demonstrate that there is an exceedance of water quality standards in the water body. However, this information cannot be used solely for the listing. This section has been revised clarify this language. | Yes |

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| | water body. Furthermore, a responsive action to a spill or violation is often collection of data on conditions throughout a water body not only within the vicinity of a discharge. Limiting use of these data is clearly an unintended consequence. | | |
| 18.24 | Delete references to other sections on data preparation, as well as references on limitations on the use of certain types of data. The sections on data preparation stand on their own. Reference to a limited number of those sections implies that the other sections on data preparation may not be applicable. | Reference to these sections allows the reader to obtain more description on the evaluation of data and information (i.e., data quantity and quality). In addition, it references the process of transforming data for evaluation and rules for using visual information. | No |
| 18.8, 18.30, 18.23 | The proposed Policy unnecessarily repeats the same information on the application of the binomial method. In the context of certain water quality information (e.g. bioassessments, nuisance), the repeated reference to the binomial method either does not make sense (how can it be applied to qualitative information? ) or raises more questions than it answers (i.e., different listing criteria are applied to the sediment quality guidelines – see section 3.1.6 vs. 3.1.9). | The Policy has been revised to address this concern. Each listing factor in section 3.1 refers to standard exceedances as described in section 3.1.1 or 3.1.2. The use of qualitative and quantitative information to support listing has been clarified in the Policy. | Yes |
| 30.5 | The Draft Policy states: 'Visual assessment or other semi-quantitative assessments may not be used as the sole line of evidence to support a section 303(d) listing.' However, section 3.1.7 appears to suggest otherwise. What is the SWRCB intent? | The intent is to use semi-quantitative and qualitative assessments as ancillary lines of evidence. The clarification on the use of visual assessments and semi-quantitative data has been incorporated in the Policy. | Yes |
| 40.23 | The state would need to adopt and receive USEPA approval of water quality standards changes pursuant to section 303(c) in order to apply natural source exclusions or the reference watershed approach to implementing bacteria standards as part of the Section 303(d) listing methodology. | Re-evaluation of existing standards is accomplished under CWA section 303(c)(1) and implementing regulation (40 CFR 131.20). During the triennial review the RWQCBs hold public hearings for the purpose of reviewing water quality standards and as appropriate, modify or adopt new standards. This Policy is not intended to change any water quality standards; therefore, the Policy provisions addressing listings for natural sources has been removed. This provides the RWQCBs with the flexibility to add, remove, or not list waters due to natural sources. Water bodies recommended for 303(d) listing in the future or existing listings recommended for removal from the 303(d) list due to natural sources will require review and approval by the SWRCB. | Yes |
| 51.163 | Data used to assess impairment related to biological impacts from sedimentation, adverse biological response, and degradation of biological populations and communities often does not lend itself to the narrowly allowed data analysis methodologies of the draft Policy. For example, the draft policy states sedimentation and degradation of biological populations and communities should be evaluated using the binomial model (Sections 3.1.8 and 3.1.9). Even if an alternative evaluation method was allowed by the Policy for these impacts (the Policy is unclear on this issue), the requirements for this alternative evaluation are severely limited by statistical requirements (Section 6.2.3).<br><br>Evaluation of impacts related to sedimentation, adverse biological response, and | It is not required or desirable that bioassessment data be evaluated using the binomial test.<br><br>The purpose of incorporating the use of a statistical approach in the listing evaluations is to verify the validity of data collected to support a particular listing. Sedimentation can be evaluated using acceptable guidelines or numeric standards that calculate impacts on beneficial uses from measured biological effects due to sedimentation. The data is then submitted to a statistical analysis to help determine if the data is sufficient at a specified level of statistical confidence to say that water quality standards are exceeded. The Policy recommends the use of the binomial distribution but it also allows other | Yes |

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| | degradation of biological populations and communities requires multiple lines of evidence (as noted in the FED). Currently, the draft Policy does not appear to allow a weight of evidence approach for these impairments. Furthermore, the draft Policy appears to eliminate the use of many, scientifically-accepted and recommended approaches to evaluating biological impacts. For example, the policy seems to not allow the use of the DFG's IBI. By doing so, the draft Policy effectively blocks the use of many types of biological datasets and bioassessment studies from consideration in the listing process, and effectively blocks most listing related to biological impacts. | approaches to be used.<br><br>In addition, The Policy also requires documented impacts due to adverse biological response or degradation of biological populations and communities to be associated with water or sediment concentrations of pollutants prior to placement on the section 303(d) list. This assessment is separate from the analysis used to evaluate chemical or physical data such as turbidity measurements. The Policy has been revised to clarify this difference. | |
| 61.15, 65.10, 84.10 | Concerned the inclusion of sections 3.1.10 (Trends in Water Quality) and 3.1.11 (Alternate Data Evaluation) could result in the continued inclusion of water bodies on the State's 303(d) list in the absence of information that water quality standards are exceeded or that beneficial uses are impaired. | The Policy (section 3.1) lists a number of specific factors to consider in order to place water bodies on the section 303(d) list. Waters meeting the conditions in this section exceed water quality standards and must be listed, and those waters that do not meet the listed conditions meet water quality standards and do not need to be listed. These factors comprise a weight of evidence approach establishing a process where individual lines of scientifically verified evidence are evaluated separately and combined to make inferences regarding water quality attainment. In general most attainment determinations will be made using one or more of the factors listed in section 3.1 which will indicate that water quality standards are exceeded. However, some waters that may currently meet water quality objectives can show a declining trend in water quality. Federal regulation requires that the water quality of these waters shall be maintained to support existing beneficial uses as well. The Policy provides general guidelines to list waters due to a decline in water quality by requiring not only substantiation of a declining trend but also a second line of evidence (e.g., adverse biological responses, degradation of biological populations and/or communities, or toxicity) that supports determination of water quality impacts. The Policy does not allow listing waters with declining water quality in and of it self unless there is additional evidence showing that beneficial uses of such waters are being impacted.<br><br>Furthermore, a situation-specific weight of evidence listing factor was included to address assessment of those waters where the available evidence may conflict making it difficult or impossible to determine whether water quality standards are attained. This section builds in flexibility by allowing other forms of evidence or other types of assessment methodologies to be used in order to evaluate attainment of water quality standards. However, the RWQCBs must also provide justification for the use of such alternative methods of evaluation. If there is an absence of information to list then the listing is not supportable. | No |
| 220.1 | Some of the current waters on the 303(d) list would not have been listed under this policy. | Comment acknowledged. | No |

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| **Draft Policy, Section 3.1.1: Numeric Water Quality Objectives and Criteria for Toxicants in Water** | | | |
| 58.12 | The values on Tables 3.1 and 4.1 are too far disparate unless a vigorous confirmation program is implemented for all values that exceed the standards. | The values in draft Policy Tables 3.1 and 4.1differ due to the nature of the mathematical foundation of the exact binomial test. In one case (listing, Table 3.1), the statistical assumption is made that each candidate water body in question is actually meeting water quality standards. This preliminary assumption is then tested.<br><br>For delisting, the initial assumption, for statistical purposes only, is that the water bodies already on the list do not satisfy water quality standards (a reasonable assumption, since they were previously listed). The appropriate statistical analysis is performed.<br><br>As the draft FED discusses, each methodology is valid, and scientifically defensible. The differences between these tables is reduced if errors are balanced. | No |
| **Draft Policy, Section 3.1.2: Numeric Water Quality Objectives for Conventional or Other Pollutants in Water** | | | |
| 1.3, 1.7, 1.16, 1.15, 1.11 | If sediment is considered a conventional pollutant, guidance should be provided for listing/delisting of water bodies whose numeric criteria are expressed as Mean of Monthly Measurements. | Guidance is provided in the Policy in section 6. For any specific averaging period, data should be considered as the first step in evaluating compliance with water quality standards. For example, if the standard is established as a mean of 12 monthly means then the data would represent the compliance determination for a year. In this example, multiple years of data would be necessary to use the statistical approaches presented in the Policy. | No |
| 11.8, 19.8, 203.5 | Dissolved oxygen data is inadequate as a sole indication of impairment. Nutrient data should also be evident. Please revise Section 3.1.2 to reflect this. | It would be ideal to have a second line of evidence (e.g., nutrient information) for exceedance of dissolved oxygen standards. However, since there is a numerical water quality objective for dissolved oxygen, exceedances can be used to determine impacts. Therefore, a listing can stand alone based on the exceedance of the dissolved oxygen WQO as long as there is some indication that the exceedance is due to pollutants. | No |
| 18.26 | The discussion of the cause of depressed dissolved oxygen should be eliminated. Depressed dissolved oxygen can have a number of causes and it is confusing to have a limited discussion of one possible cause (nutrients). Since it is not clear why such direction is necessary to conclude dissolved oxygen standards are not met, the discussion is deleted. | The discussion is necessary to rule out non-pollutant causes of the depressed DO. For example, TMDLs are not needed for DO problems caused by modified physical habitats. | No |
| 21.24 | With respect to DO depletions related to nutrients, the impact of nutrients needs to be carefully examined in terms of what constitutes a nutrient that leads to | The section on temporal representation has been revised to document the time of the measurement. | Yes |

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| | excessive fertilization and diel DO changes. Of particular concern is the time of day that measurements of DO are made. If the time of the DO measurement is not documented, data can be generated that do not properly assess DO violations of the water quality objective. | | |
| 40.70 | USEPA's 1997 guidance recommends methods for evaluating relatively small-sized sample sets to assess compliance with the applicable water quality standards, which specify allowable exceedance rates in the entire water body. The guidance does not directly identify allowable water quality standards exceedance rates for conventional pollutants. | Instead of using the section 305(b) guidance (USEPA, 1997b; 1997c) for this purpose, SWRCB used more recent guidance focused on the structure of the list and interpretation of standards (USEPA, 2003b) as well as guidance on statistical evaluation related to the section 303(d) list (USEPA, 2002a). | No |

## Draft Policy, Section 3.1.3: Numeric Water Quality Objectives or Standards for Bacteria Where Recreational Uses Apply

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| 11.11, 19.13, 203.8 | The term relatively unimpacted should be defined in order to help clarify the use of site-specific exceedance frequencies for bacteria in recreationally-designated areas. | This phrase was used to allow RWQCBs to consider a wide range of factors when using this reference condition approach. Too much detail in the Policy may limit the appropriate application of this concept for the evaluation of bacterial indicator data. | No |
| 18.85 | Recommended that data requirements and processes should be used in assessment of compliance with numeric bacteriological water quality objectives. The draft Listing Policy is not consistent with this recommendation. The TMDL recommendation focuses on an evaluation based on the existing water quality objectives, whereas the draft Listing Policy uses the binomial method and a 10 percent exceedance rate or a 4 percent exceedance rate for coastal beaches between April 1 and October 31. | The RWQCB recommendation provided no specific guidance on the approach for evaluating bacterial indicator data. The exceedance frequencies proposed to be included in the Policy were developed by BWQW. This group had several members of RWQCB staff that concurred in the recommendations. | No |
| 29.5, 61.12 | Clarify the language that applies specifically to contact recreation. | The section appears to clearly state the decision rules for interpreting bacterial indicator data and beach posting information. | No |
| 29.6, 61.13 | Impacts on contact recreation uses in freshwater should be evaluated in the context of seasonal and site-specific variation in actual use patterns. | Water contact-related water quality objectives should be implemented as stated in the Basin Plans. The fact sheets that will be prepared to implement the Policy will contain information related to seasonal variation and site-specific variation. | No |
| 29.7, 61.14 | Latitude should be allowed to consider actual pathogen data for the receiving water, if it exists, to support either listing or delisting, especially when the exceedance frequency is close to 10%. | If pathogen data (like virus density) is available it must be included in the assessment of all readily data and information. | No |
| 40.102, 40.22 | The provision that encourages application of a reference watershed approach to assessment of bacteria standards exceedances is inconsistent with state water quality standards except in Region 4, the only Region in which a reference watershed approach to bacteria standards implementation has been adopted as a component of its water quality standards. | This section of the Policy has been revised to acknowledge this point and to require that water quality objectives be implemented as adopted. | Yes |

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| 40.79, 40.77, 40.78, 51.102, 53.13 | The policy provisions for assessing bacterial standards exceedances should be revised because the proposed criteria appear to conflict with the State's current two-number water quality standards or objectives which have both an instantaneous maximum as well as specific data requirements and 30-day evaluation periods. The 10% binomial aspect would potentially be consistent with the numeric standard using the 30-day geometric mean averaging period. | The use of the binomial approach is consistent with the use of the 30-day geometric mean because the standards must be analyzed first in terms of the expression of the standard and then using the binomial test. For example, RWQCBs would assess compliance with the 30-day geometric mean for each 30-day period with data and then it would be determined if the standard is exceeded. The 'yes' or 'no' answer would be used in the statistical test along with all the other appropriately grouped nominal data. Sample size is dependent on the level of error allowed and the extent to which standards are not achieved (please refer to the Issue related to statistical analysis for more complete description). | No |
| 51.97, 51.96 | SWRCB offers no justification for allowing any other type of assessment aside from the reference system approach. Based on Heal the Bay's comprehensive database of bacteria monitoring results from County health agencies across the State, it should not be very difficult for the RWQCBs throughout the State to identify reference beaches for all beaches used for recreational purposes. The draft Policy should be revised to require a reference-system approach for the evaluation of marine recreational beaches. | Under the Policy, RWQCBs are required to use certain decision rules to interpret existing water quality standards. To the extent it is consistent with water quality standards, a reference system should be used. | No |
| 53.12 | The applicable bacteria standards are not specified. Recommend the need to specify which standards are applicable and consistently define a site-specific exceedance frequency as a percent of water quality exceedances in a relatively unimpacted watershed. | Applicable bacteria standards are contained in the Ocean Plan, California Code of Regulations (adopted pursuant AB 411), and Basin Plans. | No |
| 71.24 | If a site-specific exceedance rate is used instead of 10 percent (e.g., for bacteria in water quality where recreational uses apply), then similar tables should be constructed and used for determining compliance with bacteria in water quality objectives at those specific locations. | The fact sheet should contain the rationale for the use of a site-specific exceedance frequency. A large table is not necessary. A description of how the value is to be calculated and the critical values for confidence and power are included in the Policy. | No |
| **Draft Policy, Section 3.1.4: Health Advisories** | | | |
| 24.5 | Modify the final sentence to read: In addition, water segment-specific data meeting the data requirements of this Policy must be available indicating the evaluation guideline for tissue is exceeded. | This request would make this section duplicative of Section 3.1.5. | No |
| 44.12 | The Policy should require that fish tissue data specifically come from the water segment that is suspected of being impaired; the use of generic or area-wide data is not appropriate. | This request would make this section duplicative with Section 3.1.5. | No |
| 61.7 | The proposed listing factor would facilitate continuation of the problem of water segments being listed without pollutants being identified. Health advisory is only an indicator of an impairment unless a pollutant is identified. | Health advisories are acknowledged indicators that a beneficial use has been lost. The Policy also advocates the use of water segment-specific data to show that the pollutant is present in the segment proposed for listing. | No |

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| **Draft Policy, Section 3.1.5: Bioaccumulation of Pollutants in Aquatic Life Tissue** | | | |
| 18.27 | The discussion on bioaccumulation should be eliminated. The limited nature of the discussion provides little policy direction, and, therefore is unnecessary. | The Policy discusses the exceedance criteria necessary to list based on tissue pollutant levels. Additionally, the Policy provides guidance on how those levels are measured. | No |
| 21.35 | The minimum 10 percent exceedance approach for numeric water quality objective for bioaccumulation of pollutants in aquatic life tissue is not a valid approach for the protection of beneficial uses of water bodies. Fewer exceedance than 10 percent can have significant adverse effect on a water body. The focus should be on assessment of impacts on beneficial uses, instead of some arbitrary percentage of samples with exceedances. | Past USEPA guidance recommends making non-attainment decisions for conventional pollutants where more than 10 percent of samples exceed applicable water quality standards. Additionally, this exceedance approach has been used by many states to place waters on the section 303(d) list. The use of the critical exceedance rate is appropriately used in statistical analysis after an assessment of impacts to the beneficial use has already been made; it is not used to justify allowing an exceedance 10 percent of the time. The 10 percent critical exceedance rate applies to the determination of the number of samples needed to place waters on the section 303(d) list. | No |
| 40.84, 40.85 | In essence, an assessment based on as few as 3 composite fish sample results can be completed with sufficient confidence and it is probably more accurate than assessments made using 10 individual samples. (Composites generally consist of 3 or more individuals of the same species, where the smallest is 75% in length of the largest.) In addition, include guidelines on evaluating magnitude of tissue results. | The Policy has been revised to allow 'composite samples' to be used. The Policy now requires that at least three or more composite samples must exceed the evaluation guideline to be listed. | Yes |
| 40.86 | Concur that tissue results from muscle or whole body should be used in the assessment and that kidney or liver tissue alone are not suitable measures. | Comment acknowledged. | No |
| 56.17 | The SWRCB has essentially 'lowered the hurdle' for tissue based listings as compared to water column constituents. The draft Policy only requires 3 exceedances of aquatic life tissue evaluation for placement on the 303(d) list, while water column constituents for sample population less than 20, 5 or more sample exceedances are required, oppose this use of this minimum data requirement. | Comment acknowledged. | No |
| 56.18 | Listings based on exceedances of tissue evaluation guidelines, if used at all, should require an established relationship between tissue levels and water column concentrations. Support SWRCB's guidance to not use MTRLs and EDLs to evaluate shellfish or fish tissue data. | There is not always a correlation between concentrations of toxic substances in the water column and in aquatic organisms. Concentrations in water bodies are often too low or transitory to be detected. Aquatic organisms are sampled because they bioaccumulate and bioconcentrate toxic substances to levels that may be many times the levels found in water. | No |
| 56.19, 64.12 | Listings for bioaccumulation of pollutants in aquatic life tissue should be based on a weight of evidence approach, as is required for the evaluation of adverse biological response and degradation of biological populations and communities. | Under a weight of evidence approach, some lines of evidence are sufficient by themselves to demonstrate standard attainment. Evaluation of tissue chemical concentrations, based on screening values from USEPA, OEHHA, and NAS, are appropriate measures upon which to base a listing decision. | No |

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| 64.14 | Disagree with the minimum number of exceedances required for listing based on aquatic life tissue samples. | Comment acknowledged. | No |
| **Draft Policy, Section 3.1.6: Water/Sediment Toxicity** | | | |
| 5.8, 12.8, 23.8, 29.3, 39.3, 40.24, 40.88, 43.48, 58.8, 61.9, 71.15, 202.2 | The language in Sections 3.1.6, 3.1.8, and 3.1.9 of the Policy would seem to allow a water body to be listed due to toxicity, adverse biological response, degradation of biological populations without a clear link to a specific pollutant. This is inappropriate for the 303(d) list, and more appropriate for the planning list concept. | With the exception of toxicity, documented impacts due to adverse biological response or degradation of biological populations and communities must be associated with water or sediment concentrations of pollutants prior to placing the water on the section 303(d) list. Toxicity can be placed on the list whether pollutants are identified or not. | No |
| 10.9, 21.25, 21.19, 21.26 | There are significant problems throughout the draft 303(d) listing Policy where chemical concentrations of potential pollutants are used, assuming that there is a direct relationship between the total concentration of a constituent in water or sediments and an adverse impact on the beneficial uses of water bodies. As far as chemicals impact aquatic-life-related beneficial uses, the total concentration of a constituent is an unreliable indicator of a beneficial use impact. | Adverse biological response of resident aquatic organisms or degradation of biological populations and communities within a water body are actual indications that the beneficial uses of the water body are being impacted. The establishment of a link between impacts to beneficial uses and a specific pollutant or pollutants exceeding established water quality objective or criteria constitutes an exceedance of a water quality standard and must be placed on the section 303(d) list. | No |
| 16.1 | Submitted a memorandum dated 10/28/98 on the use of Sediment Quality Guidelines in Dredged Material Management Decision Making. | Comment acknowledged. | No |
| 21.21, 21.46, 21.18, 21.37, 64.22, 65.12, 65.14, 67.6 | The draft Policy includes a number of technically invalid approaches as listing parameters, such as the Long and Morgan/MacDonald co-occurrence-based sediment quality guidelines and the California SWRCB 'NAS criteria.' | The Policy does not require the use of any specific sediment guidelines. RWQCB are afforded significant flexibility to select the most applicable guideline. The guidelines mentioned as examples are acceptable, published values that may be used. Many of the sediment guidelines are predictive of sediment toxicity. | No |
| 21.42 | Care must be exercised in allowing dilution or other predictive models. Most of the predictive models do not adequately relate cause and effect. Dilution calculations can give erroneous results under conditions where the constituents of concern can accumulate at certain locations in the water body, such as those that accumulate in sediments. | Comment acknowledged. | No |
| 40.89 | The proposed toxicity evaluation method also needs to be revised to better account for the complexities of assessing the presence and magnitude of acute and chronic toxicity in multiple species tests. | Comment acknowledged. | No |
| 56.15 | Question whether 3 consecutive samples are required for toxicity and are the three toxic samples from different seasons of the same year. The reliance upon such few sample may make it more difficult to sufficiently represent the temporal characteristics of the water body, to determine if the conditions are persistent. The planning list or monitoring list may be a more appropriate place for these listing until it can be characterized. | The Listing Policy is not specific on which season toxicity should occur. Using the proposed binomial test with balanced error rates, if three samples showed significant toxicity it would sufficient to place the water on the list. | Yes |

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| 65.13 | Sediment toxicity is heavily influenced by site-specific factors (e.g., organic carbon content, acid volatile sulfides, sediment grain size) and guidelines developed in other jurisdictions are not legally promulgated standards within California. Therefore, this approach is inappropriate and would not result in scientifically sound listing decisions. | Many approaches have been used to develop SQGs. Data was gathered from many available sources, including those from equilibrium-partitioning models, spiked sediment bioassays, and numerous field surveys. Model studies and spiked sediment bioassays establish cause-effect relationships for a single chemical, whereas data from field studies reflect complex mixture and real world, natural conditions in ambient sediments. Therefore, the most meaningful assessment tools are based evidence from the combination of these methods. Data compiled from different study areas, with different pollution histories and physical-chemical properties converge upon ranges of contaminant concentration that are usually associated with effects, therefore guidelines derived from these studies can be broadly applicable to may other areas and situations. Until California sediment quality objectives are developed and adopted, other scientifically valid SQGs can be used to assess sediment contamination. In addition, the draft Policy does allow the use of other evaluation methods such as; equilibrium partitioning, toxicity identification evaluation along with other lines of evidence (i.e. bioassessment, tissue analysis, adverse biological response, etc.). | No |
| 217.11 | This cause and effect link typically cannot be established through simple or standardized tests. Instead, special studies are required. The listing policy is shifting the burden of establishing absolute cause to the Regional Boards. | Comment acknowledged. | No |
| **Draft Policy, Section 3.1.7: Nuisance** | | | |
| 58.9 | If it is currently impossible to identify the cause of the nuisance, it is unlikely that a source can be demonstrated. | Comment acknowledged. | No |
| 217.21, 217.20 | There are specific examples that talk about trash that are most troubling. If you have local anti-littering ordinances, for example, one can interpret that there is no way that body would be 303(d) listed, regardless of whether or not there is severe water quality impairment. | Waters can be listed for trash if evaluation guidelines are exceeded or if trash accumulation is greater than a reference condition. If there are enforceable mechanisms that solve the problem they should be used in lieu of a TMDL. | No |
| **Draft Policy, Section 3.1.7.1: Nutrient-Related** | | | |
| 18.86 | The TMDL Roundtable recommended that the parameters previously recommended for the evaluation of nutrients may be useful for establishing nutrient listings. The utility of these parameters varies, based on our current state of knowledge, and on the directness of their linkage to nutrient-related beneficial use impairment. The process for listing and/or delisting water bodies for nutrient impairment is to utilize a weight of evidence approach using this parameters, as appropriate, for each beneficial use designation in combination with the decision process in determining compliance with Water quality standards. Other scientifically defensible criteria may also be used. The draft | Comment acknowledged. | No |

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| | Listing Policy is partially consistent with this recommendation. The draft Listing Policy discusses algae growth as part of a discussion of nuisance conditions and dissolved oxygen under Conventional Pollutants. A general discussion of nutrients is not included in the draft Listing Policy. In addition, the draft Listing Policy applies a 10% exceedance rate and the use of the binomial method to dissolved oxygen data. | | |
| 58.7 | The policy is becoming overly prescriptive; the appropriate solution is to take dissolved oxygen samples in the morning, when the critical condition exists, rather than making assumptions. | Diel measurements are recommended because DO levels fluctuate seasonally and over a 24-hour period. They vary with water temperature and altitude. Cold water holds more oxygen than warm water and water holds less oxygen at higher altitudes. Aquatic animals are most vulnerable to lowered DO levels in the early morning on hot summer days when stream flows are low, water temperatures are high, and aquatic plants have not been producing oxygen since sunset. Therefore, diel measurements are recommended to ensure that the data is sufficient to document the extent and severity of the impairment as well as any temporal/seasonal trends. | No |
| 212.6 | There are some nuisance listings for the Burbank Western Channel: algae, odor, and scum that were on the 1998 listing and were carried to the 2002 lists. It's unclear how those listings were created and what additional data can be submitted to get those delisted. It's unlikely that individual observations will be accepted as new data to have those reevaluated, even though we believe that's how those listings were created in 1998. | If pollutants are not certified as causing or contributing to the observed conditions, then it is possible that the conditions are due to some non-pollutant factor (e.g., loss of habitat, natural algae growth, etc.). | No |
| **Draft Policy, Section 3.1.7.2: Other Types** | | | |
| 1.23, 1.5 | Clarification of inconsistency warranted in section 3.1.7.2 appears to permit listing based solely on visual assessments or semi-quantitative assessments while section 3.1 states they may not be used as the sole line of evidence to support a 303(d) listing. | In using qualitative visual assessments and/or other semi-quantitative assessments to evaluate waters impacted by nuisance pollutants, the policy requires the use of established evaluation guidelines to determine exceedance of water quality standards as well as site comparison against reference site conditions, when available. Section 3.1.7 has been clarified further to reflect consistency with section 3.1. | Yes |
| **Draft Policy, Section 3.1.8: Adverse Biological Response** | | | |
| 1.6 | The term 'associated with' should be replaced with the term 'are scientifically and demonstrably caused by'. The mere association of effects with sediment loads should not be used as a listing criterion, particularly in the absence of a definition for the term associated with. | Determining if an effect is caused by the suspected pollutant is not necessary in order to list and to begin the development of a TMDL. If there is substantial evidence that the pollutant is linked to the observed effect that is sufficient to implicate the pollutant. | No |
| 44.14 | Biological impacts should have a strong association with (i.e., a known or suspected causation) water or sediment pollutants. | Comment acknowledged. | No |
| 51.21 | The policy must allow listing for adverse biological response and degradation of | Identifying the potentially casual agent provides a strong line of evidence that a | No |

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| | biological populations and communities alone, without identification of the causative pollutants. The draft Policy requires the identification of the specific pollutant or pollutants causing adverse biological response and/or degradation of biological populations and communities before waters can be listed for these impairments.<br><br>The policy must allow listing and move forward with TMDL development even where the impairing constituents are not known. | problem exists. There are many environmental factors that can increase or decrease an organism response to a pollutant (e.g., temperature, flow, other pollutants, pH etc.). By identifying the potentially casual agent, we are more confident that there is adverse response in a biological community due to a pollutant. | |
| 210.6 | When considering listing factors such as adverse biological response populations, the Policy doesn't really provide any guidance on how baseline or reference conditions are to be established. populations. Additional guidance should be provided in the Policy on how to establish these conditions.<br><br>So that's -- as you can imagine, this is going to make all the difference on how these evaluations turn out, what the baseline and the reference condition is. So therefore, we would recommend some additional guidance be provided in the policy on how to establish these conditions. | The Policy is vague in identifying reference conditions because these condition depend on many site-specific factors. A discussion of these factors is contained in the FED under Issue 5G. | No |
| **Draft Policy, Section 3.1.9: Degradation of Biological Populations and Communities** | | | |
| 1.10 | For population or community degradation related to sedimentation, the term associated with should be replaced with the term scientifically and demonstrably caused by. | The use of the term 'associated with' is deliberate. Association is precautionary and provides the RWQCBs some flexibility in analysis of their data. | No |
| 1.22, 1.9 | Guidance must be provided regarding the timeframe over which degradation must be measured to establish significance; at least several years of significant data must be considered. | Degradation of biological populations and communities measure the diminished numbers of species or individuals of a single species or other metrics when compared to a reference site. In the fact sheets, RWQCBs should document the index period that sampling will occur. For example, index periods should be established for a particular season, time of day, or other window of opportunity when signals are determined to be strong and reliable. Only results from similar index periods should be compared. | No |
| 10.10 | Flexibility must be demonstrated by this policy to accommodate biologic impairment. Again, the role of professional judgment, weight of evidence, multiple lines of evidence, should be acknowledged and encouraged as acceptable policy for developing criteria, thresholds, and making determinations of exceedance. Language should be altered in this section to reflect this need and be integrated with section 3.1.9 for consistency. | The Policy uses a multiple line of evidence approach to determine if standards are exceeded. Degradation must be exhibited as compared to a reference site and associated water and sediment concentrations of pollutants. The Policy provides guidance in the selection of evaluation guidelines but leaves the selection of the guidelines up to the RWQCBs with justification in the fact sheets. | No |
| 18.88 | The TMDL Roundtable recommended that waters shall be listed based on sufficient credible data and information that indicate that water quality standards for sediment are not met, or that impacts to beneficial uses occur and | The binomial method is to be applied to the associated water or sediment concentrations of pollutants only and not to the bioassessment data. | No |

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| | are caused by sediment. The draft Listing Policy is partially consistent with this recommendation. The draft Listing Policy discusses sediment issues in a manner generally consistent with this recommendation, but appears to apply the binomial method in Section 3.1.8 and 3.1.9, which was not recommended by the Regions. | | |
| 44.15 | Comparisons of conditions in a water body to conditions in a reference water body must be made during similar season and/or hydrologic conditions for both water bodies. | The Policy has been revised to reflect this condition. | Yes |
| 48.7 | The proposed metrics to assess biological degradation should be conducted over a number of years (2-3) to accurately assess the impairment of the community. Using short term measurements may not be indicative of the long term effects on the community. | It is difficult to prescribe the appropriate test for the analysis of biological data. These data should be reviewed on a case-by-case basis. | No |
| 53.16 | Concerned that the draft policy does not appear to articulate how bioassessment data can be most efficiently utilized in listing and de-listing decisions.<br><br>Recommend to amend sections 3.1.9 and 6.1(B) of the draft policy to split paragraphs.<br><br>1. In the first sentence of the first paragraph under 3.1.9 Degradation of Biological Population and Communities add in ' pollutants are documented as described in section 3.1.6.'<br>2. After the first sentence in the first paragraph under 3.1.9 Degradation of Biological Population and Communities add the sentence, 'Association may also be made with other stressors, such as temperature, nutrients, dissolved oxygen, trash, etc. For impairments not associated with toxicity (i.e., where section 3.1.6 does not apply), a 'weight of evidence' approach may be used to document the associated pollutant(s).'<br>3. The last sentence in the first paragraph under 3.1.9 should read, 'Toxicity analyses should rely on measurements from at least two stations.'<br>4. Add a paragraph after the second paragraph stating, 'Bioassessment used for listing decisions shall be consistent with section 6.2.3.4 and section 6.2.5.11. For bioassessment, measurements at one stream reach may be sufficient to warrant listing provided that impairment is associated with a pollutant(s) as detail above.' | The first recommendation is unnecessary; the Policy provides the necessary guidance to document the listing factors. The second recommendation, 'Association may also be made with other stressors, such as temperature, nutrients, dissolved oxygen, trash, etc.' has been added after the first sentence. In response to the next statement, the Alternate Data Evaluation section has been deleted and situation-specific weight of evidence listing and delisting factors have been added. The third recommendation will not be added. Relying only on toxicity analysis would severely hamper the measurement of effects of the additional impacts that you requested be added to the section. The fourth requested addition will be added to the section. | Yes |
| 53.18 | Because bioassessments can be used to indicate where or when an impact exists, but do not often reveal the specific cause(s) of the impact, it is reasonable to require that an association with a pollutant be demonstrated prior to listing. Section 3.1.6 (Water/Sediment Toxicity) provides only a partial list of the possible pollutants that could impair biological integrity. For example, altered levels of temperature, nutrients, dissolved oxygen, trash inputs, or transient chemical pollutants that act alone or in combination can also impair biological | This revision has been made to the Policy. | Yes |

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| | integrity without exhibiting toxicity in standard toxicity tests. The draft policy should be supplemented to allow for listing whenever bioassessment data indicates impairment and a scientifically valid association with a pollutant of any type can be demonstrated. | | |
| 53.19 | Because bioassessments normally evaluate stream (and reaches), not discrete 'stations,' it is not clear what methods are covered by the sentence: 'The analysis should rely on measurements from at least two stations.' (We assume that this was meant to apply to toxicity tests, not bioassessment.) The integrative evaluation of a single representative stream reach - as is routinely performed by the bioassessment methods utilized by the SWAMP program - should be recognized by the policy as sufficient to demonstrate impairment. | The reference to 'stations' was meant to represent the vastly different water bodies through out the state. The sentence has been revised to include comparisons to similar locations. Evaluation of a water body, as performed by the bioassessment methods utilized by the SWAMP program, is sufficient to demonstrate impairment. | Yes |
| 53.21 | That paragraph is problematic because multiple issues are lumped into the same paragraph, which creates confusion and leaves the listing requirements open to wide interpretation. Specifically, it is unclear whether and how the second and third sentences modify the first sentence. The first sentence makes perfect sense if it is meant to stand alone, and we recommend that, for clarity, it be separated from the remainder of the paragraph. The last two sentences of this paragraph (i.e., requiring a minimum number of 'samples' with a confidence level of 90 percent using a binomial distribution) apply to guidelines for sediment quality, fish/shellfish consumption, or bioaccumulation. They are not applicable to bioassessments (which rely on integrative composites samples and multimetric or multivariate-derived indices). To avoid confusion, the policy should clearly acknowledge that bioassessments do not (and cannot) properly rely on the same statistical tests as guidelines for sediment quality, fish/shellfish consumption, or bioaccumulation. This can be accomplished by adopting the suggestions of the TMDL roundtable, or by splitting the second paragraph of section 3.1.9 and adding other language as recommended above. | The binomial statistical test is not intended to be used for bioassessments. The first sentence of this paragraph has been separated as suggested. The language has been revised to reflect that the binomial applies to the associated pollutant only. | Yes |
| 53.22 | Acknowledges that Section 3.1.11 (Alternate Data Evaluation) may provide for 303(d) listings based on bioassessment data if 'corroborating evidence from independent lines of evidence show narrative standards are not attained.' However, given the wide acceptance and discriminatory power of modern bioassessments, the draft policy should be supplemented to articulate when bioassessments may be used without the need for 'independent lines of evidence.' This concern can also be resolved by adopting the suggestions of the TMDL roundtable, or by adding language to section 3.1.9 as recommended above. | The alternate data evaluation section has been deleted but the added situation specific weight of evidence factors can be implemented using bioassessments. | Yes |
| 210.7 | When considering listing factors such as degradation of biological populations, the Policy doesn't really provide any guidance on how baseline or reference conditions are to be established. Additional guidance should be provided in the policy on how to establish these conditions. | Guidance for the evaluation of bioassessment data is provided in section 6. The section purposely provides general guidelines to allow RWQCBs flexibility for adopting methodology that best meets their needs and at the same time allows for the use of data from existing bioassessment programs. | No |

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| 217.13 | The trend at the federal level on regulation and research is to focus on biological effects and impacts, because the whole point is to protect our water resources, yet this listing policy is leading California in the exact opposite direction. | Comment acknowledged. | No |

## Draft Policy, Section 3.1.10: Trends in Water Quality

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| 11.9, 13.3, 13.12, 13.4, 19.9, 22.5, 23.10, 30.8, 64.9, 74.4, 203.6 | Item 1 states that at least three years of data will be used. Based on work conducted by several researchers, including Benda (USFS 2002, Benda 2003), it is clear that in many environments, including landslide prone terrain, background conditions and trends in water quality cannot be determined in such a short time. | In providing general guidance for assessing trends in water quality, the Policy establishes that the amount of data to be used in assessing trends, should not be less than three years. This timeframe was selected because there should be sufficient time to identify baseline conditions. The Policy calls for at least two years of data to list water bodies and this seems to be a reasonable amount of time and data to establish baseline conditions. An additional year would be the absolute minimum to establish the declining trend in water quality. The Policy does not establish an upper limit on the amount of data to be used by the RWQCB in listing for a decline in water quality. | No |
| 51.17, 76.4, 102.10, 108.7, 115.4 | Consideration of threatened water bodies is clearly required by USEPA CWA-related regulations. It is ignored in the proposed Policy. | The Policy section on trends has been revised to address these concerns. The definition for a water quality limited segment, as defined by 40 CFR 130.2 (j) states that, any segment where it is known that water quality does not meet applicable water quality standards, and/or is not expected to meet applicable water quality standards, even after the application of the technology-based effluent limitations required by sections 301(b) and 306 of the Act. The Policy is consistent with this definition and requires that the assessment include a description of whether the declining trend in water quality is expected to not meet water quality standards by the next listing cycle. | Yes |
| 212.9 | For a normal listing with data, there is a requirement that 10 percent of samples with a confidence level of 90 percent, using binomial distributions, is how one gets listed. For the trends, it's not clear. There is no concrete guidelines on that. Perhaps specific guidelines, such as at least 5 percent of exceedances, or there is a 25 percent increase in the pollutant concentrations over a five-year period, or if there is a minute number of samples. The only statement is that there are three years, and they have to look at some general guidelines. So those criterion are so subjective, they need to be nailed down a little bit more if trends are to be used at all. | The binomial test helps evaluate dichotomous data in order to assess compliance with water quality standards. Trend analysis methods help detect and estimate changes in water quality data over time. For example, one of the most common procedures for assessing trends is linear regression. This tool is used to determine temporal or spatial trends where temporal or spatial patterns are strong. Linear regression calculations are performed on a data set containing pairs of observations (Xi, Yi), so as to obtain the slope and intercept of a line that 'best fits' the data. For temporal trends, the Xi values represent time and the Yi values represent the observations, such as pollutant concentrations. An estimate of the magnitude of trend can be obtained by performing a regression of the data versus time and using the slope of the regression line as the measure of the strength of the trend. Using the binomial test is not appropriate for estimating declines in water quality.<br><br>The Policy also establishes that the amount of data to be used in assessing trends, should not be less than three years but it does not establish an upper limit on the amount of data to be used by the RWQCB in listing for a decline in water quality. Furthermore, data to properly substantiate the decline of | No |

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| | | water quality may require the application of other unique trend analysis approaches to account for such factors as seasonal or weekly systematic variations, data auto-correlation or jumps in the data due to interventions or sampling procedural changes. There are many widely accepted trend analysis approaches currently available. The use of any specific approach will depend on the data available for analysis or specific characteristics associated with the data. Providing specific guidance does not allow the use of the most appropriate trend analysis approach in the area where the water body is located. For this reason only a general guidance on how to address trends in water quality is provided. | |
| **Draft Policy, Section 3.1.11: Alternate Data Evaluation** | | | |
| 5.1, 11.10, 12.11, 19.12, 29.9, 39.5, 68.4, 71.1, 73.3, 84.11, 208.8, 220.4, 221.4 | Concerned that inclusion of this section could result in the continued inclusion of water bodies on the State's 303(d) list in the absence of information that water quality standards are exceeded or that beneficial uses are impaired. Alternate data evaluation methods as specified in the draft Policy could allow considerable discretion in evaluating water bodies and may lead to inappropriate listings. Encourage the SWRCB to carefully address these concerns so that objective methods are used to evaluate impairments and produce scientifically defensible 303(d) listings. | The Policy has been revised and the alternate data evaluation section has been deleted. The Policy now includes a Situation-specific Weight of Evidence Listing Factor. The justification to support listing on the section 303(d) list using this factor is now more inclusive and includes providing data or information to support the listing, describing in the fact sheets the substantial basis in fact from which the listing can be reasonably inferred, demonstrating that the weight of evidence shows the water quality standard is not attained and demonstrating that the approach is scientifically defensible and reproducible. | Yes |
| 8.9, 61.10, 102.6, 107.5, 203.7 | This Section should be removed from the policy. Good decision-making results from limited discretion in others than the policy makers. Allows for alternative methods of evaluation off sets the positive policy changes otherwise effected and adds additional discretion at agency levels far below the policy makers. Move away from subjective policies and toward objective measurable criteria for listing. | The section has been removed from the Policy and replaced with listing and delisting factors that allow RWQCBs to use a weight of evidence approach to list or delist waters. | Yes |
| 18.19, 48.8, 53.8 | It is not clear if all or only a few of the justifications provided need to be met for listing on the 303(d) list. It is also not clear if only the exceedance frequency or biological and physical parameters will be used as the basis for listing. Exceedance frequency by itself may not be representative of an impairment unless it can be shown that there is biological degradation to the community or physical degradation to the water body that is negatively impacting the community. | The Policy has been revised to provide more discretion in establishing listings and delistings when the provisions of the Policy are not met or are not applicable. | Yes |
| 18.33 | It is not clear what types of scientifically defensible procedures would be acceptable for analyzing data and how certain types of procedures could be shown to be equivalent to the binomial method in terms of confidence level and hypothesis testing. For example, it is scientifically defensible to evaluate data graphically and to consider seasonal patterns of exceedances, but it is not clear how such an evaluation would meet this criteria. | This section has been deleted from the Policy. However, the use of statistical analysis is necessary to raise confidence in decisions that are based on limited information (i.e., that the samples are representative of actual conditions). Graphs are useful to observe relationships among variables but they do not numerically address the issues of bias, variability, uncertainty, and the potential for error that sampling inevitably introduces. Graphs are valuable tools that give a visual presentation of the data being gathered. When | No |

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| | | combined with statistics, graphs can provide an effective visual representation of the recorded counts over time. For example, graphs can provide an effective visual of seasonal patterns of exceedances. This is valuable information for establishing sampling design and parameters but not for establishing the validity of the sampling data. | |
| 18.35, 18.34 | This section appears to require that a narrative objective not be attained in order to list under the Alternate Data Evaluation. | This section has been deleted and replaced with a more narrative and inclusive situation-specific weight of evidence listing factor. | Yes |
| 18.6, 40.90, 40.92, 40.30 | The policy is unclear as to whether and how alternative data evaluation and weight of evidence analysis procedures will be applied in the assessment process. | The new situation-specific weight of evidence listing and delisting factors will be applied when RWQCBs have some evidence that water quality standards are attained or not attained but the amount or quality of data do not meet the requirements of the other factors in the Policy. | No |
| 18.7, 18.32, 18.17, 20.11, 20.9, 40.53, 80.5, 101.5 | This section should be renamed the Weight of Evidence method. The Weight of Evidence method would be modified to describe the types of documentation that must be provided to justify listing a water body, if the binomial method is either inapplicable or would suggest not listing. Delete text from various identified Listing Factors and combine either into one section or include into the Weight of Evidence method. | The Policy provides guidance on the weight of evidence approach and employs a narrative process where individual lines of evidence are evaluated separately or combined using the judgement of the SWRCB and RWQCBs. Using this approach, for some listing factors, a single line of evidence could be sufficient by itself to demonstrate water quality standards attainment. For other listing factors, multiple lines of evidence would be needed to determine standards attainment. In still other circumstances, some information may still indicate non-attainment of standards. In those situations, situation-specific weight of evidence listing and delisting factors have been added to the policy that provide processes to allow the use of additional lines of evidence provided that the RWQCBs justify their decision. | Yes |
| 25.11 | Concurs with concerns presented by the Executive Advisory Committee for the Stormwater Program, County of Los Angeles, and Richard Watson on the problems associated with trends in water quality and alternate data evaluation. | Comment acknowledged. | No |
| 40.91 | These provisions for listing waters based on alternate data evaluation should more clearly apply to all data types including sediment, tissue, toxicity, and biological response data. | The situation-specific weight of evidence listing and delisting factors apply to all types of data and information. | No |
| 40.93, 51.121, 51.27, 51.29 | Concerned that the draft policy currently states 'the measurements can be analyzed using a scientifically defensible procedure that provides an equivalent level of confidence as the listing factors in section 3.1.' This seems to require any and all data must have 90% confidence level to be used in assessing impaired waters, which may be inconsistent with the concept of a weight of evidence approach. | The alternate data evaluation section has been deleted and replaced with a situation-specific weight of evidence listing factor. This new approach is consistent with weight of evidence approaches used or suggested for section 303(d) purposes. In addition, Listing Policy's weight of evidence approach now allows RWQCBs to request placement of a water on the list even if the provision of the Policy are not met as long as there is evidence that standards are not attained and that the listing can be reasonably inferred from the information at hand. | No |
| 40.94, 51.142, 51.130 | The intent of SWRCB appears to be to allow the use of a weight-of-evidence approach in some circumstances. The weight-of-evidence approach is for the interpretation of narrative objectives because of the nature of the data and | The new situation-specific weight of evidence listing and delisting factors allow RWQCBs to use a wide range of data and information as well as approaches for listing and delisting. To use this information RWQCBs need to | Yes |

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| | analytical methods necessary to evaluate narrative objectives. Such an approach should be outlined in a new draft Policy section 'Evaluation of Narrative Criteria.' In this section, use of interpretative tools other than the numeric guidelines--including biological assessment methods, biological monitoring methods, models or formulae that use input of site-specific information/data, reference-based systems, and other scientifically defensible methods--should be explicitly permitted. | describe how data and information affords a substantial basis in fact which the decision can be reasonably inferred. RWQCBs also need to demonstrate that the approach used is scientifically defensible and reproducible. | |
| 53.9 | The reference to Section 4.2 is not clear. Why does this section refer to delisting requirements? | The reference to Section 4.2 was in error. | Yes |
| 60.32, 76.19 | This subsection should be renumbered 3.2. Section 4: California Delisting Factors | Comment acknowledged. | No |
| 64.7 | Maintain the requirements for RWQCBs justifications currently included in the Alternate Data Evaluation listing factors. | Comment acknowledged. | No |
| 107.8 | The draft Policy says, 'RWQCB may use alternate exceedance frequency, if justified. Justification may include...' That can be interpreted in multiple ways. This section says, 'At a minimum the justification must demonstrate...' followed by a series of bulleted requirements. With proper modification, this can provide an outlet and mechanism for making sound decisions. | A situation-specific weight of evidence listing factor has been added to provide RWQCBs flexibility to interpret data for use in listing decisions that do not meet the listing decision rules. | Yes |
| 108.17 | SWRCB Comment: If the binomial requirements can not be met, the alternative data evaluation can be used. RWQCBs will set criteria. There is sufficient flexibility. There are sufficient alternatives.<br><br>Response: Disagree. The 'alternatives' are unguided. The RWQCBs will have no power to fix problems. The alternatives are burdensome. Your premise is incorrect. | Comment acknowledged. | No |
| 109.3 | Evidence from other states shows that the alternative data evaluation—the weight of evidence approach--could reduce conflicts between USEPA and the State over future 303(d) lists. | Comment acknowledged. | No |
| **Draft Policy, Section 3.2: TMDLs Completed Category Factors** | | | |
| 60.31 | The special condition of this subsection should be revised to specify that a TMDL has either been approved by or established by USEPA for the pollutant-water segment combination. The special condition that an Implementation Plan has been approved for the TMDL should be deleted since implementation plans are not required by the CWA and USEPA establishes technical TMDLs without implementation plans. | This section has been revised for clarity. | Yes |

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| **Draft Policy, Section 3.3: Enforceable Program Category Factors** | | | |
| 13.6 | This section clearly applies to forestry operations on non-federal lands in California where the Forest Practice Rules (FPRs) are an 'enforceable program', directed in large part to protect water quality that could be used to reduce TMDL assignments in the future. | Comment acknowledged. | No |
| 13.7 | It is not clear what is meant by 'site-specific study, case studies from similar locations, or research results from applicable situations.' Monitoring results suggest that riparian leave requirements, particularly under the Threatened and Impaired Watersheds Rule Package, are adequate to prevent water temperature effects related to forestry operations, with post-harvest canopy exceeding FPR requirements. | While the circumstances cited may very well be true, an assessment should be completed in light of all the information available for water segments with potential impacts from elevated water temperature. To allow more flexibility in RWQCB decision-making, this category has been eliminated and a new category has been created: the Water Quality Limited Segments Being Addressed. Under this new category, if the RWQCB has certified under the provisions of the Water Quality Control Policy for Addressing Impaired Waters: Regulatory Structure and Options that the pollution control requirements other than TMDLs are reasonably expected to result in the attainment of the water quality standard, the impairment will be addressed under this category. | Yes |
| 13.8 | SWRCB could greatly increase regulatory effectiveness and efficiency by acknowledging that California Forest Practice Act and FPRs are an enforceable program for purposes related to this category, while at the same time providing guidance on what additional studies or monitoring programs are needed for documentation under the proposed policy. | The Policy should remain general so that the RWQCBs can make their own determinations as to whether or not a program is working and/or should be considered. A blanket exception for any program acknowledged as an enforceable program can not be made. The RWQCB have the discretion to certify, under the provisions of the Water Quality Control Policy for Addressing Impaired Waters: Regulatory Structure and Options, that pollution control requirements other than TMDLs are reasonably expected to result in the attainment of the water quality standard. | No |
| 14.8 | Recommend that the Listing Policy not address enforceable programs since the TMDL Guidance already provides a mechanism for recognizing such programs. | This section of the Policy has been revised to avoid duplication with the TMDL Guidance. | Yes |
| 21.31, 40.27, 40.26, 48.10, 48.9, 108.3 | In order for this Enforceable Program provision to apply, the policy states that the discharge source subject to the enforceable program need only comprise the majority of the pollutant load causing the impairment. This provision is potentially inconsistent with federal regulations because minority sources not covered by the enforceable program may be sufficient to cause water quality standards violations even if the majority source is controlled. | The statement has been removed from the Policy. | Yes |
| 21.32 | The Agricultural Waiver Program is not an appropriate Alternative Enforceable Program to control runoff/discharge from irrigated agriculture. | Comment acknowledged. | No |
| **Draft Policy, Section 4: Delisting Factors** | | | |

| COMMENT NUMBER | SUMMARY OF COMMENT | RESPONSE | REVISION |
|---|---|---|---|
| 8.10, 51.144, 51.143 | We recommend that the delisting policy be revised to require the demonstration that the delisting threshold is more rigorous than the listing threshold. In most situations, the listing and delisting evaluation methodologies should be consistent to ensure that the delisting threshold is more rigorous. | The delisting requirements are not more rigorous by design so the burden of proof is equivalent. The mathematics of the exact binomial test with a fixed significance level results in this perception. This is not a change in the 'rigor' of the procedure. The statistical procedure in the draft Policy has been revised to better 'balance' the two possible types of decision-making error to make sure the burden to list and delist are equivalent. | Yes |
| 18.63 | Recommended that the Policy should describe how waters are removed from the list. Waters should be removed from the List when the data and information indicate that water quality standards are being attained. The draft Listing Policy is partially consistent with this recommendation. Section 4 describes how waters can be removed from the 303(d) list. Waters can be delisted if fewer then 10% of the samples are not exceeding standards. The Policy, therefore, allows waters in non-attainment of standards to be delisted. | As it does for listing, the Policy establishes a statistical procedure to judge with a prescribed level of confidence and power when a certain number of exceedances (or less) observed in water quality samples should trigger the need to delist a water body. The rigor and validity of the delisting model equal that for the listing procedure. | No |
| 40.107 | For de-listing waters from the 303(d) list, the proposed policy appears to utilize the same statistical approach and underlying assumptions (fewer than 10% exceedances with 90% confidence level) as described in the listing methodology. We support the State's decision to apply a different null hypothesis in assessing potential delisting decisions. | Comment acknowledged. | No |
| 40.108, 51.136, 51.138, 51.140, 51.139, 51.134, 51.133, 51.135, 217.15 | Delisting requirements should include specific requirements on data representation. The draft Policy currently requires a minimum of 22 samples before a water body can be evaluated for delisting. However, the policy contains no specific data representation requirements for these 22 samples, such as the minimum timeframe in which these samples can be collected and specific conditions that should be captured. | All data representation requirement described in the Section 6 (Policy Implementation) must be met in the evaluation of delisting a water body.<br><br>In terms of specific data representation, the Policy is intended to allow the RWQCBs the flexibility to use samples collected in a variety of ways to make listing decisions. The temporal and spatial representation requirements are the same for listing and delisting. These requirements are general so RWQCBs can make decisions to list or delist with all the available data and information. Too much specificity might render the Policy unworkable in certain circumstances. | No |
| 41.2 | The first sentence of the second paragraph should be modified as follows. All listings of water segments shall be removed from the section 303(d) list if the listing was based on faulty data. It is necessary to clarify that the RWQCB should not only reevaluate but delist water segments that were listed based on faulty data or information. | The Delisting Factors establish the criteria to remove waters from the list. This sentence is not needed. | No |
| 43.49, 60.34, 76.22 | The delisting factors section does not provide for removing water segments from the 303(d) list if specific pollutants have not been identified. A delisting factor should be added to specify that existing water segment-pollutant combinations that have been listed without specific pollutants identified shall be removed from the 303(d) List and placed on a Pollutant Identification List. | In the delisting factors, the Policy states that waters should not be listed if pollutants are not identified (toxicity is an exception). The Policy provides direction on the disposition of waters and pollutants relative to the section 303(d) list. Placement of waters on a 'Pollution List' is beyond the scope of the Policy. | No |
| 48.11 | The last sentence should be revised to clearly state that a water body can be | The sentence has been clarified. | Yes |

| COMMENT NUMBER | SUMMARY OF COMMENT | RESPONSE | REVISION |
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| | removed from the 303(d) list if the applicable section requirements under which it was originally placed are no longer applicable. The sentence can now be interpreted to read that all conditions listed in the section must be met prior to delisting a water body. For instance, Section 4.3 is intended solely for bacteria and the impairing pollutant may be a metal. In this case, it does not make sense to require this section to be met. | | |
| 50.8 | An effort to delist a water requires full compliance with all laws and should include a mechanism that verifies the existing condition and identifies any conduct that would defeat a delisting and would not be observed or documented until after the sampling results could authorize a delisting. | Any decision to remove a water from the section 303(d) should comply with federal law and regulation. There are several listings that should be reconsidered in light of the data that are available. Requiring new data in all cases seems to contradict federal requirements to base decisions on all readily available data and information. | No |
| 51.137, 51.165 | The draft Policy currently does not provide for the 'margin of safety' called for in the CWA. For instance, a fixed time period will not be sufficient for many circumstances. As an example, if a harbor is listed for synthetic chemicals that adhere to fine sediment particles, it will need to be monitored for a sufficient period of time to include rainy seasons that drive the fate and transport of the substances. A draft Policy that had an appropriate delisting margin of safety would include guidance establishing a minimum (rather than fixed) sampling time period, as well as a minimum sample count.<br><br>In addition to requiring a minimum sample size of 22, the delisting policy should clearly require that data meet the following specific representation requirement for all delisting evaluations:<br><br>- A minimum timeframe for data collection must be established. We recommend that the data represent a minimum of three years. It is imperative that a minimum time period be represented in the data to account for temporal variability, which can be significantly related to a host of factors including climate and seasons. In particular, rainfall conditions greatly influence water quality in most water bodies. In California, drought conditions have lasted for more than six years at a time. So, a three-year requirement should be viewed as an absolute minimum. | A minimum of three-years of data to support removing a water from the section 303(d) list is not justified unless the requirement for 3-years of data is necessary for listing as well. Larger data sets that cover several years are preferable for both listing and delisting decisions but this amount of data is rarely available. If conditions repeat over a two year period, confidence in the assessment decision is increased. If a 3-year timeframe is used, water quality problems that are manifested within two years will be ignored.<br><br>The 'margin of safety' concern is focused on the development of TMDLs not the section 303(d) list process. The 'minimum' sample size concerns are addressed in the FED sections related to balancing statistical errors. | No |
| 51.141 | This item should be added to this section.<br><br>- Re-evaluation of existing data should not be conducted unless it can be demonstrated by the questioning party that the listing was based on faulty data or if objectives and standards have been revised. | Review of listings should be performed if warranted. The provisions of the Policy may influence which waters are included on the list. | No |
| 51.145, 51.146, 217.18 | The delisting policy for marine recreational waters should require the use of a reference system approach to ensure consistency between the listing and delisting decisions regarding these water bodies. | The Policy has been revised to allow the use of the reference system approach to remove listings related to bacteria if the water quality standards allow. | Yes |

| COMMENT NUMBER | SUMMARY OF COMMENT | RESPONSE | REVISION |
|---|---|---|---|
| | The listing policy for marine recreational waters recommends the use of a reference site to account for exceedances of health-based bacteria standards that occur due to natural sources. The delisting policy for recreational beaches uses an exceedance threshold of 10% using the binomial distribution for a confidence level of 90%. These two approaches are inconsistent, and could result is a delisting threshold that is less rigorous than the listing requirements, depending on reference beach used to list. For example, a beach could be listed because it has an exceedance rate greater than its associated reference beach, but if the reference beach has an exceedance rate lower than those listed in Table 4.1 (the binomial model for delisting), the beach could then be eligible for delisting – not because water quality at the beach has improved, but because the delisting threshold is lower than the listing threshold. | | |
| 58.10 | The second paragraph allows for delisting based on faulty data, however, it is unclear how this process might be initiated (RWQCBs and SWRCB) and how the quality of data might be assessed. | The review of existing listings has been clarified in the Policy. | Yes |
| 58.11 | The delisting criteria assumes an incorrect null hypothesis that the water is contaminated. | The hypothesis selected for assessing if a water should be removed from the section 303(d) list assumes that the water does not meet water quality standards because in a previous listing cycle the water was judged to not meet water quality standards. The hypothesis that the water does not meet standards will not be accepted if data and information show standards are attained. If data show that standards are not met then waters will remain on the section 303(d) list. | No |
| 60.33, 76.21, 76.20 | Subsections 4.1 through 4.9 should be renumbered 4.1.1 through 4.1.9. | Comment acknowledged. | No |
| 72.7 | The draft policy suggests using a (worst-case) 'erroneous de-listing' probability of 10%-- i.e. a 90% worst-case probability of 'erroneous failure to de-list'-- for such decisions. This seems too stringent unless standards for subsequent data collection are imposed to monitor closely possible improvements in impairment levels. To be effective, such monitoring would probably require more sophisticated statistical sampling designs than the 'fixed n' design of the Exact Binomial Test. | If it is more appropriate to use a different statistical test or different confidence level RWQCBs are allowed flexibility to use alternate tests as long as the use is justified under the situation-specific weight of evidence delisting factor. | Yes |
| 74.6 | This section should be expanded to include specific language to allow the delisting of a water body if the data quality and data quantity requirements under the new policy are not met by the existing listing. | The Policy has been revised to address this comment. | Yes |
| 216.1 | Concerned about the delisting process; concerned that we won't be able to protect this water, and nor will we be able to improve this water. | Comment acknowledged. | No |

## Draft Policy, Section 4.5: Bioaccumulation of Pollutants in Aquatic Life Tissue

| COMMENT NUMBER | SUMMARY OF COMMENT | RESPONSE | REVISION |
|---|---|---|---|
| 21.36 | The concept that excessive tissue residues depend on fish consumption rates need to be considered especially for certain key populations who depend on fish from a water body as their primary source of food. | The issue of fish consumption rates and susceptible populations is addressed in Section 3.1.4. | No |
| **Draft Policy, Section 4.9: Degradation of Biological Populations and Communities** | | | |
| 53.23 | The use of bioassessments in de-listing decisions. A significant number of water bodies in California have been listed as impaired based on little (or no) actual data to document violation of objectives or impacts to beneficial uses. In many such cases, bioassessment could be a cost-effective tool to demonstrate attainment of aquatic life uses, thereby justifying de-listing and saving substantial resources for addressing real problems. For example, where water bodies have been listed for sediment based on anecdotal evidence, bioassessment could document non-attainment of aquatic life uses (thereby confirming impairment). Alternatively, bioassessment could document the attainment of aquatic life beneficial uses, thereby justifying de-listing. But the draft de-listing criteria could be interpreted to impede or even preclude reliance on bioassessment for such delisting decisions. | Revisions to this section have been made to address this issue. | Yes |
| 53.24 | For de-listing to occur under this section, the draft Policy specifies a minimum sample size of 22, and statistical tests not appropriate for bioassessment data. These provisions would make it infeasible to de-list under this Section using bioassessments, because 22 bioassessment 'samples' would be prohibitively expensive, and bioassessment data cannot be meaningfully analyzed using the binomial distribution method. | The statistical test is to be applied to the associated pollutant not to the bioassessment data. This section has been revised to clarify this point. | Yes |
| **Draft Policy, Section 4.10: Alternate Data Evaluation** | | | |
| 53.25 | For delisting to occur under this section, there must exist 'corroborating evidence from independent lines of evidence,' and an alternative approach as defined by Section 3.1.11 must have been used originally to place the water segment on the list. These provisions could make it infeasible to delist under this section using bioassessments, because: (1) even though bioassessment may document healthy instream communities, independent lines of evidence may be unavailable or cost-prohibitive; and (2) few (if any) of the currently-listed waters that may be cost-effectively shown to be 'healthy' using bioassessment were listed following the criteria at Section 3.1.11. | The Policy has been revised to include a situation specific weight of evidence listing factor that provides the RWQCBs the flexibility to delist using bioassessment data if it can be documents that water quality standards are met and that the data and information affords a substantial basis in fact that the delisting can be reasonably inferred. | No |
| 60.35 | Subsection 4.10 should be renumbered 4.2. | Comment acknowledged. | Yes |
| **Draft Policy, Section 6: Policy Implementation** | | | |

| COMMENT NUMBER | SUMMARY OF COMMENT | RESPONSE | REVISION |
|---|---|---|---|
| 7.6 | The Policy should allow appropriate time frames to collect adequate temporally and spatially representative data. | Comment acknowledged. | No |
| 11.14, 19.22, 203.9 | Section 6.1 states that 'data and information older than 10 years' is inconsistent with Section 6.2.5.2. | Section 6.1 has been deleted. A general statement regarding revision of existing listings has been incorporated into the delisting factors, Section 4. | No |
| 11.18, 19.21 | Section 6 should be moved ahead of its many references in the Policy document. | The document is organized to describe the section 303(d) list, the listing factors, delisting factors, and then the supporting guidelines needed to develop the list. Moving Section 6 to the front of the document may confuse the main goal of the policy which is to: establish a standardized approach for developing California's section 303(d) list. | No |
| 19.1 | Supports the inclusion of requirements regarding (data) quality and quantity assessments. | Comment acknowledged. | No |
| 25.4 | There has been much discussion on the problems with water body listings in the 1998 and 2002 listing process, and better requirements for data quality and evaluations will prevent these problems from reoccurring. | Comment acknowledged. | No |
| 40.97 | The commenter developed and applied a semi-quantitative method of evaluating water column, sediment, and fish tissue data for toxic pollutants in the process of developing several TMDLs for Newport Bay, CA. Recommend that the State consider the use of this type of approach as part of the listing policy. | These approaches were considered. | No |
| 44.6 | It is important for the SWRCB explicitly recognize in the Policy that the role of all available data assembled in determining water body impairment will be subject to data quality and quantity scrutiny. | Comment acknowledged. | No |
| 61.18 | Request clarification in the descriptions of spatial representation and representation temporal because the technical meaning of these sections is unclear. | Comments acknowledged. | No |
| 65.4 | Endorse the inclusion of requirements for data quality and quantity, requirements for consistent and statistically valid data evaluations, and implementation provisions. However, the building and construction industries want to ensure that these efforts are practical, achievable and effective. | Comment acknowledged. | No |
| 217.23 | Most NPDES permit programs are set up where you have the outfall and you're looking at water quality impact at the outfall and below the outfall. And if you were to combine those together, that just makes no sense. And the same sort of approach occurs for spatial distribution where if you collected samples within the same week. | Comments acknowledged. | No |

## Draft Policy, Section 6.1: Evaluating Existing Listings

| COMMENT NUMBER | SUMMARY OF COMMENT | RESPONSE | REVISION |
|---|---|---|---|
| 5.6, 7.9, 11.15, 11.5, 12.7, 17.3, 19.5, 23.6, 28.3, 38.8, 41.3, 43.51, 43.57, 44.2, 47.13, 49.3, 60.38, 60.39, 61.11, 64.5, 65.8, 65.9, 68.5, 70.7, 70.9, 71.11, 71.10, 74.3, 76.24, 79.4, 84.4, 84.5, 109.18, 111.4, 112.2, 114.7, 115.5, 116.5, 203.3, 207.13, 208.6, 210.2, 212.5, 212.4, 212.3, 213.7 | Requests re-evaluation of each previously listed water body as proposed in the July 2002 draft policy. | The Policy has been changed to allow for the reevaluation of an existing listing if new data are available or not. To reduce the workload on RWQCB and SWRCB staff, the request for a reevaluation from interested parties must include an assessment of all the readily available data and information. | Yes |
| 7.7, 24.2, 39.6, 48.5, 56.11, 64.3, 67.4, 205.4, 211.6 | The paragraph at the end of section 6.1 should be moved to a new section and modified as follows: 6.2. An interested party may request an existing listing be reassessed under the provisions of the Policy. In requesting the reevaluation, the interested party must describe the reason(s) the listing is inappropriate, state the reason the Policy would lead to a different outcome, and provide any new data and information that would assist the RWQCB and SWRCB in conducting the review. | This recommendation has been incorporated into Section 4 of the Policy. | Yes |
| 8.11 | The policy should set forth specific guidance for the RWQCBs as to the burden interested parties must show in order to trigger a procedure for a thorough reevaluation. | The Policy has been revised to add clarifying language. | Yes |
| 10.18 | Timber and agricultural proponents would like review of historical listings.<br><br>Re-reviewing all these listing would result in the same outcome listing. Going through this process would be a huge waste of resources and set the schedule for implementation ( you are not going to implement if you need to re-review) back another 2 or 3 years. | Comment acknowledged. | No |
| 18.61 | The Policy should be applied retroactively within time and resource constraints. Approaches for applying this policy to currently listed waters should be described. The draft Listing Policy is partially consistent with this recommendation. Existing listings must be reevaluated if new data and information are available; otherwise, reevaluation appears to be discretionary and based primarily on whether an interested party requests such an evaluation. | Comment acknowledged. | No |
| 18.68 | The TMDL Roundtable recommended that all waters currently on the Section | The draft Policy does not state when the review of the section 303(d) list is to | No |

| COMMENT NUMBER | SUMMARY OF COMMENT | RESPONSE | REVISION |
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| | 303(d) list (as of 2002) should be reviewed for consistency with this listing policy within the first two listing cycles following adoption of the listing policy. Recommendations per this Listing Policy should be made for these waters. Waters on the current Section 303(d) list may also be reviewed between periodic updates as described in Recommendation 10 above. The draft Listing Policy is partially consistent with this recommendation. The draft Listing Policy includes provisions for reevaluating currently listed waters, but does not give a timeline for completing the reevaluation. | be completed. Revision of the list is a staff intensive effort and it is not advised that RWQCB be mandated to complete the review within a certain time frame. | |
| 24.3 | The last sentence is misplaced and belongs at the beginning of section 4. It should read: The most recently completed section 303(d) list shall form the basis for any subsequent lists. This section provides the methodology for removing waters from the section 303(d) list (including the water quality limited segments category, enforceable program category, and TMDLs completed category). | Comment acknowledged. | No |
| 25.10 | Listings on the 1998 and 2002 lists may have been inappropriate. | Comment acknowledged. | No |
| 25.9 | SWRCB should consider the re-evaluation of each water body identified on the previous 303(d) list. | Comment acknowledged. | No |
| 29.10, 61.16 | Clarify the language regarding use of data older than 10 years. Listings based on such data may have had inadequate scientific basis, or may not reflect current conditions and may no longer be valid. | It is ideal to use the most recent data in the evaluation of water quality assessment. The disadvantage of the requirement limiting the data age to 5-7 year, for example, is the possibility that high quality data will be missed in the assessment. For example, peer reviewed and reports of some data (e.g., USGS) takes many years to get through the review process. If older data are the only data available it should be used in decision making. For this reason, the Policy has been revised; the age of data used is up to the RWQCBs discretion. | Yes |
| 36.2 | The draft Policy specifies that all water bodies on the 2002 303(d) list would be reevaluated using the Policy over the next two listing cycles. This would place a tremendous strain on RWQCB already limited staff resources. | The draft Policy does not mandate review of the entire section 303(d) list over two cycles. No timeframe for complete reevaluation is included. | No |
| 39.7, 41.4, 41.6, 41.5, 53.15, 53.14 | The following steps should be used to complete the reevaluation of a faulty listing:<br>A. Document the basis for the original listing.<br>B. Provide information documenting that the listing was based on faulty data or information, including, but not limited to, typographical errors, improper quality assurance/quality control procedures, limitations related to the analytical methods that would lead to improper conclusions regarding the water quality status of the segment, or deviation from listing policies in effect at the time of the listing. | The Delisting Factor section contains provisions that allows a water body to be removed from the list data and information are faulty. This clarification is not needed. | No |
| 39.8 | The following steps should be used to complete a reevaluation based on new data and information: | Comment acknowledged. | No |

| COMMENT NUMBER | SUMMARY OF COMMENT | RESPONSE | REVISION |
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| | A. All readily available data and information shall be used to assess a water segment. Data and information older than ten years may be used if the original listing was based on the data.<br>B. In performing the reassessment the RWQCBs shall use the California Listing Factors (i.e.., water shall be assessed as if they had never been listed before) to assess each water segment-pollutant combination. The original listing was established using the provisions of this Policy, the California Delisting factors shall be used. | | |
| 41.1 | The Policy provision regarding listing reevaluation and delisting need to be clarified. The provisions are ambiguous and subject to varying interpretations. | The provisions of this section have been clarified. | Yes |
| 44.17 | The Policy should reflect that the delisting process can be initiated at any time and need not correspond to the listing cycle. | Development of the section 303(d) list is a resource intensive effort. If RWQCBs were to be required to consider listing and delisting decisions between biennial list reviews, it would be a substantial drain on staff resources. Staff would have to be redirected from other activities, such as TMDL development, to address these requests. | No |
| 51.159 | The draft Policy no longer calls for an automatic review of all of the currently-listed waters. A comprehensive review of every water body on the 2002 section 303(d) list would be costly, would not result in a substantial improvement in the accuracy of the list, and would cause inordinate additional delay in California's already dilatory implementation of the TMDL program. Time is of the essence if we are to reverse the further degradation of our limited and dwindling supply of clean water. | Comment acknowledged. | No |
| 53.26, 53.27, 53.17 | The first paragraph under Section 6.1 Evaluating Existing Listing it should read as follows.<br>Water segment and pollutant on the section 303(d) list shall be reevaluated if new data and information become available. The steps to complete a reevaluation are:<br>A. All readily available data and information shall be used ...<br>B. In performing the reassessment the RWQCBs shall either: (1) use the California Listing Factors (i.e., waters shall be assessed as if they had never been listed before) to assess each water segment-pollutant combination, or (2) where bioassessment would be an appropriate indicator, follow the process specified at section 6.2.3.4. | This section of the Policy has been deleted and a replaced with a brief statement in Section 4 on the process for reevaluating existing listings. | No |
| 57.5, 202.5 | Periodic reevaluation of contaminant listings should be mandatory and new listings should be balanced by delistings (due to new data or objective achievement) so that a predictable workload exists for both the regulated and regulatory communities. | The level of work does not drive which waters should be listed or delisted. All readily available data and information is used to assess waters. | No |
| 58.13 | Pre-policy listings should be revisited to determine whether appropriate criteria | Comment acknowledged. | No |

| COMMENT NUMBER | SUMMARY OF COMMENT | RESPONSE | REVISION |
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| | were utilized, especially as it relates to analytical Quality Assurance and Control. | | |
| 70.8 | SWRCB should adopt a policy that both allows and compels staff to evaluate previously listed water bodies if, based on current policy and available data, that review might reasonably lead to a different listing decision. | Comment acknowledged. | No |
| 114.8 | Some listed water bodies merit a reevaluation. | Comment acknowledged. | No |
| 211.5 | Commend the SWRCB for providing a mechanism for the reevaluation of water bodies identified in the 303(d) list using the Listing Policy. | Comment acknowledged. | No |
| 218.6 | I would just like to emphasize that when we're talking about this policy, what we really are talking about are very concrete waterways that are in jeopardy of falling off the 303(d) list. And what this means is a very real impact to communities and to the local economy, and I would urge you to look with great care at the suggestions of my colleagues in making your final determinations. | Comment acknowledged. | No |

## Draft Policy, Section 6.2: Process for Evaluation of Readily Available Data and Information

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| 18.80 | The TMDL Roundtable recommended that staff from the RWQCBs and SWRCB should collaborate to specify some general guidance on managing data and information. DWQ and OIT staff of the SWRCB will investigate a networked data management system (e.g., utilizing ArcGIS and GeoWBS) in which the RWQCBs' data and recommendations will be compiled. Some approach for processing, storing and retrieving data and scanned information will be required. Accessible archives of all information submitted are an increasing challenge, due to volume and variety of formats. Support, with staffing, hardware, and software, will need to be long-term and distributed among the SWRCB and RWQCB offices. Office of Information Technology staff should evaluate the following alternatives:<br><br>a. State Board investigates contract services, via commercial vendor, to provide a web site outside the state network, to improve access and security for public and state employees.<br>b. State Board and Regional Boards develop this web site using state network facilities.<br><br>At the end of the list update process, the entire contents of the web site could be transmitted to a State Board server for preservation as the Administrative Record. The Draft Listing Policy is not consistent with this recommendation. The Draft Listing Policy does not discuss data management. | The development of a data management system is an administrative task that is outside the scope of this Listing Policy. Data management is being developed under contract. Data management is not a matter that should be included in the Policy because the technical aspects of the data system are best addressed by the scientists and engineers completing this task. In any case, the data management system will implement the Policy as adopted. | No |
| 40.13 | The proposed policy and supporting documentation do not contain sufficient rationale for a decision to exclude available data and information from | Data will not be excluded from evaluation. The policy has been revised to address this issue. | Yes |

| COMMENT NUMBER | SUMMARY OF COMMENT | RESPONSE | REVISION |
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| | consideration, as required by 40 CFR 130.7(b)(6). Data and information are often useful within a "weight-of-evidence" assessment context even if they do not meet every quality assurance expectation. | | |
| **Draft Policy, Section 6.2.1: Definition of Readily Available data and Information** | | | |
| 18.37 | Delete language regarding the order that information should be reviewed. It is unclear why the Policy should specify the order in which to evaluate information, since Regions would just evaluate all relevant information together; therefore this language is deleted. | The Policy has been revised to make this change. | Yes |
| **Draft Policy, Section 6.2.2: Administration of the Listing Process** | | | |
| 14.10, 18.56 | The Listing Policy does not establish a clear listing cycle. Currently, federal regulations require an update to the 303(d) list every two years. The process outlined in the draft Listing Policy is similar to the process used in 1998 and 2002. The requirements for RWQCB hearings may add additional time to what we have observed in the past. It should be noted that for the 1998-303(d) list update, the Regions began the assessment process in the spring of 1997 and USEPA did not approve the list until the summer of 1999. For the 2002-303(d) list update, the solicitation process began in February 2001 and US EPA did not approve the list until July 2003. The listing process defined in the draft Policy will likely continue to take more than 2 years to complete. This will put the State in a situation of continually updating the 303(d) list. As an alternative, the SWRCB should pursue a longer 303(d)-list update cycle (e.g. four years). If federal regulations require a 2-year update, the State Board could define an intensive update every four years (i.e. full review of all available data) with a less intense update in between (e.g. a review of specific requests for changes). | The two year cycle to update the section 303(d) list is required by federal regulation and is not defined by SWRCB. Performing a less intensive survey does not comply with federal regulation that requires States to evaluate all readily available data during each cycle. During the development of the 2004 list, SWRCB will use a modified approach to complete the list. SWRCB will complete all tasks related to the development to the 2004 section 303(d) list. The policy has been revised to acknowledge the abbreviated process to be used in 2004. | Yes |
| 18.67 | The TMDL Roundtable recommended that the RWQCBs should be responsible for assessing the existing and readily available information, including information received during the solicitation process. The RWQCBs should also be responsible for identifying waters on the List. The RWQCBs may hold a workshop and/or public hearing to take comments on staff recommendations. The RWQCBs should then take formal action to adopt recommended changes to the list. The RWQCBs will be responsible for submitting to the SWRCB the administrative record which supports their recommendations. The SWRCB should review each RWQCB's recommendations for consistency with the Listing Policy. The SWRCB should accept RWQCB recommendations, unless they are inconsistent with the Listing policy or applicable law. The SWRCB should then adopt the statewide List through a formal action. The draft Listing Policy is consistent with this recommendation. The draft Listing Policy also makes it clear that only issues raised before the RWQCBs will be considered. | The last sentence is an administrative task that will be addressed when the list is developed. | No |

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| | The Listing Policy may also need to explicitly limit the time period for submission of data and information. | | |
| 43.4 | In developing 303(d) policy, the SWRCB should address the following question: What are the roles of the State and Regional Boards in making and implementing policy? | The roles of the SWRCB and RWQCBs are explained in the Listing Policy. | No |

## Draft Policy, Section 6.2.2.1: Solicitation of All Readily Available Data and Information

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| 18.66 | The TMDL Roundtable recommended that each RWQCB should be responsible for soliciting information from interested parties within its Region. The SWRCB should be responsible for requesting information from agencies/entities that are likely to have information relevant to multiple regions (e.g., from federal/State agencies or from the State university systems). The solicitation process should take place during the same period of time in each Region. The draft Listing Policy is consistent with this recommendation. The draft Listing Policy should explicitly state that the solicitation process will take place concurrently at the SWRCB and Regions. | The Policy has been revised to add that SWRCB and RWQCBs shall initiate the listing process by concurrently and actively soliciting all readily available data and information. The division of tasks to be completed will be accomplished administratively when the data solicitation is initiated. | Yes |
| 18.69, 80.10, 80.9 | The solicitation for data and information and assessment needed for changes to the list should take place every four years. The RWQCB may, on its own motion, recommend changes to the list between periodic updates. Any such changes must go through the same process as the periodic updates (e.g., RWQCB adoption of the recommended change, SWRCB approval, and USEPA approval for Section 303(d) listed waters). The draft Listing Policy is not consistent with this recommendation. The draft Listing Policy makes no mention of the frequency of the assessment process. Currently annual 305(b) reports are required and biennial 303(d) lists. Without a defined State policy on the frequency of assessment, the State will likely be conducting continual and possibly overlapping assessment processes. | Federal Regulations (40 CFR 130.7(d)) currently requires that the water quality limited segments list be submitted to USEPA every two years. This deadline could be changed in the future. By not including any specific deadline in the language the Policy, it assures that the Policy will remain current with regard to submittal of the 303(d) list regardless of any federal regulatory change in submittal deadline. | No |
| 18.75 | The TMDL Roundtable recommended that to provide a minimum statewide level of consistency and completeness in soliciting existing and readily available data and information, each RWQCB will solicit, and document its methods and sources for soliciting, existing and readily available data and information. In general, RWQCBs shall seek readily available data and information generated since the prior list evaluation period. For purposes of data and information solicitation, information is any documentation describing the current or anticipated water quality condition of a surface water body. Data are considered to be a subset of information that consists of reports detailing measurements of specific environmental characteristics. Data and information not submitted by interested parties in response to the solicitation are not considered to be readily available. The draft Listing Policy is consistent with this recommendation. A requirement that each Region document its solicitation | Language requiring that each RWQCB document its solicitation process is not necessary. This documentation issue is addressed when RWQCBs submit listing recommendations and fact sheets to the SWRCB (section 6.2). | No |

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| | process should be added to be fully consistent with this recommendation. | | |
| 18.76, 18.77 | The TMDL Roundtable recommended that the SWRCB should provide a list of general methods for acquiring data and information (e.g., mailings to Basin Plan mailing lists and lists of other interested parties; website posting; direct requests to select agencies; and internal RWQCB staff requests) that the RWQCBs will, at a minimum, use to solicit existing and readily available data and information. The draft Listing Policy is not consistent with this recommendation. No description of the methods to be used to conduct the solicitation is provided. | The Policy provides general guidance regarding the type of data and information that should be solicited. Solicitation methods should be left to each RWQCB to determine. | No |
| 18.78 | The TMDL Roundtable recommended that the data and information submittals to the RWQCBs should contain the following:<br>(a) The name of the person and/or organization providing the information.<br>(b) The name of the person certifying the completeness and accuracy of the data and information provided.<br>(c) The person certifying data and information may also provide a statement as to what impairment they believe is occurring.<br>(d) Mailing address, telephone numbers, and email address of a contact person for the information provided.<br>(e) Two hard copies and one electronic copy of all information provided. Data should be submitted in electronic form. Data may be submitted in other formats negotiated with the pertinent Region.<br>(f) If computer model outputs or GIS files are included in the information, submitters should provide bibliographic citations and specify any calibration and quality assurance information available for the model(s) used. Metadata for the field data should be provided (i.e., when measurements were taken, locations, number of samples, detection limits, and other relevant factors). For GIS files, the metadata must detail all the parameters of the projection, including datum.<br>(g) Bibliographic citations for all information provided.<br>(h) A description of, and reference for, the quality assurance procedures and whether data quality objectives were attained (see Section 4.1 below).<br>(i) In addition, data from citizen volunteer water quality monitoring efforts should include an indication of any training in water quality assessment completed by members of the group.<br>(j) For photographs, the information listed for photo documentation in Section 4.1.<br>The draft Listing Policy is partially consistent with this recommendation. The draft Listing Policy contains most of the components of recommendation 20, but does not include a requirement to state whether data quality objectives were attained as part of the QAPP, nor does it include items b, c, or j. | The Policy has been revised to include requirements whether data quality objectives were attained as part of the QAPP, certification requirements regarding data completeness, and accuracy, certification regarding what impairments the data and information demonstrate. The Policy provides guidance for the information required for photo documentation submittals. | Yes |
| 48.12 | The last bullet regarding citizen groups should be clarified. The current statement may be interpreted as suggesting that only the training received by | The Policy has been revised to include language requiring citizen groups data to be subjected to data quality assurance procedures. | Yes |

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| | such a group needs to be identified. It should be made clear that the requirements, including quality assurance procedures, are also required for citizen group data. | | |
| **Draft Policy, Section 6.2.2.2: RWQCB Fact Sheet Preparation** | | | |
| 18.38 | The section requires preparation of individual fact sheets. Rewording is suggested to ensure that the RWQCB documents the basis of each decision, but does not require repeat information that might be common to a number of recommendations. Redundancies in the type of documentation required should be deleted. | This section has been revised to remove unclear and redundant language. | Yes |
| 21.44 | It is important that the summary of non-numeric data and information is not based on chemical concentration data, but on data that relate to impacts through proper TIE or other valid and appropriate studies. | Comment acknowledged. | No |
| **Draft Policy, Section 6.2.3: Evaluation Guideline Selection Process** | | | |
| 1.18 | Guidance must be provided regarding the means to establish Evaluation Guidelines' applicability and protection of beneficial uses. | The Policy provides guidance on the use of evaluation guidelines. The Policy requires that the pollutant, beneficial use and narrative water quality objective be identified when selecting an evaluation guideline. For some pollutants specific consideration in the selection process are detailed; for other parameters further guidance is detailed. | No |
| 8.13, 14.6, 18.39, 18.10, 20.16, 36.4, 101.11 | No justification is provided to support the statement that the Policy supersedes any regional water quality control plan or water quality control policy to the extent of any conflict when evaluating narrative water quality objectives. | This statement has been removed from the draft Listing Policy. Water quality control plans must conform to state policy for water quality control (CWC section 13240). | Yes |
| 8.5, 8.12, 49.4, 64.21, 67.5 | Concerned about the adoption of numeric guidelines by other than policy-making bodies using rule-making procedures with public notice and opportunity to provide input. Numeric guidelines or thresholds should not be adopted summarily by board staff.<br><br>The draft Policy should direct RWQCB staff to adopt numeric objectives when appropriate, consistent with the California Water Code (sections 13241 and 13242), rather than use 'numerical evaluation guidelines' to interpret narrative objectives. | Adoption of guidelines as water quality objectives is beyond the scope of the Listing Policy. Evaluation guidelines use is limited to interpretation of narrative water quality objectives. Quantitative guidelines are used so narrative objectives interpretation can be more consistent and predictable among the RWQCBs. The Policy states in the Introduction that the guidelines are not to be used for any purpose other than the development of the section 303(d) list.<br><br>In its listing guidance, USEPA (2002a) provides guidance on the structure for documenting listing and assessment methodology and provides information on the content of these methodologies. Additionally, justification for the use of an evaluation guideline must be presented in the fact sheet. Therefore, the use of the documentation will be subject to public scrutiny during the listing process. | No |
| 13.10 | RWQCBs selection of sediment quality guidelines has led to problems in the past and will continue to cause problems in the future. | The Policy provides specific guidance in the selection of sediment quality guidelines and restricts the use of sediment guidelines to those that are most | No |

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| | | predictive of toxicity. | |
| 17.5, 22.7, 205.5 | Recommend that only guidance approved and referenced by Basin Plan amendments be used in making listing decisions. Such guidance would thus be subject to the public review and comment process, ensuring that guidance are applicable to our water bodies. Promulgation and documentation of numeric guideline in Basin Plans ensure transparency of the listing process. | The Policy provides guidance on the identification of quantitative evaluation guidelines that represents standards attainment or beneficial use protection. Limiting the use of guidelines to only those approved and referenced in the Basin Plan amendments would, in some cases, exclude a way to predictably interpret narrative water quality objectives. In any case, the listing and justification of these guidelines in the fact sheets would provide an opportunity for public scrutiny during the listing process. Incorporation of these values in the Basin Plan is beyond the scope of the Listing Policy. | No |
| 18.40 | The procedure for selecting evaluation guidelines need to be clarified with State guidelines preferred over federal. This should be done to ensure consistency between State agencies and between Regions in selecting appropriate guidelines. | Distinguishing a priori between federal and state guidelines is impossible. To provide the ability for use of the most applicable guideline or newly developed scientific research, the Policy does not specify specific documents or preferences for state over federal values. By doing so, applicable federal guidelines or the most recent research may not be useable. | No |
| 21.29 | The most important parameter in evaluation of concentration data is to determine whether the concentration is a cause of toxicity or is a source of excessive bioaccumulation. The presence of a constituent above some numeric guideline (e.g. section 6.2.3) is not a valid approach for listing the water body as impaired. | The Evaluation Guideline Selection Process section has been revised. 'Numeric' has been deleted and will be rewritten to reflect the appropriate use of 'interpretive' evaluation guidelines. | Yes |
| 21.45 | Caution must be taken in the Evaluation Guideline selection process. The RWQCBs and SWRCB are not well equipped technically and financially to properly evaluate numeric water quality objectives. | The purpose of this section is to provide guidance to make the selection of evaluation guidelines more consistent and transparent throughout the state. | No |
| 21.47 | No provisions are necessarily included in the Evaluation Guideline for the Protection of consumption of fish and shellfish to protect populations whose subsistence depends on fish and shellfish. The population is not protected as long as regulatory agencies do not include appropriate consumption rate information. | Consumption rates protective of populations whose subsistence depends on fish and shellfish are recommended by OEHHA and is one of the listing parameters included in Section 3.1.4, Health Advisories, please refer to this section of the Policy for further clarification. | No |
| 21.50, 21.49 | Scientifically-based and peer review can by highly subjective. Peer review does not necessarily lead to a credible or reliable discussion. | The selection of scientifically based and peer reviewed data relies on the professional judgement of RWQCB staff. The Policy, however, does provide staff guidelines on how to determine data quality and requires that documentation used to verify impairment contain a QAPP. | No |
| 21.51 | The statement, 'Identifies a range above which impacts occur and below which no or few impacts are predicted' can easily be an erroneous approach, especially if it is based on sediment quality guidelines. | Comment acknowledged. | No |
| 44.11 | Absent a promulgated translator, narrative criteria, with or without numerical guidelines cannot be used to make listing decisions. | A promulgated translator would be necessary if effluent limits were being developed. This Policy only applies to section 303(d) listing and delisting decisions. | No |

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| 67.7 | Recommend that the final Listing Policy require the RWQCB and SWRCB assess the appropriateness of the guideline in the hydrographic unit and not only rely on guidelines previously used. | This section has been revised in response to this comment. However, evaluation guideline appropriateness will primarily be a determination of the RWQCBs. | Yes |
| 71.18 | The proposed draft policy would allow listing decision to be made on the basis of the concentrations of chemical constituents in sediment. California currently does not have adopted sediment quality objectives (SQOs) upon which to base listing decisions. Guidelines developed for use elsewhere are not legally promulgated standards within California, therefore this approach is inappropriate and would not the result in scientifically sound listing decisions. Request that the SWRCB modify the draft policy so that listing decisions be based upon actual measurements of sediment toxicity or upon properly adopted SQOs. | If sediment quality objectives were available sediment chemistry data would be used as a single line of evidence to support a listing decision. In the absence of the objectives, the Policy requires an effects measurement associated with potentially causative chemicals. With the currently drafted Policy, in no case would sediment chemical measurements alone be allowed as the sole basis for listing. | No |
| 109.14 | There are no clean sediment guideline or metrics. Recommend clarifying procedures for assessing sediment conditions. | This section has been revised to allow a reference system approach. | Yes |
| **Draft Policy, Section 6.2.4: Data Quality Assessment Process** | | | |
| 8.14, 11.1, 40.4, 213.2 | We endorse the inclusion of requirements for data quality and quantity requirements for consistent and statistically valid data evaluations, and implementation provisions. This would immediately improve the scientific merit of the 303(d) list. | Comment acknowledged. | No |
| 21.43 | Data from such data sources such as; SWAMP, STORET, the Bay Delta Tributaries database, SCCWRP, San Francisco Estuary RMP, and data reported by local, state, federal agencies (including receiving water monitoring data from discharger monitoring reports), citizen monitoring groups, and academic institution, and the public may not necessarily valid and must be critically evaluated with response to their validity in properly assessing water quality. The dataset should be critically evaluated with respect to its reliability and applicability to properly characterizing water quality, independent of who generates the data. | Comment acknowledged. | No |
| 21.52 | In regards to data quality assessment process, not all of the data produced by agencies/entities listed are reliable. To simply assume that data are reliable because they were generated by one of these groups is technically invalid. An approved QA/QC program by the SWRCB and RWQCBs doesn't mean that the data are reliable or appropriate for assessing water quality. Substantial amounts of unreliable data are generated that pass the QA/QC testing, which are not applicable to an evaluation of water quality. | Comment acknowledged. | No |
| 29.11, 60.44, 61.17, 76.27 | Subsection 6.2.4 should be revised to clarify that photographic documentation is used only as supportive information since listing requires scheduling of a | This section has been revised to clarify this issue. | Yes |

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| | TMDL and development of a TMDL requires data suitable for calculation in order to develop load allocations and waste load allocations. | | |
| 40.43 | Encourage the State to define the basic QA/QC components that correspond to the 'equivalent' of a QAPP. For example, if a monitoring group were to provide documentation of study objectives, rational for selection of sampling sites, sampling frequency, field techniques, analytical methods, and personnel training, then we see no legal rationale to exclude the analytical results and monitoring data from the assessment. | This section has been revised to apply the same requirements for QAPPs or any 'equivalent' document. | Yes |
| 40.44 | The policy lists major monitoring programs in California considered to be of high quality. Recommend the State include all EPA monitoring data (not just EMAP) as well as other agencies that operate high quality sampling programs (e.g., U.S. Fish and Wildlife Service, U.S. Department of Agriculture, U.S. Army Corps of Engineers, and National Oceanic and Atmospheric Administration). | The commenter did not submit the named QAPPs so their quality can not be evaluated. | No |
| 40.45, 40.11, 40.42, 53.11, 53.10 | The policy includes provisions for excluding from consideration data and information that do not meet all of the State's preferred tests of data quality and representativeness. These provisions appear to conflict with 40 CFR 130.7(b), which requires the state to gather and consider all existing and readily available data and information in the listing process. This requirement creates a strong presumption that data and information will be used in the assessment process unless it is completely unreliable. | This section has been revised to make it clear that all readily available data and information will be considered. As outlined in the Policy, data without rigorous quality control (such as photographic documentation) can be used in combination with high quality data. Data that is not supported by a QAPP, or its equivalent, can not be used 'by itself' to support a listing decision unless justified by the situation-specific weight of evidence listing factor (section 3.1.11 or 4.11). The Policy provisions do not conflict with 40 CFR 130.7(b), and the state will gather and consider all existing and readily available data and information in the listing process as required. | Yes |
| 44.4 | Additional assessment categories of information should be included in the minimum QA/QC requirements. Suggest revising the bullets as follows:<br>-Methods used for sample collection and handling;<br>-Field and laboratory measurement and analysis;<br>-Data management, validation, and record keeping (including proper chain of custody) procedures;<br>-Quality assurance and quality control requirements<br>(including matrix spikes, duplicates, blanks, lab QA/QC samples, lab certification, etc.) | This section has been revised for clarity. | Yes |
| 44.5 | RWQCBs should be required to identify the criteria used to review, verify, and validate data. The fifth paragraph after the second set of bullets be revised as: The RWQCBs shall clearly evaluate and make a finding in the fact sheets on the criteria used to review and validate the data, the appropriateness of data collection and analysis practices, and the data verification process including the chain of custody, detection limits, holding times, statistical treatment of data, precision and bias, etc. | The suggested revision has been included. | Yes |

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| 51.31 | The requirement should be removed to realistically allow the submission of data collected from a variety of different sources, in particular, nonprofit organizations, academic sources, and private citizens. Requiring all data to be in SWAMP format to be considered by SWRCB or the RWQCBs would substantially limit the amount of data that could be included in the review process because many entities such as nonprofit groups, academic professionals, and private citizens would have to invest significant resources to submit data in the SWAMP format. | The Policy is permissive on the format of data submittals. The preference is for all data to be submitted in a SWAMP-compatible format, for the purpose of data management. | No |
| **Draft Policy, Section 6.2.5: Data Quantity Assessment Process** | | | |
| 18.11, 20.17 | Sections 6.2.5.3 and 6.2.5.4 provide direction on sample collection, which seems misplaced in a policy on how to assess available information. | These sections are needed to assure that the assumptions of any statistical test are met. RWQCBs have approached many of these issues inconsistently in the past.<br><br>A proper assessment of water quality requires that samples collected should be representative (spatial and temporal) of the area and conditions of the water body in question during a specific time period. Therefore, in order for assessments to be consistent within Regions and Statewide, guidelines need to be established. In addition to spatial and temporal representation, environmental conditions need to be taken into consideration. Environmental conditions (e.g., storms, fires, land use practice, etc.) can have a dramatic effect on the water body. | No |
| 40.48, 40.49 | This section is inconsistent with federal guidance that water quality modeling results by themselves are sufficient means of assessing water quality conditions. Federal regulations require the consideration of information from dilution calculations or predictive models in the assessment process (40 CFR 130.7(b)(5)(ii)). | All data and information shall be considered. The relationships between standards exceedances and computer model outputs are dubious. Modeling information is useful in combination with numerical data. | No |
| **Draft Policy, Section 6.2.5.3: Spatial Representation** | | | |
| 21.53, 51.32, 217.22 | Samples collected within 200 meters of each other shall be considered the same station or location is an arbitrary approach that should not be followed. Site-specific evaluations of how replicate samples collected at one time and location vary should be the approach that is used - not an arbitrary definition of distance as set forth in the Policy. | In order to provide consistency within and between Regions, guidelines should be to set in the Policy. The general guidance stated in the Policy for spatial representation is provided to avoid biasing samples in narrowly defined locations. For example, samples collected near each other, may not reflect the true condition of a large water body (if the listing is focused on the larger water body). Samples should be collected in a manner that characterizes the condition of the water being considered for listing. Guidance is provided to require that spatial independence of samples is maintained and, if smaller areas, must be characterized that this be described in fact sheets.<br><br>A 200 meter sample site separation has been used by several states to maintain | No |

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| | | spatial independence of sites. The 200 m designation is not mandatory but rather used as a trigger to determine when additional justification is needed. | |
| 29.12 | Clarify the descriptions of spatial representation. The technical meaning is unclear. | The Policy has been revised to clarify the description of spatial representation. | Yes |
| 71.30 | To the extent possible, data should be collected at more than one spatially independent station to better capture the true condition of the water body. Even if a network of stations is located in the same water body, the sample measurement will vary among stations and over time due to naturally occurring factors. | A single station may be representative of water body conditions if there are many samples in time and the samples were selected to represent the water body. It is impossible to provide a simple rule that would be applicable to the wide range of water body types in California. Of course, samples should be representative of the area being assessed and the representation of the samples should be described in fact sheets documenting the listing decision. | No |
| **Draft Policy, Section 6.2.5.4: Temporal Representation** | | | |
| 18.42 | Language in this section regarding how samples should be collected should be deleted, since this provides monitoring guidance that is not appropriate for a Listing Policy. Language regarding the use of data collected on a single day or during a single event should also be eliminated, since this language suggests that it should not be used as the primary data to support listing. The justification for such a requirement is unclear and the meaning of primary data in the context of this section is not clear. | The language provided in the Policy is appropriate in order to avoid individual samples over- or under-representing conditions in the water body. Virtually any statistical test requires samples to be independent and random and unless these conditions are built into the policy it is very likely that inferences made from sample data could misrepresent water body conditions. If the Policy does not establish these simple rules for random and independent samples, it is possible that data will result in a higher probability of placement of waters on the section 303(d) list.<br><br>Judgement should not be used in place of the randomization needed to make probabilistic inferential statements (Hahn and Meeker, 1991). This problem can be avoided by describing what the samples represent and making sure samples are independent. | No |
| 18.70, 51.168, 71.31 | Data should be collected to capture temporal variability (e.g., by requiring data collected from at least two seasons). From a statistical perspective sampling should not be conducted only (or even mostly) when 'water quality objective exceedance would be expected to be clearly manifested ' or during just the critical conditions for a particular pollutant. The best estimator of the true condition of a water body with respect to a given water quality parameter is some measure of central tendency, not an extreme value. The methodology for determining compliance with a numeric water quality criterion is predicated on the fact that random sampling will provide a representative data set from the population (i.e., that each individual sample provides a ransom snapshot of water quality at a given moment in time). The goal then is to estimate the true state of the water body, both spatially and temporally, not the maximum state at a single time or place. | The goal is to determine if water quality standards are attained or not attained in the water segment under consideration. Data and information should be as representative as possible of true conditions of the water body but 'true' conditions are never actually known. If historical data and information shows that water quality standards are exceeded during particular events or seasons, then assessment should be limited to that period. Otherwise, these events may not be detected. Random samples can be collected that represents events. The significance of the timing of sampling must be included in the fact sheets.<br><br>Average exceedance of standards equates to an exceedance frequency of roughly 50 percent (if the data are normally distributed around the mean). This exceedance frequency would prevent the Boards from listing many waters that can be identified with relatively small sample sizes. | No |
| 19.17 | Requests that when known changes have taken place in a water body (such as | The draft Policy has been revised to incorporate this comment. In order for | Yes |

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| | implementation of management practices) only recent data be considered during re-evaluation. | statistical analysis to be used the data must be independent. The requirement would help in meeting the independence assumptions of statistical tests. | |
| 21.54 | The temporal representation approach stated in the Policy is technically invalid. Runoff from agricultural areas or urban areas where pesticide toxicity that occurs only during a runoff event can have a significant adverse effect on the beneficial use of water bodies. | Samples collected during storm events (e.g., during runoff) may be used in the assessment as long as they have been collected over two or more storm events. This is to ensure that the exceedance of water quality standards reoccur over several events and the problem exists. | No |
| 29.13 | Clarify the descriptions of temporal representation. The technical meaning is unclear. | The Policy has been revised to clarify the description of temporal representation. | Yes |
| 51.33 | The temporal representation requirement is unclear and could be misinterpreted. Temporal independence is based on site-specific conditions, and prescribed guidance or requirements should be avoided to ensure all valid data is used in the listing process. The provisions of the current draft Policy should be replaced with a requirement that data evaluations consider the temporal representation of the samples, particularly in light of site-specific characteristics including seasonal variability and input events. | The reason for this section is to avoid problems related to independence of the samples. Consideration of temporal independence is not enough. For results to be most useful some control on temporal representation must be included in the Policy. | No |
| 217.16 | Critical conditions must be sampled, and this includes a representative number of wet weather samples during varying levels of storm duration intensity. The policy related to small sample size must be modified as well. | Samples collected in storm events should be representative of the entire event in order to accurately assess the potential problem. In addition, samples should be collected over two or more events to accurately reflect the reoccurrence and extent of the problem. | No |
| **Draft Policy, Section 6.2.5.5: Minimum Number of Samples** | | | |
| 18.43, 29.14, 61.19 | The section describing minimum number of samples, should be eliminated. This section refers to a Planning List, which is not described elsewhere. In addition, the application of the binomial method already discusses how small sample sizes would be handled, so this section appears unnecessarily redundant. There is no need to restrict the number of samples for the RWQCB staff Weight of Evidence method, since multiple lines of evidence can be used to support a listing or delisting decision. | The section has been removed from the Policy. The second paragraph has been included in the 'Aggregation of Data by Reach/Area' section of the Policy. | Yes |
| 111.2 | Confused that USEPA does not support minimum sample sizes. Seems contrary to the 2002 CALM guidance. Supports the Policy's minimum sample size requirements. Also supports consistent and valid data evaluations and the strong move towards more elaborate, public and stakeholder involvement. | Comment acknowledged. | No |
| **Draft Policy, Section 6.2.5.6: Aggregation of Data by Reach/Area** | | | |
| 1.20, 28.5 | If data is to be pooled for consideration, the data should be combined regardless of whether one of the measurements is above the applicable water quality objective. | References to pooled data have been removed from the Policy. | Yes |

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| 5.9, 11.16, 12.9, 19.19, 19.18, 23.9, 25.8, 29.4, 38.6, 51.28, 51.22, 51.34, 57.8, 58.14, 60.40, 60.41, 61.1, 64.23, 65.7, 66.3, 71.16, 74.7, 76.25, 79.3, 84.9, 116.6, 118.3, 202.8, 203.10, 213.6 | Concerned with language contained in Section 6.2.5.6 that would allow data to be pooled together for the purpose of impairment evaluations. It appears that a reach could be listed as impaired if only one sample from that reach met the listing criteria, provided that sufficient data related to the same pollutant were available from adjacent reaches. | References to pooled data have been removed from the Policy. | Yes |
| 18.41 | This section should be eliminated since Section 6.2.5.6 discusses aggregation of data by reach (e.g. spatial representation). | This section is needed to provide specific guidance on how to address water body segmentation. | No |
| 18.44 | The first paragraph in the section should be eliminated since a similar description of aggregation of data can be found in the following paragraph. | This section has been revised. | Yes |
| 18.64 | Recommended that the policy should address how water bodies are identified on the List. To the extent practicable, water body segments not meeting standards should be identified in a consistent manner. The draft Listing Policy is consistent with this recommendation. Section 6.2.5.6 describes how data should be aggregated by reach/area and presumably how such reaches should be defined. There is an apparent inconsistency between sections 6.2.5.3 and 6.2.5.6. Section 6.2.5.3 (Spatial Representation) implies that data from a given station can only represent 200 meters of a stream section, whereas, section 6.2.5.6 suggests a number of factors be used to define stream or waterbody segment. | Section 6.2.5.3 is needed to make sure assumptions of statistical tests are met. Section 6.2.5.6 addresses a completely different issue regarding ways to aggregate data within segments. RWQCBs have used dramatically different approaches in assigning areas of impact. This section provides some modest guidelines to make listing decisions more predictable. | No |

## Draft Policy, Section 6.2.5.7: Natural Sources

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| 11.17, 20.21, 22.4, 40.98, 40.21, 40.99, 40.101, 41.11, 51.18, 58.3, 109.8 | The State must list waters impaired by natural sources.<br><br>Section 3.1 of the draft Policy states that water segments for which standards exceedances reflect 'natural background conditions' shall not be placed on the 303(d) list. This directly contradicts the 9th Circuit's recent rejection of the proposition that section 303(d) only applied with respect to waters where effluent limits existed for a particular pollutant. In doing so, the court emphasized that both the listing obligation and TMDL development obligation are triggered when water bodies do not attain water quality standards, regardless of the source of pollution. It also contradicts the position of the NRC, which found that the TMDL program 'should encompass all stressors . . . that determine the condition of the waterbody.' | If a water body does not meet water quality standards it should be placed on the section 303(d) list. Some Basin Plans contain language regarding the applicability of narrative and numeric water quality objectives to uncontrollable sources. For these regions no listing for natural sources would occur. For other regions waters would have to be placed on the section 303(d) list. In these cases, it is unlikely that a TMDL would be completed because the source is uncontrollable. The Policy will not provide any guidance concerning the listing /delisting of water segments due to natural sources of pollutants. RWQCBs will determine how to proceed with listings or delisting related to natural causes. | Yes |

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| | More significantly, it contradicts both the CWA (which contains no exemption for impairments due to natural sources) and the TMDL regulations. For example, 40 C.F.R. § 130.2(g) defines "load allocation" for purposes of developing a TMDL as '[t]he portion of a receiving water's loading capacity that is attributed either to . . . nonpoint sources of pollution or to natural background sources.' The regulations thus clearly contemplate the listing for waters impaired by natural sources. Moreover, the language of section 130.2(g) indicates that Pronsolino's approval of TMDLs for nonpoint pollution extends logically to natural sources as well, as both are addressed in the definition of 'load allocation.' | | |
| **Draft Policy, Section 6.2.5.8: Quantitation of Chemical Concentrations** | | | |
| 21.55 | Using a value at one-half that leads to a particular conclusion on listing is an inappropriate approach. Usually, a more appropriate analytical method can be used to define the actual concentration. | This section of the Policy has been revised and the reference to one-half the quantitation limit has been removed. | Yes |
| 58.4 | Standard deviation from a single sample analysis may rise as the detection limit is approached and samples are often subject to matrix interference effects that introduce an additional source of error; these false positives may lead to unwarranted diversion of effort. | Comment acknowledged. | No |
| 58.6, 215.1 | Concerned about how these new rules interact with things like CTR, when we have seen past listings based on very, very low and unusual hardness levels. CTR listings for metals that are interacting with very, very low hardness measurements that are essentially atypical and require the CTR to be extrapolated beyond what is represented in CTR documents at the level of, like, two parts per million hardness when the CTR tables stop at 25. There are exceptions that pop up; it's not a perfect science. We appreciate that the Regional Board would take those kinds of analytical anomalies essentially into consideration. | The RWQCBs have the discretion to interpret the CTR at low hardness levels where appropriate. It is beyond the scope of the Listing Policy to modify standards. | No |
| **Draft Policy, Section 6.2.5.9: Transformation of Data consistent with expression of numeric water quality objectives, water quality criteria, or evaluation guidelines** | | | |
| 2.4 | Agree with the recommendation. This reflects real effects/conditions better than instantaneous maxima (which overstate the severity of the condition) and statistically are rare events. | Comment acknowledged. | No |
| 18.3 | The Policy, as proposed, does not reflect the details of many specific water quality standards such as spatial and temporal applicability and frequency and duration of allowed non-attainment. | The Policy requires all water quality standards to be interpreted based on the structure and form of the standard as adopted before any statistical tests are performed. Staff will compare data to the applicable standard and applicable averaging period(s) and the result will be either 'yes' the standard is exceeded | No |

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| | | or 'no' the standard is not exceeded. Then the series of 'yes' and 'no' answers will be analyzed statistically using the binomial test.<br><br>The form of the standard is preserved, the averaging periods are used, and a statistical assessment of the strength of the data sample is completed. No standard is changed in this evaluation. | |
| 18.45, 43.8, 60.53, 76.33 | Alter the staff-recommended alternative 2 to require sampling greater than the single sample requirement currently recommended where RWQCBs do not have enough data to match specific averaging periods. | The Policy does not seek to change the form and expression of the water quality objective used in list assessments. Therefore, the Policy provides guidance to ensure that sampling data is interpreted appropriately. Recommendations for a single sample to represent the averaging period allows the use of available data in a manner that is precautionary and provides the RWQCBs some flexibility to use what's available to assess compliance. | No |
| 37.3 | The draft Policy's direction on transformation of data for use in the binomial model is inappropriate for assessment of compliance with most of the Lahontan RWQCB's numeric water quality objectives. This direction could result in listing of water bodies that are actually attaining standards. | Sampled data for virtually all water quality objectives lend themselves to analysis by binomial statistics. This is because data are easily transformed into nominal information: 'yes' the sample falls below the standard or 'no' the standard is exceeded. | No |
| 51.30 | The policy's generalized requirements for data averaging and combining data from adjacent reaches do not seem to be based on scientific methods and will have the effect of eliminating data that should be considered. For example, the policy indicates that 'If the averaging period is not stated for the standard, objective, criterion, or evaluation guideline, then the samples collected less than 7 days apart shall be averaged.' Samples collected within a 7-day time frame may be considered temporally independent if justified. The seven-day time frame is arbitrary. No justification or data are presented that indicates that the duration of seven days between sampling events is required to ensure temporal independence. More importantly, the time frame required for temporal independence is specific to each location and site-specific conditions that existed at the time of sample such as the weather conditions. | The 7-day averaging period is recommended in order to reduce the possibility that the results used in statistical analysis are auto-correlated or dependent. Autocorrelation of the measurements has been observed in some data sets from California waters. Spurlock et al. (2000) showed that a chlorpyrifos sample collected on a given day is influenced by concentrations 1 to 6 days prior to the sampling (positive autocorrelation). If the data are positively autocorrelated then it is probable that the observed variance to be smaller than expected. This could then leads to an inflated Type I error. Averaging samples collected during a 7-day period would reduce this problem. | No |
| 107.9 | The draft Policy states all samples taken in one day should be averaged and represented as one sample. This is scientifically problematic for certain kinds of parameters, e.g., dissolved oxygen. A characteristic problem with dissolved oxygen due to nutrients is that readings are high in the daytime and fall sharply just before dawn. An average of the high and low values gives results that would not allow listing, yet fish will be dying at dawn for lack of oxygen and at noon from super-saturation. The test requirements do not fit this real-life situation. With only a few minor modifications the problems can probably be remedied. | This section of the Policy has been revised to recognize to use of dissolved oxygen minima. | Yes |

## Draft Policy, Section 6.2.5.10: Binomial Model Statistical Evaluation

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| 18.46 | The redundant language in this section should be eliminated and references to samples and measurements should be changed to data points. The change to the term data points is proposed because once individual samples or measurements are averaged or transformed the binomial method is applied to the new data point and not to the individual samples or measurements. | The section has been revised for clarity. Although numeric sampled information is transformed into nominal (named) information, it remains data: Samples either provide readings above a numeric objective or not. The Policy and FED use of sample data is appropriate, even if it takes the form of a 'yes' or 'no'. | Yes |
| 18.82, 21.15 | The draft Policy focuses on developing statistical evaluation of the data. Rather than statistical manipulation of the data, the focus should be on protection of water quality. Most statistical manipulation of water quality data does not properly reflect how chemicals impact aquatic-life related beneficial uses of water bodies. Toxicants do not impact fish based on the mean, median, mode, maximum, range, etc., but rather toxicity is based on a concentration of toxic chemical for, duration of exposure relationship for a particular chemical and type of organism. | The focus of the Listing Policy is to provide direction on the consistent development of the section 303(d) list. Statistics are used as a tool to make decision making more transparent and to allow policy makers to establish the parameters that should be used when listing decisions are made. The relationships between toxicity and chemical concentration is a standards issue that is beyond the scope of the Listing Policy. | No |
| 40.50, 40.28, 40.29, 40.52, 40.51, 51.76 | The policy does not require verification that data sets are suitable for analysis through the proposed binomial statistics method. Unless evaluated data exhibit particular characteristics (e.g. normal distribution, sample independence, absence of systematic biases) it may be invalid to draw valid statistical inferences based on binomial statistical tests (see Lin et al., 2000). | The data collected in most, if not all, water quality sampling program is applicable to appropriate statistical evaluation. The use of the exact binomial test requires that the likelihood of 'success' and of 'failure' (i.e., standards not met and standards met) remain constant in the population (i.e., water body), and that samples be independent of one another and be representative (e.g., random). The requirements are now included in the Policy. However, being a nonparametric procedure, the exact binomial test does not require an assumption of normally distributed data. | Yes |
| 104.4 | Rigorous QAQC procedures, perhaps a standard deviation method, is the proper way to address sample uncertainties. The hypothesis testing procedures described in USEPA testing manuals and guidance documents certainly provide adequate protection against indirectly concluding that waters are toxic when they are not. | Comment acknowledged. | No |

## Draft Policy, Section 6.2.5.11: Evaluation of Bioassessment Data

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| 18.90 | Recommend that the assessment process for biological standards (biocriteria) when incorporated into RWQCB's Basin Plan should be followed. At that time these standards would necessarily guide listing decisions for the affected geographic areas. RWQCBs (especially the larger Regions) will probably adopt biocriteria for one or a few areas at a time, not for the whole Region at once. After the biocriteria are adopted for a specific area, watershed, ecoregion or waterbody type, those established biocriteria would guide listing or delisting decisions for that area only. The remainder of the Region (for which no biocriteria have yet been adopted) would still follow the recommended process. The draft Listing Policy is partially consistent with this recommendation. The draft Listing Policy discusses evaluation of bioassessment data in a manner generally consistent with the recommendation in Section 6.2.5.11. The draft | The development of biocriteria is beyond the scope of the Listing Policy. | No |

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| | Listing Policy requires that a link between specific pollutants and degraded conditions must be made before a water is listed. | | |
| 51.114, 51.115 | As currently drafted the draft Policy appears to block the use of bioassessment studies that are not completed by the RWQCBs. SWRCB's chosen alternative for assessing degradation of biological populations or communities repeatedly contains language requiring the RWQCBs to "clearly document how reference sites are selected and used" and "describe the habitat they are sampling and why it was chosen." This language appears to imply that only data collected from bioassessment studies conducted by the RWQCBs can be used in the assessment of biological communities for the purposes of listing. In practicality, bioassessment studies are completed by other State and federal agencies (resource agencies), research groups, academia, the regulated community, and non-profits. | The Policy has been revised to allow bioassessment data from all sources to be used. | Yes |
| 51.116 | We therefore urge SWRCB to revise the language in the FED that all readily available bioassessment data will be considered for listing purposes, and add this language to appropriate sections of the draft Policy. In addition, the draft Policy should explicitly state that assessment for biologically-related impacts often requires the use of multiple lines of evidence, in a weight of evidence approach. | Under the provisions of the Policy, bioassessment-related impacts always require multiple lines of evidence for listing. | No |

## Draft Policy, Section 6.2.5.12: Evaluation of Temperature Data

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| 18.47 | The language in this section that provides examples should be removed to emphasize the parts of the discussion that provide policy direction. | This revision has been made. | Yes |
| 18.87 | Recommended that when data of sufficient quantity and quality are available, a comparison of current and historic or natural water temperatures can be made to determine whether water quality objectives are being met. If the current temperature regime of COLD or WARM waters has been altered from the natural or historic temperature regime in a manner prohibited by the applicable objective, then the water quality objective is not being met and the water body shall be determined impaired by temperature. The provisions of the SWRCB's Thermal Plan should also be considered. When historic or natural temperature data are not available, alternative approaches must be employed to assess temperature impairment. One such approach is based on the assumption that the beneficial uses associated with aquatic life are most sensitive to modifications to natural temperature regimes. Other beneficial uses that may also be affected by temperature include recreation and aquaculture; other approaches for assessing temperature impairment may be more appropriate for these beneficial uses. The draft Listing Policy is partially consistent with this recommendation. The draft Listing Policy discusses temperature issues in a manner generally consistent with this recommendation in Section 6.2.5.12, but appears to apply | Comment acknowledged. | No |

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| | the binomial method in Section 3.1.2, which was not recommended by the Regions. | | |
| **Draft Policy, Section 6.3: RWQCB Approval** | | | |
| 8.22 | There is no policy regarding appeal of RWQCB decisions to the SWRCB. Provisions should be added to specifying the procedure for requesting re-evaluations of existing listings, including an appeal procedure. | Provisions requesting reevaluation of existing listing is included in the Policy. | No |
| 18.48 | Changes should be made to the description of the RWQCB approval procedures to be more consistent with legal requirements and standard practices. | The RWQCBs approval procedures are consistent with all legal requirements. | No |
| **Draft Policy, Section 6.4: SWRCB Approval** | | | |
| 18.49 | References to fact sheets should be changed to documentation for consistency with changes suggested to Section 6.2.2.2. | If the requirements were changed to provide simply documentation consistency, it is unlikely that RWQCBs would provide consistent, combinable data and information needed to support SWRCB's adoption process. The specificity of the information needed is intended to make the listing process consistent among regions and to allow for easy combination of the data and information summaries. | No |
| **Comment related to Policy Adoption Process** | | | |
| 21.20 | SWRCB should start over with respect to drafting a 303(d) listing policy that properly incorporates protection of aquatic life from adverse impacts of chemical constituents, which reflects how USEPA national water quality criteria are to be used to protect the designated beneficial uses of water bodies. | The Policy recommendation for listing decisions due to adverse impacts of chemical constituents implements water quality standards as they exist in plans, policies, and regulation and is consistent with USEPA guidance and policies. | No |
| 30.6 | Recognize that economic concerns are not a factor in developing the list. It should be recognized that both the listing and the subsequent development of a TMDL and associated BMPs and Management Measures (MMs) may have significant local and regional economic impacts. The overall process does not address how various sectors of the economy will absorb the costs. | Economic considerations are addressed when TMDLs are developed. | No |
| 40.10 | When the State develops its 2004 Section 303(d) list based on the adopted policy, USEPA will carefully scrutinize the proposed listing decisions and associated assessment rationales. If the actual listing decisions are consistent with applicable water quality standards and federal listing requirements, the list will be approvable. | Comment acknowledged. | No |
| 40.36 | USEPA expressed these concerns in comments to SWRCB staff dated June 2003 on the previous draft of the proposed policy. Concerned that most of the inconsistencies with federal listing requirement identified in previous comments | Comment acknowledged. | No |

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| | remain in the December 2003 draft policy. | | |
| 40.37 | Unless the policy is modified to address our remaining concerns, it appears likely that the State will develop section 303(d) listing decisions that do not comply with federal listing requirements. | Federal listing requirements are contained in CWA section 303(d) and 40 CFR 130.7. The Policy is in compliance with these requirements. | No |
| 60.2, 60.3 | Several of these concerns are related to what appears to be a policy reversal from the July to the December drafts. Instead of building on the listing process improvements that resulted in the 2002 303(d) list, the December draft policy moves back toward the policy that produced the inclusive but flawed 1998 303(d) list in which many water segments were erroneously listed. | While there are some significant revisions between the July and December draft Policy, a standardized approach for the consistent identification of waters that do not meet water quality standards was retained. The Policy outlines the decision rules for different kinds of data; an approach for analyzing data statistically; and requirements for data quality, data quantity, and administration of the listing process. | No |
| 60.4 | Concerned that the December draft Policy does not comply with the federal regulations for implementing section 303(d) of the CWA. As noted on page 1 of the Notice of Public Hearing for the January 28 and February 5 hearings on the draft listing policy, 'The section 303(d) list must include the water quality limited segments, associated pollutants, and a priority ranking of the waters for purposes of developing Total Maximum Daily Loads (TMDLs) in the next two years.' | The Policy complies with federal regulations for implementing section 303(d). The CWA requires states to identify waters that do not meet applicable water quality standards and prioritize for the development of TMDLs. USEPA guidance allows the States to develop a TMDL schedule that itself can reflect the priority ranking and further believes this is a reasonable, efficient way to demonstrate priority ranking. The Policy follows this guidance. | No |
| 65.11, 70.6, 73.5 | Encourage the SWRCB to adopt a policy that will ensure scientifically defensible and appropriate methods are applied consistently in evaluating all potential 303(d) listings. | Comment acknowledged. | No |
| 101.9 | RWQCBs will provide assistance (e.g., ideas and support) to ensure that the policy is workable, effective, and technically and legally valid. | Comment acknowledged. | No |
| **Miscellaneous Comment** | | | |
| 4.1 | No comment at this time. | Comment acknowledged. | No |
| 5.4 | Endorse SWRCB's intention to evaluating the appropriateness of water quality standards prior to the development of a TMDL. | Comment acknowledged. | No |
| 5.5 | Support the following concepts from the SWRCB' s draft listing/de-listing policy:<br>- Many listings contained in the State's 1998 and 2002 303(d) lists were based upon limited data, or have occurred despite evidence that natural sources have caused or contributed to the impairment. The basis and rationale for additional listing decisions is unclear.<br><br>- Support guidance regarding the requirements for and transparency of listing decisions. | Comments acknowledged. | No |

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| | - Encourage the SWRCB to reinstate language from the July 2003 draft that would provide for a re-evaluation of each water body identified on the 2002 303(d) list. | | |
| 7.1, 8.1, 8.3, 13.1, 25.1, 30.11, 56.2, 56.4, 60.1, 67.1, 70.1, 84.2 | Support the SWRCB's efforts to establish a statewide approach to assessing California's Surface Waters. Applaud staff's efforts in seeking broad stakeholder input into development of the current draft of the Listing Policy. Staff has gone to extraordinary lengths to work with all interested parties in developing, for the most part, a very objective and scientifically sound Listing Policy. | Comment acknowledged. | No |
| 14.1, 36.1, 42.2, 53.3, 53.1, 66.1, 101.3, 101.2, 115.2, 205.1 | Support the comments submitted by the TMDL Round Table, which includes RWQCB staff and managers who have years of experience interpreting water quality standards and evaluating a vast array of environmental data and information. | Comment acknowledged. | No |
| 15.1, 25.2, 31.1, 38.1, 40.39, 43.2, 48.1, 56.28, 56.1, 56.27, 56.26, 61.3, 61.2, 64.1, 65.2, 65.3, 68.2, 71.2, 74.8, 74.1, 79.1, 112.1, 114.2, 115.1, 116.1, 117.1, 118.1, 121.1, 201.1, 210.8 | Commend SWRCB staff for their efforts to develop the proposed Listing Policy. The accessibility and willingness to answer questions and clarify issues raised during the review of these documents has been extremely helpful. Support the SWRCB's goal of establishing a standardized approach for assigning water bodies to the State's 303(d) list. | Comment acknowledged. | No |
| 18.1, 80.2 | We provided detailed recommendations on a multitude of technical and procedural issues for consideration in developing the policy, but regrettably, most of these recommendations have been ignored or overlooked in the proposed Policy. | Recommendations from the TMDL Roundtable dated 18 December 2002 were evaluated by staff. Of the 35 recommendations made as presented by the RWQCB staff, SWRCB staff agreed with 9 in their entirety; 7 for the most part; 2 provided a good starting point; and agreed that 3 of the recommendations should form the basis for the listing policy. | No |
| 18.2, 20.3, 41.10, 101.1 | The Policy should be compared to the draft Process Guidance and the Draft Implementing Policy and any consistencies identified should be resolved. Inconsistencies between the document will likely lead to inconsistencies between RWQCBs in how they interpret and apply the policies. | The Policy has been revised to make sure that inconsistencies are minimized to the extent possible. | Yes |
| 18.52, 80.8 | Change references of pollutants to pollution in order to eliminate the additional burden on RWQCBs beyond that of performing the assessment of whether water quality standards are being attained. Section 303(d)(1)(A) of the Clean Water Act requires the identification of all waters not attaining standards, and requires a priority ranking based on the severity of the pollution. TMDLs are only required for certain pollutants. These distinctions are important since the Clean Water Act defines pollution broadly, whereas, pollutants are defined as a subset | The focus of the Listing Policy is to provide the requirements for the development of the section 303(d) list. Federal regulation limits the section 303(d) list to those waters where water quality standards are not met, pollutant contributing to or causing the exceedance are identified (with limited exceptions), and TMDLs are still required. Including all pollution on the section 303(d) list goes beyond the basic requirements and USEPA guidance. | No |

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| | of pollution. The Listing Policy should require the identification of all waters not meeting standards to be consistent with federal law and use the TMDL Guidance to identify the options for addressing different pollution problems. Trying to distinguish between pollution and pollutants may require additional evaluation that is not part of the water quality assessment process. | | |
| 18.55, 30.1 | The Listing Policy should include a clear sunset provision. The Listing Policy is largely untested and the consequences of implementation of this Policy are not clear. A sunset provision would allow the SWRCB and public to review whether the Policy is effectively implementing federal law and meeting the goals of the Policy. A sunset date of 2008 or 2009 is suggested to allow the Policy to be applied at least twice prior to review. | The requirements for developing the section 303(d) list have been in place since the mid-1970s and it is not likely that the requirements will be repealed any time soon. If the Policy sunsets or was made non-effective at some future date, SWRCB would have to re-adopt the Policy to address future listing processes. To avoid this resource intensive effort, SWRCB could address provisions periodically, review the Policy and revise any section that is ineffective or less effective than it could be. This process is consistent with the review and revision requirements for State policy for water quality control (CWC section 13143). | No |
| 18.74, 20.1, 51.150 | It appears as if the detailed recommendations provided by the TMDL Roundtable have been ignored or overlooked. There are still significant, technical, procedural, and legal problems with the proposed Policy. | Approximately two-thirds of the TMDL Roundtable comments were incorporated into the draft Policy in the preferred alternative. Most of the remaining comments were included in the draft FED as alternatives to be considered by SWRCB. Comments focused on administrative matters such as the creation of the data system, were not included in the draft FED or Policy because these issues should be addressed based on feasible options given staffing and contract resources and not as a matter of SWRCB policy. | No |
| 18.79, 20.13, 43.53, 101.10 | The Policy should be brief, non-repetitive, and focused on the requirements SWRCB wishes to establish to assess the status of the State's surface waters. Any guidance or suggestions should be developed as separate technical modules (as is being done with the TMDL Guidance). | One of the goals of the draft Policy is to provide consistent and transparent approaches for the identification of water quality limited segments using a standardized set of tools and principles to be used by RWQCBs to evaluate data. The Policy has been drafted to include sufficient detail so the listing approaches are consistent among Regions and so the tools are standardized. If the approaches and tools were voluntary guidance or suggestions then it would be unlikely that SWRCB would achieve the stated goal. The draft Policy is as brief and focused as necessary to provide consistent approaches and a standardized set of listing and delisting tools. | No |
| 20.12, 27.2, 53.2, 101.6, 102.1 | In many places the Policy is confusing, is redundant, or includes unnecessary direction. | The Policy has been revised and several of issues have been clarified. | Yes |
| 20.2 | Suggest that you revisit the recommendations and consider the comment submitted by the TMDL Round Table. | Each of the recommendations have been carefully considered by SWRCB. | No |
| 21.17 | Rather than trying to make it more difficult to have a water body listed on the 303(d) list as proposed in the draft Policy, there should be a need to increase the number of water bodies that are listed as beneficial use CWA 'impaired.' | Comment acknowledged. | No |
| 21.3 | The proposed approach is drastically different from the approach that has been used in the past and that should be followed to protect aquatic-life-related | Comment acknowledged. | No |

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| | beneficial uses of the State's waters and that is necessary to properly implement the CWA. | | |
| 21.4 | The proposed 303(d) listing approach is technically invalid and strongly contrary to protecting the beneficial uses of the state of California's waters. | Comment acknowledged. | No |
| 21.5 | The draft Policy is based on a fundamentally flawed interpretation of the federal CWA's key provisions regarding the intent and approach that is to be followed in protecting and, where degraded, improving the beneficial uses of the nation's waters. | Comment acknowledged. | No |
| 21.66 | The TMDL implementation approach should, as the first step, verify the reliability of the listing with respect to current violation of WQS. This evaluation should include determination of the need for adjusting the WQO for site-specific conditions. If the validity of the listing is confirmed through a special-purpose studies, then it is appropriate to precede to implement the TMDL to control the WQS violation. | Comment acknowledged. | No |
| 21.69 | The draft FED falls far short of presenting a credible discussion in support of the staff's draft Policy. It contains numerous technical problems, which reflect a lack of understanding of how chemical constituents potentially impact the beneficial uses of water bodies and how the USEPA national water quality criteria and state standards based these criteria should be used in developing the CWA 303(d) list. | Comment acknowledged. | No |
| 22.8 | Strongly recommends that a review of the applicability of a water quality standard be made part of all TMDL development. | Comment acknowledged. | No |
| 22.9 | Joins and incorporates by reference herein comments that have been submitted on the Draft Policy by Tri-Tac and CASA. | Comment acknowledged. | No |
| 23.2 | NRC recommendations from its July 2001 report on the TMDL program are important and should be incorporated into the Policy. | Comment acknowledged. | No |
| 23.4 | Per the December 2003 SWRCB TMDL Guidance, water quality standards should be evaluated before a TMDL is developed. | Comment acknowledged. | No |
| 23.5, 114.4, 206.2, 212.1 | Supports transparent process. Supports public access to the supporting data. | Comment acknowledged. | No |
| 26.1, 75.1, 82.1, 217.1, 222.3 | Support and join in the AB 982 Environmental Caucus Comments on the State's proposed 303(d) Listing Policy and the TMDL Guidance. | Comment acknowledged. | No |
| 33.1, 34.1, 35.1, 45.1, 46.1, 52.1, 54.1, 62.1, 78.1 | Support comments made by County of Orange Resources and Development Department. | Comment acknowledged. | No |

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| 36.5 | All surface water bodies should be assessed, including waters that have no previous monitoring data, along with the development of extensive fact sheets, is impractical given staff and budget constraints. | The draft Policy does not mandate review of all surface waters, including water with no monitoring data. This issue is not within the scope of the Policy . | No |
| 37.2 | Support the February 2004 comments of the TMDL Roundtable on the draft policy, including the suggested changes in policy language. | Comment acknowledged. | No |
| 37.4 | The draft Policy, as proposed, will greatly increase demands on RWQCB staff resources for Section 303(d) assessment. The impacts will be greater for regions with more surface water bodies. If additional funding cannot be provided, fewer resources will be available for other important tasks, including TMDL development. SWRCB should consider revising the policy to minimize increased demands on RWQCB staff time. The revised policy and/or the SWRCB resolution for adoption of the Policy should recognize that, in the absence of additional resources, RWQCBs may not be able to perform section 303(d) assessments at the level of detail envisioned by the policy. | The draft Policy will place more demands on RWQCB resources. However, these new demands may be offset by better quality listings. Resources for TMDL development at SWRCB and RWQCBs should be focussed on the well characterized water quality standards attainment problems. The Boards' should make every effort to minimize spending TMDL resources on waters where problems do not exist.<br><br>To the extent possible, the Policy requirements have been reduced to minimize the drain on RWQCB resources. | Yes |
| 40.1 | USEPA is responsible for acting upon the State's section 303(d) listing decisions that will be based on the assessment methodology contained in the Policy, we carefully evaluated the draft policy to determine whether it is consistent with applicable water quality standards, the CWA and associated federal regulatory requirements. USEPA does not take formal action on the assessment methodology itself. | Comment acknowledged. | No |
| 40.3, 56.3, 73.1, 210.1 | Although the policy needs to be revised, the draft policy represents a step in the right direction. Recognize that the SWRCB has devoted substantial effort in developing the draft listing policy and understand that it is difficult to define policies that account for the full range of water quality assessment challenges that face California. | Comment acknowledged. | No |
| 40.38, 51.152, 109.16 | USEPA would be compelled to disapprove any listing decision that conflicts with these requirements. EPA partially disapproved and added waters and pollutants to the California Section 303(d) lists submitted in 1992, 1996, 1998, and 2003 an outcome we want to avoid in future listing decisions. | USEPA makes an independent assessment of whether the section 303(d) list adequately describes those waters that do not meet water quality standards. During at least the last four listing cycles, USEPA has disagreed with some of the listing decisions of SWRCB. For example, in 2002, USEPA disagreed with approximately 1 percent of the water body listing recommendations and 1.5 percent of the water body-pollutant combination recommendations. Given the scope of the list and the types of data and information available it is inevitable that USEPA would disagree with some portion of the proposed listings. Given the results of the 2002 listing cycle, there is good correspondence between USEPA's evaluation and SWRCB's evaluation. | No |
| 40.6 | Appreciate your staff's effort to solicit input from USEPA during the initial phases of policy development. | Comment acknowledged. | No |
| 43.52 | The procedures outlined seem reasonable and technically valid as long as the data requirements are modified to reflect that listings require pollutant | Comment acknowledged. | No |

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| | identification, and the process for evaluating readily available data and information includes the proposals for statistical evaluation based on the use of the binomial model. | | |
| 48.13, 58.1, 62.2, 202.1 | Appreciate that the SWRCB held the additional public hearing on this policy in Torrance on February 5, 2004. Holding the hearing locally in Southern California facilitated the participation of many local governments and stakeholders. Appreciate your efforts to include all stakeholders in this important issue. | Comment acknowledged. | No |
| 48.3 | Strongly support the elements of the Listing Policy that will ensure that the listing process is 'transparent,' including the requirements for fact sheets, public hearings by RWQCBs, and opportunities to comment on the list prior to review by the SWRCB. | Comment acknowledged. | No |
| 51.151 | USEPA raised examples of its numerous significant problems with the draft Policy in oral testimony before SWRCB on January 28, 2004. Unfortunately, many of these had been raised with staff eight months ago but remain unaddressed. | Comment acknowledged. | No |
| 51.153, 51.154 | USEPA's comments are entitled to significant deference, far more than they have received to date. See Arkansas v. Oklahoma, 503 U.S. 91, 105-06 (1992) (USEPA is entitled to discretion to interpret its own regulations and those regulations are entitled to considerable deference). Courts have consistently given deference to USEPA's construction of the CWA. Importantly, an agency's long-standing interpretation of law or its own power is due heightened deference. SWRCB should address fully USEPA's concerns with regard to consistency with water quality standards, data inclusion, the weight of evidence approach, nuisance/nutrient/sediment guidelines, priority setting and scheduling, and other concerns, through modifications to the draft Policy as described in our other comments. | USEPA's comments are being addressed as part of the process to develop the Listing Policy. SWRCB will fully comply with CWA section 303(d) and the associated federal regulations. USEPA has also offered several guidance document to be used by States in developing the section 305(b) report and section 303(d) list. These reports often provide a menu of approaches that should be considered by States in their listing processes. None of these guidance documents have the force of law or regulation. SWRCB has reviewed these guidance documents and used the approaches that can best be implemented in California. Many revisions are proposed in response to USEPAs comments. | Yes |
| 51.155 | In oral testimony before SWRCB on January 28, 2004 and elsewhere, including written comments projected to be submitted to SWRCB by February 18, 2004, the RWQCBs' representative listed a number of concerns with the draft Policy, many of which had been raised previously in numerous communications. These include the following concerns:<br><br>- Primary reliance on the binomial method would lead to a redefinition of almost all state and federal water quality standards. As currently described, the draft Policy would allow those standards not to be attained, but would not require listing.<br>- This deficiency of the binomial method necessitates the description of an effective 'weight of evidence' methodology. The current 'Alternative Data Evaluation' section does not provide an appropriately robust and comprehensive | RWQCB's comments are being addressed as part of the process to develop the Listing Policy. Many revisions are proposed in response to their comments. | Yes |

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| | alternative to the binomial model. Along these lines, the number of samples for a 'weight of evidence' approach should not be restricted, as called for in the draft Policy, since multiple lines of evidence can be used to support a listing or delisting decision.<br>- The purpose of the Policy needs to be stated as the attainment of standards in surface waters. The Policy should not be limited to attainment of pollutant-based standards, since section 303(d)(1)(A) requires the state to identify waters not attaining any standard and to account for the severity of pollution (not just 'pollutants') in priority ranking.<br>- The analysis in the FED does not provide apparent rationale for the choice of alternatives, and so does not appear to be consistent with CEQA requirements.<br><br>The RWQCBs are the entities that will have to implement this policy. Simply put, the concerns they raise indicate strongly that the draft Policy will be unworkable in practice. Significant revisions must be made if the Policy is to be credible and implementable. | | |
| 51.4 | Given that we have found so many waters impaired with the limited information that we have, it seems to follow that we could expect a number of additional listings if an appropriate level of monitoring is performed in the state. | Comment acknowledged. | No |
| 51.6 | The section 303(d) programs are our last line of defense in the protection of our waterways, applied only after other CWA provisions have failed. As such, it is all the more important that these programs ensure that all impaired waterways are identified; the consequences of missing them include threats to human health and aquatic life, and if impaired water bodies are ignored by the 303(d) program, they are ignored altogether. | Comment acknowledged. | No |
| 57.1 | Appreciate that SWRCB recognized the significant level of local interest in these draft policy documents and chose to hold a hearing in Los Angeles County. The effort of the SWRCB to hold this hearing and then carefully consider local agency input is both laudable and welcomed. | Comment acknowledged. | No |
| 58.5 | The current 303(d) listings greatly exceed governmental resources and the emphasis should be on cost effective management efforts. | Comment acknowledged. | No |
| 63.1 | The Policy must provide pollutant-specific, detailed guidance. | Comment acknowledged. | No |
| 68.1 | Support comments made by the California Coalition for Clean Water and other industry representatives as expressed at the January 28 workshop and submitted in writing. | Comment acknowledged. | No |
| 69.1 | Supports comments submitted by the California Coalition for Clean Water. | Comment acknowledged. | No |
| 76.1 | The SWRCB staff has prepared a comprehensive, well-researched document to support the December Draft Water Control Policy. However, it must be updated | Comment acknowledged. | No |

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| | and revised to address the alternative policy recommendations made in response to the Board's request for comments on the Draft Policy and the FED. | | |
| 80.1, 110.1, 111.1, 119.1, 204.1 | Commend the effort to establish consistency to the 303(d) listing process. | Comment acknowledged. | No |
| 102.11, 102.12, 111.3 | The Policy will result in more work at the RWQCBs, more work at USEPA, and ultimately more work at the SWRCB, where staff and Board Members will have to review different applications and petitions for water bodies to be looked at again because the original policy was unclear. | The draft Policy's implementation may require more work to clearly document and consistently analyze readily available data and information. However, this additional work will likely produce listings that are more scientifically defensible. | No |
| 102.2 | The policy fails on three grounds: science, legal and actual practical application, the policy aspect of it. | Comment acknowledged. | No |
| 104.1 | Development of the draft Policy is not a technically driven, bottom-up process. Instead, it is a top down, politically driven process that is biased in favor of not listing or delisting water bodies. SWRCB staff ignored opinions that don't conform to its preconceptions or pre-determinations.<br><br>For example, the December '02 submittal by all nine RWQCBs that criticizes the proposed binomial method for its lack of flexibility and its inconsistencies with water quality objectives. Also, in June '03 USEPA detailed a multitude of concerns about the binomial approach, its inconsistency with regulatory requirements and water quality standards. Again in October of '03 the RWQCBs submitted a joint recommendations containing a strike-through of proposed policy. That submittal was ignored. SWAMP staff has even expressed serious concerns regarding the policy, but now they've been forbidden from commenting or even contacting SWRCB staff. | Comments acknowledged. | No |
| 106.3 | The current (303(d)) system worked well. All the North Coast rivers are listed except for the Smith River, and 600 water bodies or more are listed statewide. The big problem is a lack of implementation plans. | Comment acknowledged. | No |
| 108.1 | Is this policy one that you, each of you as Board Members, want to approve? | Comment acknowledged. | No |
| 108.14 | The SWRCB's jurisdiction is protecting water. The proposed Policy is far more likely to result in the failure of water quality programs than in their success. The draft Policy should be rethought. | Comment acknowledged. | No |
| 108.15 | The SWRCB and staff should read the comments with an open mind. The 303(d) list and TMDL program are very important. Effort should not be put in solely to reduce the list. | Comment acknowledged. | No |
| 108.16 | The FED points out that implementation of the draft Policy will actually reduce the number of listed water bodies. | Comment acknowledged. | No |

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| 108.19 | SWRCB Question: In 2002, 200 water bodies were added to the list. Hopefully, the really badly polluted waters have been identified. Now it is a matter of fine tuning.<br><br>Response: Disagree. All the badly impaired waters have not yet been identified. SWAMP shows that California monitors only a small portion of its water bodies. Furthermore, there may be pressure to reevaluate the existing list. | There does not exist any definitive information to show whether or not, all of the 'really badly polluted' water bodies have been identified and/or have been monitored. To be 100 percent sure one way or the other, we would need complete monitoring for the entire State of California, which to date we do not have. | No |
| 108.2 | This policy almost always reaches a conclusion which reinforces either not listing an impaired water body or provides some kind of escape, some kind of exit from the TMDL approach. | Comment acknowledged. | No |
| 108.20 | SWRCB member question: There is a lot of significant concern about the ramifications of a water body being listed.<br><br>Response: Disagree. The Policy should guide the identification of impaired water bodies, not try to reduce the list due to resource limitations. Stories that California business is hurt by 303(d) listing are apocryphal. Recent decisions by the SWRCB have minimized impacts of listing. Having a water body listing is in the public interest, and does not harm business to the level claimed. | The draft Policy is primarily focussed on waters that do not meet water quality standards. | No |
| 108.4 | The TMDL program is still there and should be used. Other speakers recommended this, including RWQCB staff. The program is being severely limited, if not overruled entirely in many circumstances. | Comment acknowledged. | No |
| 108.8 | As pertaining to ASBSs, section 303(d) lists are supposed to include both impaired water bodies and those that do not or may not meet standards. The Policy does not adequately address this requirement. It should, because these problems are easy to rectify sooner rather than later. | The draft policy is focussed on waters that do not meet water quality standards as described in CWA section 303(d)(1) and 40 CFR 130.7. | No |
| 109.12 | The methods of nuisance and nutrient assessment are vague. Recommend clarifying procedures for assessing nuisance and nutrient conditions. | The provisions have been clarified. | Yes |
| 109.2 | Lack of clarity in the Policy makes it hard to evaluate how USEPA would react to a resulting list. | USEPA has provided comments to SWRCB on their reaction to the draft Policy. | No |
| 109.4 | Good aspects of the Policy:<br><br>(1) Interpreting unconventional data, biological information, sediment tissue, et cetera.<br>(2) Translation of narrative objectives into numerical criteria or guidelines for assessments.<br>(3) Attempts to provide some clear assessment criteria.<br><br>The goal of the Policy should be to streamline assessments as well as to provide greater consistency. | Comments acknowledged. | No |

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| 110.2 | Listing is expensive to public funds and results in significant reductions in land management productivity and land values. | Comment acknowledged. | No |
| 110.3 | Compare the large number of listed water bodies scheduled for actions that result in an expense and impact on lands to budget shortages. Reasonable decisions are therefore needed. The Policy should assures that no water body is listed unnecessarily.<br><br>Supports a Policy that elevates listing decisions to the top levels, subject to scrutiny by the voters. Only water bodies with credible scientific evidence of human-caused impairment should be listed, and only where implementation of control measures is feasible to achieve actual remedial results. | Comment acknowledged. | No |
| 111.5 | How many existing listings are problematic? Another Commenter may be able to answer. | The number of listings that are problems could be large. This has been acknowledged by RWQCB staff (Commenter 53). | No |
| 114.1 | Endorses comments by Craig Johns and Tess Dunham. | Comment acknowledged. | No |
| 114.3 | Need more rigor in the 303(d) process. Need to account for variability in water quality and capture real world complexities. | Comment acknowledged. | No |
| 119.4 | Offers participation support. Concerned about costs of the program. | Comments acknowledged. | No |
| 120.1 | Supports comments by Armand Ruby and Karen Ashby with CASQA. Supports standardized approach to 303(d) listing. Supports use of planning and monitoring list. Supports re-evaluation of listed water bodies. | Comments acknowledged. | No |
| 206.1 | Support the comments of the California Association of Sanitation Agencies. | Comment acknowledged. | No |
| 207.2 | The 303(d) Listing Policy is one of the most significant policy decisions that the SWRCB will make this year. Impairments that alter included on the 303(d) list will require TMDLs to be developed. | Comment acknowledged. | No |
| 207.27 | Support comments that others have made at the Torrance Public Hearing. | Comment acknowledged. | No |
| 207.4 | SWRCB should look carefully at 40 CFR 130.7, which provides the regulation for implementing CWA Section 303(d) as the environmental community continually refers to the general requirements of the CWA section 303(d). | Comment acknowledged. | No |
| 207.5 | The 1998 list became a general impaired water list rather than a 303(d) list consistent with 40 CFR 130.7. | Comment acknowledged. | No |
| 207.8 | Who makes policy: What are the roles of the SWRCB and RWQCBs? | SWRCB is ultimately responsible for submission of the section 303(d) list to USEPA. RWQCBs provide water body specific understanding and necessary local perspective on listing decisions. In this situation, SWRCB makes the | No |

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| | | policy to meet the goals stated in the Introduction to the FED. | |
| 207.9, 208.10 | Is California going to have a standardized, scientifically based 303(d) listing policy or are the RWQCBs and staff going to have the same level of flexibility and lack of SWRCB oversight in developing 303(d) lists that they had prior to development of the 2002 list? | At present, the recommendation is for the draft Policy to contain consistent and transparent approaches for the identification of water quality limited segments using a standardized set of tools and principles to be used by RWQCBs to evaluate data. | No |
| 208.9, 213.9 | Support comments of the Coalition of Practical Regulation given by Richard Watson. | Comment acknowledged. | No |
| 209.1 | Support of comments that have been made so far, and hope that the decisions taken by the SWRCB are something that can help the cities in these difficult times so that resources can be invested to create solutions that would provide the results that we are all looking for. | Comments acknowledged. | No |
| 212.2 | With this new policy, we look forward, when this policy is implemented, that we can get the delistings that we think are justified. | Comment acknowledged. | No |
| 213.1 | Thanks the SWRCB and staff for recent progress on the State's 303 (d) List. This was a good start at scrutinizing the technical and scientific support used by the RWQCBs and their staffs for listing and delisting. We strongly support establishing a standardized approach to listing. | Comment acknowledged. | No |
| 216.3 | As you go through this process of listing and delisting, think very, very carefully and remember that you are not here just to represent the cities or the industries that feel overburdened; you're here to represent people who really don't have the knowledge to speak for themselves, people who you'll never see, people who you'll never know. But you will know that they are there because they are just the faceless, nameless people of California. | Comment acknowledged. | No |
| 217.14 | This exact debate has occurred for the last 25 years on the whole 301(h) waiver issue, and that argument made by the dischargers has lost time and time again where if there is impairment, then you must indeed upgrade your facilities. | Comment acknowledged. | No |
| 217.2 | Support the bulk of USEPA's comments that were given last week as well. We were very happy to see that we see eye to eye with them on most of the issues and concerns that they had on the listing and delisting process as well. | Comment acknowledged. | No |
| 217.3 | Our goal at Heal The Bay is to see more certainty in the listing and delisting process, which could be obtained through a more rigorous and better document listing process. And we believe that the State's effort to date is definitely a start to move in that direction, but not even close to where we need to go to adequately protect water quality in the State of California. | Comment acknowledged. | No |
| 218.1 | The questions that I would ask are what types of waterways would never have been listed in the first place if this policy were to be adopted as it is today? The | Comments acknowledged. | No |

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| | second question is what types of waterways will drop off the list if this current criteria is applied to waterways that are already on the 303(d) list? The answer is that the impact will be that real waterways that are part of communities that are part of the fabric of this state that people fish in, swim in, and reply upon to escape the hustle and bustle of their daily lives will never be cleaned up. | | |
| **Unrelated Comment** | | | |
| 10.17 | Timber and agricultural proponents implied that the 2002 listing process was not public. There was a public hearing process. The timber landowners were just not paying attention and want a second chance. A second chance is available which at the TMDL development level, Implementation Plan development level, and/or new (credible) evidence can be added to the file. | Specific comment on the 2002 section 303(d) listing process is beyond the scope of the Listing Policy-development process. | No |
| 10.19 | Timber and agricultural proponents feel that it is not the listing that is the problems, it is the implementation and it diminishes land values. Land values are not diminished by implementation planning by any measurable amount. Garcia land values seem stable as evidenced by recent land sale prices. | Specific comment on the 2002 section 303(d) listing process is beyond the scope of the Listing Policy-development process. | No |
| 10.20 | Timber and agricultural proponents feel that over fishing killed the fish; loss of habitat is not responsible for fishery losses and at the same time there are plenty of fish in our rivers.<br><br>Fish populations do go in cycles and there has been over fishing. There has been a slight resurgence in the numbers of coho salmon returning to some rivers. The overall trends are still down (to a large extent) from historic levels. There has also been a precipitous decline in spawning and rearing habit values. This has been substantiated by supported scientific review and CDFG surveys, etc.. Large numbers of baby (2 year old or less) salmonids found in a stream do not indicate increases in populations.<br><br>Survival of adult spawners returning to the rivers is indicative of population trends. | Specific comment on the 2002 section 303(d) listing process is beyond the scope of the Listing Policy-development process. | No |
| 10.21 | Implementation Planning (Basin Plan Amendment) was argued to the SWRCB to be part of the long term solution and basis of support of the NCRWQCB Conditional Waiver of Waste Discharge (Policy) for logging operations.<br><br>Implementation Planning has fallen way behind schedule. It would be nice to see progress. If the Conditional Waiver Policy is to have merit and be supported by Implementation Action Plans, progress must be demonstrated by approval of TMDL related Implementation Plans. | Specific comment on the 2002 section 303(d) listing process is beyond the scope of the Listing Policy-development process. | No |
| 38.2 | SWRCB should also develop statewide policy on beneficial use determination | This comment is beyond the scope of the Listing Policy development process. | No |

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| | guidelines and criteria. | | |
| 43.3 | Look closely at 40 CFR 130.7, the [USEPA] regulations for implementing CWA section 303(d). The 1998 list was not consistent with the USEPA regulations. | Comment acknowledged. | No |
| 63.3 | The Santa Clara River provides an example wherein aerial deposition and sewage treatment, not storm drains, were found to be the primary sources of pollutants. | Comment acknowledged. | No |
| 104.2 | An illustration of how petty and paranoid this process has become is that there is a Regional Board Roundtable strategy session listing, SWRCB staff left the room and then anonymously eavesdropped on the conversation. While not illegal, it is certainly unprofessional and unethical. Rather than engaging in a transparent collaborative process to develop a workable, protective policy, SWRCB staff has essentially 'circled the wagons' to fend off criticism of a policy that was largely proposed by the regulated community. | Comment acknowledged. | No |
| 119.2 | Speaks highly of water quality conditions in North Coast rivers. | Comment acknowledged. | No |
| 119.3 | Listing is not a problem. Implementation plans for TMDLs will be the problem. Loss of the fisheries is not due to pollution but to over-fishing. | Comment acknowledged. | No |
| 201.3 | The portion of the San Gabriel River that flows along the eastern edge of Bellflower is a concrete-lined channel. The LARWQCB should review the beneficial uses that it has assigned to flood control channels such as the San Gabriel River above the estuary. These uses were defined several years ago, and some of them may not be applicable. | Specific comment on the 2002 section 303(d) listing process is beyond the scope of the Listing Policy-development process. | No |
| 208.5 | Concerned about the listing of the Dominguez Channel for high coliform count; it is a flood control area with no recreational use. | Specific comment on the 2002 section 303(d) listing process is beyond the scope of the Listing Policy-development process. | No |