

CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY
 REGIONAL WATER QUALITY CONTROL BOARDS
 NORTH COAST REGION
 SAN FRANCISCO BAY REGION
 CENTRAL COAST REGION
 LOS ANGELES REGION
 CENTRAL VALLEY REGION
 LAHONTAN REGION
 COLORADO RIVER BASIN REGION
 SANTA ANA REGION
 SAN DIEGO REGION

**Policy for the Identification of Surface
 Waters not Meeting Water Quality
 Standards**

Recommendations from the Regional Board Representatives
 of the TMDL Round Table to
 the Management Coordinating Committee



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State of California
California Environmental Protection Agency
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List of Acronyms and Abbreviations

§	Section (as in a law or regulation)
Basin Plan	Water Quality Control Plan
CDFG	California Department of Fish and Game
CDPR	California Department of Pesticide Regulation
CDWR	California Department of Water Resources
CWA	Federal Clean Water Act
CWC	California Water Code
DWQ	State Board Division of Water Quality
GIS	Geographic Information System
OEHHA	California Office of Environmental Health Hazard Assessment
OIT	State Board Office of Information Technology
Porter-Cologne or Porter-Cologne Act	Porter-Cologne Water Quality Control Act as amended (CWC Section 13000 et seq.)
State Board	California State Water Resources Control Board
Regional Board	California Regional Water Quality Control Board
USEPA	United States Environmental Protection Agency
USFWS	United States Fish & Wildlife Service
USGS	United States Geological Survey

Definitions

Concept Paper	Refers to the document entitled “Concepts for Developing a Policy for Listing and De-Listing on California’s 303(d) List”, released for the AB 982 Public Advisory Group meeting of July 23, 2002
List	Refers to California’s list of surface waters not attaining water quality standards.
Listing Policy	Refers to the policy for identifying waters to be included on the List.
Persistent	Used in the context of evaluating water quality data and information. A water quality condition that is likely to endure or exist, unless factors causing that condition are changed.
Recurrent	Used in the context of evaluating water quality data and information. A water quality condition that is likely to appear or occur again or periodically.

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1 INTRODUCTION

Water Code § 13191.3 requires the California State Water Resources Control Board (State Board) to develop guidelines for: a) the purpose of listing and delisting waters and b) developing and implementing the Total Maximum Daily Load (TMDL) program and TMDLs. The State Board is preparing two policies to address these requirements. This document is directed to the listing and delisting policy, which would be used for future updates to California's Clean Water Act (CWA) Section 303(d) list of impaired surface water bodies.

In July 2002 State Board staff completed a draft "Concept Paper" document, outlining proposed policy direction and alternatives for discussion with the AB 982 Policy Advisory Group (PAG). Staff of the nine Regional Water Quality Control Boards (Regional Boards) had significant concerns with the Concept Paper's proposed direction on a number of issues, and agreed to develop alternative Regional Board recommendations. Regional Board workgroups discussed these issues between August and October 2002, and drafted 22 separate issue papers. Members of the TMDL Program Roundtable reviewed the issue papers and formed a steering committee to edit the issue papers into a unified set of Regional Board staff recommendations. This document is the result of that process.

Scope of Recommendations

The Regional Board recommendations address the solicitation and assessment of data and information on water quality and beneficial use attainment, and the general process to be followed in formulation of an impaired waters list. As used in this document, the word "List" refers to a statewide list of all surface water bodies that are not attaining water quality standards. This List would not be limited to waters requiring TMDLs. This is consistent with the language of Section 303(d)(1)(A) of the CWA.

Assessment of waters that are attaining standards (or waters with insufficient data to determine whether standards are attained) is outside of the scope of these recommendations. Regional Board staff may provide separate recommendations at a later date on the relationship of the "Impaired Waters List" to the CWA Section 305(b) assessment process, and on the desirability of a "watch list" or "monitoring priority list" for waters with insufficient data. Additional recommendations may also be provided later for other issues that were not resolved or could not be covered by Regional Board workgroups due to staff time constraints.

Differences with the Listing Policy Concept Paper¹

The “binomial model” approach proposed in the Concept Paper does not provide the flexibility needed to assess the attainment of water quality standards in California, given the state’s wide diversity of aquatic ecosystems and water uses, and the variability among standards in the Regional Boards’ Basin Plans. Furthermore, the binomial model is inconsistent with the manner in which most of California’s water quality objectives are expressed. None of the Regional Board workgroups favored exclusive use of the binomial model. Instead, the Regional Board recommendations describe general procedures to be followed in the solicitation and evaluation of data and information, with a few specific recommendations on criteria for use with certain categories of pollutants and stressors.

The Regional Board staffs are strongly opposed to the Concept Paper’s proposed linkage of priority ranking and schedules (and its direction that TMDLs for all high priority waters be completed within two years). The Concept Paper assumes that priorities and schedules are for TMDL development. The Regional Board recommendations assume that priorities are for a broader group of potential actions to address impairment, and that schedules (including schedules for TMDLs) will be developed and updated through the Regional Boards’ annual workplan processes rather than through formal action on the List.

Advantages of Recommended Approach

The alternative approach recommended below will provide overall consistency in the assessment approaches used by all Regional Boards while allowing the flexibility necessary to address regional differences and site-specific concerns. The Regional Boards’ Best Professional Judgment (BPJ) is an essential component of the evaluation process, however “transparency” can and should be provided through documentation of the assessment process, and the scientific rationale for listing/delisting, in water body fact sheets. The maintenance of a single “Impaired Waters List” and database will allow the state to respond to potential changes in USEPA regulations for the implementation of Section 303(d). Future federal regulations could at some point 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 will be easily amenable to sorting the waters to accommodate any such requirements.

Format

In general, each section in the report includes an introduction followed by the recommendation. The recommendations are numbered and indented for easier reference. The exception to this formatting convention is the section on Determining Compliance with Water Quality Standards. In some cases a rationale is given to provide context to

¹ “Concepts for Developing a Policy for Listing and De-Listing on California’s 303(d) List”, released by DWQ for the AB 982 Public Advisory Group meeting of July 23, 2002

the recommendation. The rationale is not indented and is preceded by the heading "*Rationale*".

2 SCOPE OF THE LISTING POLICY AND GENERAL LISTING CONSIDERATIONS

2.1 Scope of Listing Policy

This section provides general recommendations on what the listing policy should or should not address.

Recommendation 1: 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.

Rationale: The public and regulatory agencies should have one list of surface waters not attaining standards. This will allow easier tracking and identification of water quality problems. Whether a surface water requires a TMDL to address the problem should not be a factor in reaching a conclusion that the water quality standard is not attained. If federal law or regulations are changed to require the submittal of a subset of a broad list (i.e. a list of waters still requiring TMDLs), this can still be done.

Recommendation 2: The listing process should not describe a process for determining whether water quality standards are appropriate.

Rationale: The listing policy should focus solely on the assessment process and the assessment should be based on water quality standards that exist at that time. If the assessment process indicates a potential problem with the water quality standards, the Regional Board may choose to review or revise the standards prior to taking any other action on that water body. However, including a review of standards and uses in the assessment process would be unduly burdensome and time consuming. The Regional Board would not be able to change the standard as part of the assessment process without amending its Basin Plan, and without generating an administrative record that would be wholly unwieldy.

Recommendation 3: The policy should be applied retroactively within time and resource constraints. Approaches for applying this policy to currently listed waters should be described.

Rationale: It may not be possible to apply this policy to currently 303(d) listed waters during the next assessment, unless significant time and resources are set aside to do so. In some cases (e.g., due to an upcoming TMDL or renewal of a permit), it may be desirable to apply the policy to currently 303(d) listed waters prior to the next assessment. The policy should describe procedures for this process, but it should allow flexibility to Regional Boards regarding its use.

Recommendation 4: The policy should not describe the actions to be taken as a consequence of listing.

Rationale: The assessment process should be separate from decisions on the actions needed to correct the identified problem. Data that are sufficient to identify nonattainment of standards may not be sufficient for determining the proper course of action. A separate policy should be developed that identifies the alternatives for addressing nonattainment of water quality standards.

Recommendation 5: 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.

Rationale: Once standards are attained, the water body and associated problem description should be removed from the List. It would be confusing to the public and regulatory agencies if the List contained both waters attaining standards and waters not attaining standards. If a TMDL has been established or other regulatory response initiated the water would still remain listed until the standards are attained. Such listings will allow tracking of the progress of any actions taken.

Recommendation 6: 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.

Rationale: Different Regional Boards have used different methods for identifying waters or watersheds on the Section 303(d) list (e.g. some have listed watersheds and others have listed small stream segments). This can lead to misperceptions regarding the relative scope of water quality problems in one Region versus another. The policy should describe a consistent method for identifying water body/problem pairs so an accurate assessment of the status of the State's surface waters can be made.

2.2 Effects of Listing

This section discusses the consequences of listing a water body for nonattainment of standards.

Recommendation 7: The effect of listing is to target the water body for a thorough evaluation of the nature and extent of a problem and implementation of an appropriate response. The process that the Regional Boards will use to identify an appropriate response will be addressed in the TMDL development policy. The response could be anything from permitting actions, enforcement actions, voluntary actions, revisions of the standards if appropriate, or another appropriate response to address the impairment.² A TMDL may or may not be required.

² A decision tree flow chart should be developed to clearly describe the appropriate course of action to follow for listed waters.

Rationale: The identification of a water quality problem should trigger some type of action. The most appropriate action to take will depend on a number of factors, including legal requirements, the approach that is likely to most effectively address the problem, and whether the problem has been adequately characterized. Listing should not automatically trigger a specific, pre-defined action, since what is known about a problem and how best to address it can differ significantly from water body to water body.

2.3 Listing Process

This section describes the administrative process that the State will undertake to periodically update and make changes to the List of surface waters not attaining water quality standards.

Recommendation 8: Solicitation: Each Regional Board should be responsible for soliciting information from interested parties within its Region. The State Board 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.

Rationale: Regional Boards have the greatest knowledge of interested parties within their Regions, as well as knowledge of those entities collecting relevant data and information. The State Board is better positioned to ensure that sister State agencies and federal agencies are aware of and responsive to our request for information. The solicitation process should take place concurrently among Regions to avoid confusion among parties who may have interests in multiple Regions.

Recommendation 9: Assessment Process: The Regional Boards should be responsible for assessing the existing and readily available information, including information received during the solicitation process. The Regional Boards should also be responsible for identifying waters on the List. The Regional Boards may hold a workshop and/or public hearing to take comments on staff recommendations. The Regional Boards should then take formal action to adopt recommended changes to the List. The Regional Boards will be responsible for submitting to the State Board the administrative record which supports their recommendations. The State Board should review each Regional Board's recommendations for consistency with the Listing policy. The State Board should accept Regional Board recommendations, unless they are inconsistent with the Listing policy or applicable law. The State Board should then adopt the statewide List through a formal action.

Rationale: The Regions are most familiar with their local watersheds and the conditions within those watersheds, so primary assessment responsibility must stay with the Regions. The Regional Boards should act on staff recommendations, with a focus on the appropriate priorities and actions for each water body on the List. Since the Regional

Board action can significantly impact the direction the Regional Board takes on surface water, it should be a formal action. The State Board should review Regional Board recommendations for consistency with the Listing Policy and applicable law. In some cases, a Regional Board's judgment may be consistent with the Listing Policy, but the State Board could reasonably come to a different conclusion based on the same data. In this case, deference should be given to the Region.

Recommendation 10: Frequency of Updates to the List: A solicitation for data and information and assessment of the need for changes to the List should take place every four years. The Regional Board 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., Regional Board adoption of the recommended change, State Board approval, and USEPA approval for Section 303(d) listed waters).

Rationale: The assessment process (formal solicitation and assessment of readily available data and information) should take place every four years. A more frequent cycle would lead to continual assessment, since the process can take up to two years from the initial solicitation to final USEPA approval of the Section 303(d) list. A less frequent cycle would lead to a list that is out of date. A process for amending the List between cycles should be identified in case new information becomes available that would change the assessment and subsequent decision on action(s) to address the problem.

Recommendation 11: Waters Currently on the Section 303(d) List: All waters currently on the Section 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.

Rationale: The State must expeditiously review waters currently on the Section 303(d) list for consistency with the Listing Policy. Available resources may prevent all waters from being reviewed during the first listing cycle after adoption of the Listing Policy. The Regions should perform and document a consistency review for all currently (2002) listed waters by the completion of the second listing cycle. This recommendation is based on the adoption of Recommendation 10.

2.4 Listing/Delisting Factors

The listing/delisting factors below describe the broad issues that should be considered in adding waters to the List, for deleting waters from the List, or for not adding waters to the List. Specific recommendations for factors to consider in listing/delisting are described in Section 4.

Recommendation 12: Listing Factors: A water should be listed when readily available data and information indicate that existing water quality standards

(which include narrative criteria, numeric criteria, beneficial uses, and anti-degradation considerations) are not attained on a persistent or recurrent basis.

Rationale: The primary focus of the List is to identify for the public those surface waters that are not attaining water quality standards and to identify for the Regional Boards pollution or pollutant problems that must be addressed. Data and information should indicate that non-attainment of standards is persistent or recurrent.³ If the non-attainment of the standards does not appear to be persistent or recurrent, then the Regional Board need not take any listing action. The Regional Board may determine, as a separate action outside of the listing process, that more data and information should be collected.

Recommendation 13: Delisting or Not Listing Factors:

- a) Readily available data and information indicates that water quality standards are being attained.
- 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.
- 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.
- 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.
- e) The Regional Board has made findings pursuant to State Board Resolution 68-16 to allow degradation of the high quality of the water body.⁴ Data and information indicates that the degradation does not exceed that which is permitted in such a finding.

Rationale: Waters should be removed from the List or not added to the List if the available data and information indicates that water quality standards are being attained.

³ Data and information need not indicate that nonattainment of standards is frequent for a listing decision to be made. The relevant standard or criteria should be consulted to determine if there is an acceptable frequency of exceedance.

⁴ For reasons similar to those described in Recommendation 2, the antidegradation finding must be made in a proceeding outside of the Listing process. Note that a finding allowing some degradation to occur does not establish a basis for allowing non-attainment of other water quality standards (i.e. numeric objectives, narrative objectives, or beneficial uses).

The status of attainment may change based on new water quality data and information, an administrative action (such as changing the standard or use), or new information on the quality of data previously used. The same decision rationale is used to delist a water as is used to not list a water. These general delisting (or not listing) factors should be considered in the review of data and information for all types of pollutants and pollution and all surface water body types.

2.5 Priority Ranking

This section addresses the meaning of priority ranking and the factors that should be considered in priority ranking. The term "priority ranking" refers to priorities for taking action to address impairment. Such actions may or may not involve TMDL development.

Recommendation 14: For waters on the List, the Regional Board should establish high, medium, and low priority categories based on the following factors: a) Water body significance (such as importance and extent of beneficial uses, threatened and endangered species concerns, and size of water body); b) Degree that water quality standards 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; see 40 CFR 130.7(b)(4)); c) Availability of information to address the water quality problem.

Recommendation 15: The Regional Board will not assign schedules on the List. A priority setting is not a scheduling commitment. The Regional Board will determine schedules based upon additional considerations including but not limited to available funds, Triennial Review List priorities, applicable court orders, Watershed Management Initiative (WMI) priorities, and other relevant administrative constraints.

Rationale: Regional Boards should assign priorities to waters addressing the need for Regional Board corrective action. For example, some water bodies need corrective actions sooner than others because of the extent of impacts to beneficial uses or the size of the area impacted. In some cases the Regional Board will have insufficient information to determine the urgency of a problem. Regional Boards can assign priorities in accordance with the quantity of information available to document conformance with water quality standards.

The List should not contain Regional Board schedules. Regional Board schedules are determined based upon available funding and other factors. Year-to-year work planning, Triennial Review, and the WMI Chapter are utilized to focus available funding.

Low priority issues may be addressed sooner than higher priority issues, if desirable, e.g., in conjunction with a higher priority water, or because the solution may be easier to adopt. Priorities will help to guide Regional Boards in addressing water quality impairment. Priorities will not address when and how these commitments are met.

2.6 Structure of the List

There has been discussion of whether there should be a single list or a multi-part list. This section provides recommendations as to how the List should be structured.

Recommendation 16: A data management system to store the basic data attributes of surface waters not attaining standards should be used (e.g., such as is currently done for the Section 305(b) Water Quality Assessment report through the GEOWBS data management interface). To allow queries related to surface waters not attaining standards, this database shall contain, at a minimum, the following attribute fields: Name of water body; Pollution/pollutant, if known, or indicate "unknown"; Numeric identification of water body (CU, HU, HA, HSA, etc.); County(ies); Major water body name; Standard (beneficial use not supported, objective not met, or antidegradation not attained); Overall size (acres, lineal miles, square miles); Size of impaired portion, if known; Comment/descriptor (useful language to help an individual recognize the watershed). In addition to the above attributes, the database will continue to allow the Regional Board to assign priorities (high, medium, low) for actions to be taken.

Rationale: The continued use of available data management tools to track the quality of surface waters in California provides the appropriate structure for the List. Inclusion of the attributes recommended above will give the public basic information on surface waters not attaining standards. Additional attributes could be added, if tracking of proposed action steps is desired (e.g., TMDL development, further assessment, other control actions). By maintaining the basic water body attributes in a database, various reports can be produced depending on legal requirements or public information needs. There is no need to create and maintain separate "lists" of water bodies, which would inevitably contain similar data attributes and would lead to greater potential for error as the same data are entered in multiple documents.

3 ADMINISTRATION OF THE LISTING PROCESS

The administration of the listing process should be done in a manner that balances the need to review available information, the desire to make the assessment process as transparent as possible, and the Regional Board resources available to conduct the assessment.

3.1 Solicitation of Existing and Readily Available Data and Information

The solicitation process for "existing and readily available data and information" should be defined so that the public and the Regional and State Boards will know, at a minimum, what data and information will be sought and from what sources, and how the sources will be solicited.

Recommendation 17: To provide a minimum statewide level of consistency and completeness in soliciting existing and readily available data and information, each Regional Board will solicit, and document its methods and sources for soliciting, existing and readily available data and information. In general, Regional Boards 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.

Recommendation 18: METHODS: The State Board 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 Regional Board staff requests) that the Regional Water Boards will, at a minimum, use to solicit existing and readily available data and information.

Recommendation 19: SOURCES: The policy should provide a list of specific sources that the Regional Boards will, at a minimum, solicit for existing and readily available data and information produced since the prior List evaluation period. The list of sources should include:

(1) Stakeholders and interested parties, including, at least,

- Other government agencies (e.g. CDFG, CDWR, CDPR, USFWS) via direct solicitation by the State Board
- Other (previously identified) interested parties via solicitation letter
- General public via solicitation on the Regional Board's website

(2) Other sources for existing and readily available data and information produced since the prior list evaluation period such as:

- The most recent Section 305(b) Report
- CWA Section 319 non-point source assessments
- Drinking water source assessments
- Dilution calculations or predictive models for assessing the attainment of applicable water quality standards
- Water quality problems reported by local, state and federal agencies; members of the public (for example citizen monitoring groups); or academic institutions

- Data, information, and reports available internally from Regional Board projects/programs/units/groups since the prior list evaluation period.

Recommendation 20: FORMAT: Data and information submittals to the Regional Boards should contain the following:

- a. The name of the person and/or organization providing the information.
- b. The name of the person certifying the completeness and accuracy of the data and information provided.
- c. The person certifying data and information may also provide a statement as to what impairment they believe is occurring.
- d. Mailing address, telephone numbers, and email address of a contact person for the information provided.
- 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.
- 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.
- g. Bibliographic citations for all information provided.
- h. A description of, and reference for, the quality assurance procedures and whether data quality objectives were attained (see Section 4.1 below).
- 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.
- j. For photographs, the information listed for photo documentation in Section 4.1.

3.2 Documentation

Documentation types, formats, and procedures pertinent to the processes by which the Regional Boards submit their recommendations to the State Board should be defined for the public and for the Regional and State Boards so that consistent and complete documentation of the process can be maintained for the Administrative Record.

Processes that should be documented for the Administrative Record by each Regional Board include: sources and mechanisms for soliciting and obtaining readily available data and information; criteria and procedures for evaluating the data and information;

format for providing the data and information; workshop(s) particulars; recommendations to the State Board; comments received relevant to the recommendations and the Regional and State Boards' responses to the comments.

Recommendation 21: To provide statewide consistency and completeness in the formats and procedures of documentation for the List Administrative Record, each Regional Board will use, at a minimum, similar general and specific types of formats and procedures of documentation for submitting its List recommendations to the State Board for the Administrative Record.

The documentation should be provided in electronic format, as document and spreadsheet files (as appropriate), using standard file formats (e.g., Microsoft Word or Excel) as agreed upon between each Regional Board and the State Board. Documentation should include:

- 1) The text of the solicitation letter for existing and readily available data and information, including:
 - The date that the letter was prepared;
 - The date(s) that copies of the letter were sent out.
- 2) The mailing list(s) to which the solicitation letter is sent.
- 3) The solicitation posted on the Regional Board's website (if different from the mailed solicitation).
- 4) Solicitation response tracking information including:
 - A unique (to the individual Regional Board) response identifier number;
 - The name, address, telephone number, FAX number, affiliation and/or company, and any other pertinent contact information represented by the responder;
 - Date the response was received;
 - Response format (e.g., "hardcopy", "electronic cover letter spreadsheet");
 - Relevant water body(ies) and pollutant(s)/stressor(s);
 - Any specific recommendations.
- 5) Response and comment letters and data files.
- 6) Data compilation files (generated within the Regional Boards to evaluate water bodies and pollutants/stressors to relevant water quality standards).
- 7) A summary table specifying all of the Regional Boards recommendations for the List, including (for each water body) the pollutant/stressor, affected size, priority and whether the recommendation is for listing, de-listing, or changing existing information.

- 8) Fact sheets for each Regional Board recommendation for listing, de-listing, or changing existing List information. Each fact sheet will include:
- 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 and total size (including Calwater watershed number)
 - D. Pollutant or type of pollution
 - E. Medium (water, sediment, tissue, habitat, etc.)
 - F. Water quality standards (copy applicable standard from appropriate plan or regulation) including:
 - Beneficial use(s) affected by impairment
 - Numeric water quality objective/water quality criterion plus metric (single value threshold, mean, median, etc.) or narrative water quality objective plus summary of assessment methods used
 - Antidegradation considerations (if applicable to situation)
 - Any other provision of the standard used
 - G. Watershed Description (e.g. land use, precipitation patterns, or other relevant factors considered in the assessment)
 - H. Description of data quality and quantity assessment processes
 - Data Quality Assessment should be documented per Figures 1 and 2
 - Data Quantity Assessment should be documented per Figures 1 and 2
 - I. Potential source of pollutant or pollution (including point or nonpoint source discharges under permits or waste discharge requirements, natural sources, etc.)
 - J. Water Body Assessment should be documented per Figures 1 and 2
- 9) Fact sheets are also recommended for waters not proposed for listing, when some data or information indicated non-attainment of standards.

3.3 Data and Information Management and Access

The processes by which the Regional Boards compile and evaluate existing and readily available data and information, and submit their recommendations and supporting data and information to the State Board, should be defined. Data and information management should be done in a complete, consistent, and transparent manner.

Data and information types to be managed include:

- Solicitation for existing and readily available data and information;
- Schedule and process description for List preparation;
- Responses to the solicitation;
- Tracking list of responses received/posted;
- Data compilations and source data;
- Criteria and policies against which responses will be evaluated;
- Public workshop announcements;
- Fact sheets for List recommendations prepared by each Regional Board;
- Final Regional Board recommendations for impaired waters List;
- Public comments on the Regional Board's List recommendations and fact sheets;
- State Board's recommendations for the List;
- Public comments on the State Board's recommendations for the List;
- Responses to the public comments;
- Final List of impaired waters;
- Final 303(d) list as submitted by the State Board to the USEPA.

Recommendation 22: Staff from the Regional Boards and State Board should collaborate to specify some general guidance on managing data and information.

DWQ and OIT staff of the State Board will investigate a networked data management system (e.g., utilizing ArcGIS and GeoWBS) in which the Regional Boards' 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 State Board and Regional Board offices. Office of Information Technology staff should evaluate the following alternatives:

- 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.
- b. State Board and Regional Boards develop this web site using state network facilities.

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.

4 DATA AND INFORMATION ASSESSMENT PROCESSES

This section describes a general process for evaluating compliance with water quality standards, as well as specific approaches for certain types of pollution or pollutants. These processes focus on following a specific procedure and documenting decisions at key process steps.

4.1 Determining Compliance with Water Quality Standards

In California, water quality standards include existing and designated beneficial uses, narrative and numeric water quality objectives, and the antidegradation considerations expressed in the state Nondegradation Policy (set forth in both State Board Resolution 68-16 and federal regulations at 40 C.F.R. § 131.12). Water quality standards are contained in separate water quality control plans adopted by the nine Regional Boards and the State Board. Additional federal criteria for "priority" pollutants, promulgated by the U.S. Environmental Protection Agency (USEPA) in the National Toxics Rule and California Toxics Rule, are part of California's statewide standards for surface waters.

Water quality standards, surface water conditions, and surface water quality monitoring programs vary too widely among regions and between water bodies to justify using the precisely defined mathematical assessment procedures that have been proposed (binomial model and finite list of criteria for assessment of compliance with narrative objectives). Requirements to use such procedures would not be scientifically justified, since the proposed application of the statistical methods would often allow more frequent exceedances than allowed by the applicable standards. In addition, such methods could lead to arbitrary exclusion of readily available data and information (e.g., trends in water quality, magnitude of exceedance, or knowledge of remedial activities or permit revisions) that would inform the conclusions of the assessment.

Therefore, the Regional Boards should use the following decision-tree approach that describes the general process to assess compliance with standards. The approach includes specific considerations related to quality, quantity, and representativeness of data and information. Additional considerations for assessment related to certain categories of pollutants and stressors are discussed in separate sections below. The recommended approach provides overall consistency among Regional Boards in the assessment process, but allows flexibility to deal with regional and water body differences in standards and aquatic ecosystems. The recommended approach also allows the Regional Boards to fully consider the readily available data and information.

Recommendation 23: Regional Boards should use the decision processes described below and summarized in Figures 1 and 2 (on pages 52 and 53) 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 remainder of Section 4.1, together with Figures 1 and 2, constitutes the whole of Recommendation #23. In some cases a *rationale* is provided for a given process step. In contrast to the convention used in other sections of this document, the rationale is highlighted by *italics*.

Decision Process for Determining Compliance with Water Quality Standards (Decision Process):

The Decision Process is composed of four main process steps – Criteria Selection, Data Quality Assessment, Data Quantity Assessment, and Water Body Assessment. Within each of those four process steps, there are a number of steps that the Regional Boards must go through. It is not critical that the process steps be conducted in a particular order. It is critical that each step is taken and that the results of each process step are documented.

The processes for assessment of compliance with numeric objectives, narrative objectives and beneficial uses, and antidegradation regulations are shown in separate flowcharts (Figures 1 and 2). Where appropriate, a discussion of the factors that should be considered for each step is provided below. The steps in the decision process are similar for evaluation of compliance with the three different components of water quality standards (i.e. objectives, uses, and antidegradation), and the Data Quality and Quantity Assessment steps are identical. Text descriptions of the process steps are given below and distinctions among flowcharts are noted where appropriate.

CRITERIA SELECTION PROCESS

(See Boxes 1-5 in Figure 1, and Boxes 1-4 in Figure 2)

Identify the pollutant/ pollution, water body & beneficial use(s) being considered

The water body and beneficial use being considered, and the water quality problem (pollutant or pollution, if known), must be clearly identified in order to adequately document the basis for the assessment. For evaluation of narrative objectives and beneficial use support, the criterion/criteria selected will be based on the pollutant/pollution being considered and in some cases may be water body specific. Numeric water quality objectives are either site specific or applicable to waters with specific beneficial uses.

Are there adopted narrative and/or numeric water quality objectives and/or water quality criteria (WQO/WQC) for the pollutant & beneficial use in that water body (Figures 1 and 2)? Has the Regional Board previously determined that degradation of water quality is allowable under federal and State anti-degradation requirements (Figure 2)?

Compliance with narrative and numeric water quality objectives should be determined using the process in Figure 1. Compliance with the antidegradation component of water quality standards should be evaluated using the process in Figure 2. This process involves assessment of attainment of water quality objectives and beneficial uses, as well as evaluation of the necessary antidegradation findings. See the discussion of antidegradation on page 25.

Identify the applicable beneficial use indicator.

The applicable beneficial use indicator should be clearly identified for the water body, pollution/pollutant, and beneficial use being considered. When possible, beneficial use support in a particular water body (particularly for aquatic life and recreational uses) should be evaluated in relation to local and regional reference conditions, in addition to state and federal criteria. The beneficial use indicator is used to determine whether a particular beneficial use is being supported when pollution is present. In many cases, the beneficial use indicator will be one or more narrative water quality objectives.

In other cases, beneficial use indicators cannot be derived through interpreting the narrative water quality objectives. Such indicators should still be applied to determine whether beneficial uses are attained. For example, flow alteration, habitat modification, or channel modification may cause beneficial uses not to be attained, but narrative water quality objectives do not exist for these potential stressors.

Rationale: *The definitions of most beneficial uses in the Basin Plans are broad, especially for aquatic life and recreational uses. Even under minimally disturbed "reference" conditions, variation in actual beneficial uses can occur. For example, because of the ecological and geographical diversity of California, the Cold Freshwater Habitat (COLD) use means support of a different aquatic life community in a Southern California reservoir than that in a natural Sierra Nevada lake. Inland saline lakes are naturally eutrophic and support a much less diverse biological community than freshwater lakes; however, each lake type has its own degree of "biological integrity." California has not specifically designated seasonal beneficial uses; the broad definitions cover summer-dry ephemeral waters and high elevation waters that freeze over during the winter.*

For numeric objectives, identify the applicable numeric WQO/WQC for the pollutant & beneficial uses in that water body.

The applicable numeric water quality objective or water quality criterion should be clearly identified. Information on the applicable averaging period and/or allowable frequency of exceedance should be described. If there is specific direction in the Basin Plan on determining compliance with an objective, that direction should be followed. If there are any Regional or statewide policies that apply to interpretation

of compliance with objectives (as adopted by the Regional or State Board), those policies should be described.

For narrative objectives and beneficial uses, identify local, State, or federal numeric criteria or guidelines or other numeric endpoints that represent attainment or protection of the beneficial use.

There are a number of different local, State, and federal criteria or guidelines that could be used to represent attainment of the narrative water quality objective, or that represent a level that is protective of a beneficial use. These criteria and guidelines should be identified, so that the public and Regional Board have a clear understanding of the metrics that could be used to interpret compliance with narrative water quality objectives. Regional Boards should also try to identify local government water quality guidelines (e.g., those used by local health departments).

For narrative objectives and beneficial uses, select criterion/criteria to assess numeric data.

Interpretation of attainment of narrative water quality objectives or determination of attainment of beneficial uses usually requires the selection of criteria, guidelines, or other numeric values. These numeric values are used to evaluate the available quantitative data and make a determination as to whether the water body is attaining standards. In selecting criteria, guidelines, or other numeric values, the Regional Board must ensure that the selected values provide a reasonable metric for determining whether standards are attained.

In selecting criteria or guidelines, the Regional Board should give preference to criteria or guidelines adopted by another California State agency, as long as a given criterion or guideline is designed to protect the beneficial use or to ensure attainment of the narrative water quality objective being considered. California State agency criteria or guidelines that have been modified to account for factors other than beneficial use protection (e.g., economics, analytical detection limits, etc.) should be used with caution, since such adjustments may produce levels that are not protective of the beneficial use and/or levels that are inconsistent with the Regional Boards' water quality objectives. Federal criteria or guidelines can be used, if no State-specific criteria or guidelines are available, and if such criteria or guidelines are designed to protect the beneficial use or attain the narrative water quality objective being considered⁵. As long as a Regional Board is following the above hierarchy for criteria selection, no water body-specific justification needs be given for selection of the criteria.

The Regional Board may select other numeric criteria (e.g., criteria from other States or countries) or other numeric endpoints (e.g., fish population levels), if no State or

⁵ Criteria promulgated by the USEPA for waters in California, such as the National Toxics Rule and California Toxics Rule criteria, must be used where applicable.

federal criteria are available or if a different endpoint is appropriate for that particular water body. The Regional Board must provide a specific rationale for choosing those other criteria or numeric endpoints. The rationale should include a clear description of the relationship between the numeric endpoint, pollution, and beneficial use being assessed.

DATA QUALITY ASSESSMENT PROCESS

(See Box 6 in Figures 1 and 2)

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 List. The data from State or federal monitoring programs consistent with their QAPPs are considered to be of acceptable quality. The quality assurance/quality control data from such a program need not be reviewed by the Regional Board prior to the use of the data in the assessment process.

If a discharger monitoring report has been determined to be adequate for assessing compliance with waste discharge requirements, no further review of the QAPP is necessary for assessment purposes.

A local agency, citizen group, private entity, or university may also submit data. These types of data may be sufficient for determining water quality standards attainment if the Regional Board determines that their QAPP is consistent with practices identified below. Entities that have not provided a current QAPP to the Regional Board should submit their QAPP.

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. The monitoring entity must develop and submit a QAPP containing certain required elements including the following:

- methods used for sample collection,
- field and laboratory analysis,
- data management procedures, and
- personnel training.

The monitoring entity must also submit a site-specific or project-specific sampling and analysis plan for numeric data containing:

- data quality objectives of the project,
- sound 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 .

Data without rigorous quality control can be useful (in combination with high quality data and information). If the data collection and analysis is not supported by a QAPP or if it is not possible to tell if the data collection and analysis was supported by a QAPP, then the data set or information cannot be used by itself to support listing or delisting of a water segment. These data may only be used to corroborate other data and information with an appropriate QAPP.

The organization submitting data should submit its entire data set for a given monitoring program in order to allow evaluation of spatial/temporal conditions for the time frame specified.

To facilitate evaluation of spatial conditions, data should be accompanied by information on sampling locations. The entity providing data should mark station locations on a general area map and either 1) mark each location on a USGS 7.5 minute quad map along with quad sheet name or 2) provide location latitude/longitude or 3) or provide other details that will allow the Regional Board to locate the specific sampling site.

For narrative and qualitative submittals, the submission must:

- describe events or conditions that indicate impairments of 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 sound and defensible,
- provide author's credentials and training, and
- be verifiable by the State and Regional Board. If not verifiable, the information may still be used in planning future water quality monitoring programs.

If there is no linkage between a measurement endpoint and a water quality standard, then that study may not be used to evaluate the status of water quality standards.

For photo documentation to be utilized, the submission must:

- identify the date,
- mark 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 photo,
- describe conditions that are not represented by the photo in surrounding areas,

- for photo documentation of impairment, provide linkage between photo represented condition and condition that indicates impairments of water quality that are outside the expected natural range of conditions,
- provide photographer's rationale for area photographed and camera settings utilized, and
- be verifiable by the State and Regional Board. If not verifiable, the information may still be used in planning future water quality monitoring programs.

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.

The Regional Boards should clearly evaluate the appropriateness of data collection and analysis practices, and should discuss them in the fact sheets. If any data quality objectives in the QAPP are not met, the reason for not meeting them and the potential impact on the overall assessment should be clearly documented.

***Rationale:** The data used in the development of the List should be of sufficiently high quality to allow determinations of water quality standards attainment. The intent of the List is to identify impaired surface waters so that necessary actions can be taken. Therefore, it is critical that the listing process accurately identify when impairment exists. This means that the data and/or information should not only be of high quality, but should also accurately reflect the surface water conditions. Quantitative data are of little use unless accompanied by descriptions of sample collection, the analytical methods used, quality control protocols, and the degree to which data quality requirements are met.*

Likewise, the information used in the development of the List should be of sufficiently high quality to make water quality standard attainment determinations. Information is usually provided in scientific reports or opinions. However, information submitted is of little use unless accompanied by documentation to support the basis of the information provided.

DATA QUANTITY ASSESSMENT PROCESS (Boxes 7-9 in Figures 1 and 2)

Data Quantity Assessment

Once data and information are determined to be of adequate quality, the question of adequate quantity should be addressed. Concurrent with considering the number of samples or studies, and whether they suggest water quality impairment or attainment, the Regional Board should consider the water body setting and the spatial and temporal extent to which the data or information collected represents an indicator of beneficial use support. This consideration enables the Regional Board to determine whether a listing decision applies to all or part of a water body.

Determining adequate data quantity involves more than specifying a minimum number of samples, or a minimum number of sampling locations and events in a water body to support a decision. To support a decision on a water body segment, the data or information should represent water quality conditions throughout the water body segment that pertain to a beneficial use, including seasonal or year-to-year variations where necessary. A regular program of data or information collection can provide this representation, but even a small amount of information, coupled with knowledge of the water body setting, can support a decision on impairment or attainment. For instance, if a numeric guideline or objective is exceeded by order(s) of magnitude and the exceedance is downstream of known discharges. The Regional Board's decisions on beneficial use support and compliance with narrative or numeric objectives are always dependent on judgment of how much of the water body is represented by whatever data or information is considered.

The water body setting includes natural and anthropogenic factors that assist in the interpretation of water quality data and other information about beneficial uses. Of particular importance are the physical characteristics of the water body and land uses of the upstream watershed whose effects on surface water quality are well documented in research and practice (e.g., higher coliform counts where septic systems are failing, or higher nutrients in certain agricultural or silvicultural settings).

Data and information are collected in a water body at discrete locations and times, but the resulting assessments pertain to large reaches or areas of a water body over a period of years. In determining compliance with narrative or numeric water quality objectives, extrapolations are made to all or part of the water body based on the data and information reviewed, and what spatial or temporal extent of the water body they represent. The confidence of the Regional Board in such extrapolations is dependent on knowledge of the water body and watershed, its land uses and physical features such as dams or tributary network, probable pollution sources, and proper documentation of these factors that affect water quality. These extrapolations will always be necessary due to our inherent inability to monitor all parameters at all places and all times, and the need to make decisions to support priority-setting for the state's regulatory programs to protect water quality.

Aggregate Data by Reach/Area.

In a stream system, the Regional Boards should consider defining 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, even at the level of the entire water body, depending on the nature of the source of the pollutant or pollution and the 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. Knowledge of land uses and the physical characteristics of the drainage network upstream of a sampling or study location can strengthen the Regional Board's ability to evaluate part or all of a water body based on what may appear to be limited water quality data. In all cases, the

Regional Boards must document the assumptions based on land uses, known water quality issues, and other factors in the administrative record for the water quality assessments.

If available data suggest that a pollutant may be impairing a water body, the Regional Boards should identify land uses, subwatersheds, tributaries, or dischargers that could be contributing the pollutant to the water body. The Regional Boards 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, the Regional Boards should aggregate the data by appropriate reach or area.

In some cases, Regional Board Basin Plans define distinct stream segments. Data may also be aggregated by the stream segments defined in a Regional Board Basin Plan.

Consider temporal representativeness

If older data are used to justify a listing decision, the Regional Boards should demonstrate why they represent current conditions. Preference should be given to the most current information, which was not available during the previous listing process. However, older data and information may be used for many purposes. Older data can provide context for newer data, for the purpose of characterizing trends or checking for compliance with antidegradation provisions. They can be used to represent current conditions if the water body setting has not changed significantly. Conversely, if data are available before and after a change in water body setting (e.g., a cleanup or new permit conditions), it may be more appropriate to base assessments on only the most recent data. Older data may be used in re-evaluating previous listing decisions if guidelines or numeric objectives are enacted or revised subsequent to the previous listing cycle and re-assessment based on those data yield different findings of attainment or impairment of water quality standards.

When reviewing the data used (both newer and older), the Regional Board 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 in reviewing the data. A limited water quality data set can be used to make an assessment determination, when coupled with an understanding of the discharge and pollutant transport processes.

The type of water quality data being reviewed should also be considered when determining whether the data are temporally representative. Certain water quality measurements may represent a point in time (e.g., dissolved oxygen), whereas other environmental measurements may integrate several years of information (e.g., bioaccumulatives in tissue samples).

If necessary, transform the data in a manner consistent with the expression of the water quality objective/criterion/guideline.

If the water quality objectives, criteria or guidelines state a specific averaging period and/or mathematical transformation, the data should be transformed in a consistent manner prior to conducting the assessment. The analyst may perform necessary transformations outside of the stated averaging period, if justification for doing so can be provided⁶. If sufficient data are not available for the stated averaging period, the analyst may assume that the available data are representative of the averaging period.⁷ Any pollutant-specific guidance provided in these Listing policy recommendations supersedes this general guidance on transformation of data.

Rationale: *In a number of instances, individual data points must be transformed prior to using them in the assessment process. Water quality objectives, criteria or guidelines may be expressed as an arithmetic mean, geometric mean, four-day average or other mathematical expression. If the data can be transformed in a manner consistent with the criteria or guidelines, they should be transformed in order to permit appropriate assessment of the condition of the water body.*

WATER BODY ASSESSMENT PROCESS

(See Box 10 in Figures 1 and 2)

Water body assessment

After organizing the data and selecting appropriate criteria, the Regional Board must answer two fundamental questions: Does the available data set/information indicate that the applicable narrative or numeric water quality objective or other beneficial use indicator is not being attained? Does the available data set indicate that the pollutant/pollution problem is persistent or recurrent? If Regional Board Basin Plans or State Board Plans describe how compliance with water quality objectives should be determined, the applicable provisions of those Plans must be applied.

The Regional Board should consider all available data and information in answering these questions. If the data and information are inconclusive as to whether the objectives are being attained or beneficial uses are supported, then the Regional Board should indicate the type of assessment that would be required to resolve the status of the water body.

⁶ For example, a criterion may call for calculating a geometric mean for a 30-day averaging period. With justification, the analyst may apply the geometric mean to data that were not all collected within a 30-day time period.

⁷ For example, daily data may not be available and a four-day average criterion is being evaluated. The analyst may compare the available data directly to the four-day average criterion.

If any data or information indicates that objectives or uses are not attained (or were not attained at some point) and the Regional Board does not suggest listing, the specific rationale for not listing should be provided.

If any data or information indicates that objectives or uses are not attained on a persistent or recurrent basis, the rationale for that conclusion should be provided.

Rationale: *Available data and information are generally highly site- and pollutant-specific. In performing an assessment, it is generally not possible to use specific decision criteria (e.g., minimum number of samples, specific exceedance rate) without ignoring critical information. The Regional Boards should consider factors such as potential pollutant sources, climatic conditions that may affect pollutant runoff, the magnitude of exceedances of criteria, the design of the monitoring plan used to collect the data, and whether similar results occur in similar settings. In lieu of using specific decision criteria, the Regional Board should make transparent the factors that were considered in making a recommendation. These factors should be clearly documented so that they can be critically evaluated.*

In some cases, a Regional Board may be able to develop specific decision rules (e.g., specific exceedance rate). Generally, this can only be done when the monitoring program is designed to answer specific assessment questions and the assessment questions are framed in a manner consistent with the numeric criteria or guideline being used.

The data and information available to assess compliance with water quality objectives and attainment of beneficial uses vary significantly from water body to water body. Rather than specific, universally applicable evaluation criteria, a universally applicable evaluation methodology is proposed. This evaluation methodology provides the opportunity for each Regional Board to describe and make transparent its assessment process.

The recommended evaluation methodology should promote consistency by requiring each Regional Board to go through the same process steps. Transparency will occur as the Regional Boards document the outcomes of each of the process steps. Documenting the basis for the decision to list or not to list will give the public the opportunity to critically evaluate the rationale used by the Regional Board.

DOCUMENTING COMPLIANCE WITH ANTIDegradation REQUIREMENTS

The process for determining compliance with antidegradation requirements is outlined in Figure 2. After identifying the water body, pollutant or pollution, and beneficial uses under consideration (Step 1), Regional Boards should determine whether findings have been made (e.g., in connection with a waste discharge permit) that degradation (lowering of water quality in relation to baseline conditions) is in the

best interest of the people of the state (Step 2). If such findings have not been made, the Regional Board must determine whether data are available to determine whether degradation has actually occurred (Step 3.a.) and identify and select appropriate criteria to assess the extent of degradation. If findings to allow degradation have been made, the Regional Board should determine whether water quality objectives/criteria and beneficial uses are being attained (Step 3.b). The key to determining compliance with antidegradation provisions is to clearly describe the baseline by which degradation will be evaluated (Step 4). The baseline may be temporal (e.g., an evaluation of conditions in the past relative to current conditions) or it may be spatial (e.g., an evaluation of conditions in one part of a water body versus another). The steps involved in data quality and data quantity assessment in connection with antidegradation requirements are the same as those involved in determining compliance with water quality objectives and support of beneficial uses (Steps 6-9). The recommended Water Body Assessment process for antidegradation (Step 10) includes examples of factors that should suggest that degradation is not occurring, or factors that would suggest that further assessment is needed.

4.2 Assessment of Toxicity Test Data

This section presents an approach to determining whether toxicity is causing nonattainment of water quality standards.

Toxicity testing can be an important tool to directly measure attainment of the narrative toxicity objective. Several Regional Boards and others have used USEPA toxicity test methods to characterize water quality throughout California watersheds since the late 1980s. Monitoring objectives and study design differ among toxicity studies, past and current. Therefore, a single approach for identifying impaired water bodies using toxicity monitoring data cannot be implemented.

Recommendation 24: The following factors must be considered and documented to make management decisions using toxicity monitoring data. This decision process is outlined in the attached figure and in narrative form below.

- a. Are the data of sufficient quality? (See Section 4.1 above.)
- b. Do the data indicate toxicity to one or more test species? If toxicity is not observed, then there is no evidence to suggest that the narrative toxicity objective is not attained based solely on toxicity test results. No further investigation is necessary. However, if the data show toxicity, then several other factors must be considered to determine if a water body is impaired.
- c. Are the duration, magnitude, frequency and spatial/temporal extent of toxicity sufficient to infer violation water quality objectives (per Regions' Basin Plans) or to infer beneficial use impairment? (See Section 4.1 above.) Numeric basin plan objectives define the duration, magnitude, and frequency of exceedances allowed to occur to protect beneficial uses. For any chemical constituent, these parameters are ultimately based on the chemical's toxicology. For toxicity, estimates of these

parameters essentially mimic instream exposure scenarios. The estimates can then be used to determine whether instream toxicity is likely to cause aquatic life impacts/beneficial use impairment.

- d. Are the data representative of current conditions? (See Section 4.1 above.) How old is the data set? Does more current data suggest toxicity is no longer a problem? Is the toxicity/impairment likely to recur? Definitively answering these questions requires some knowledge of the cause and source of toxicity.
- e. Do the data identify all causes of the toxicity? In many cases a toxicity identification evaluation (TIE) identifies a cause of toxicity. In such cases, regulatory efforts should focus on and listing should be for the specific cause. However, when TIEs are inconclusive or do not identify all causes of the toxicity (i.e., a chemical is identified but is not present in high enough concentrations to explain the magnitude of toxicity observed), further monitoring and assessment should be conducted. However, listing should be for unknown toxicity.

4.3 Assessment of Toxicity to Aquatic Life Using Water Column and Sediment Data

This section presents an approach to determining whether toxicity to aquatic life is causing nonattainment of water quality standards. The section applies to data and information that is available for a specific pollutant or pollutants.

Each Regional Basin Plan contains narrative objectives in a form such as "no toxic substances in amounts that impair beneficial uses." Most of the Basin Plans and the California Toxics Rule also contain numeric values designed to protect aquatic life. All of the Basin Plans contain beneficial use designations for some form of aquatic habitat (such as Cold or Warm Freshwater, Shellfish, Commercial and Sport Fishing, etc.). This section recommends a process for the use of toxic substances data from the water column and/or sediment to assess compliance with water quality objectives related to protection of aquatic life uses.

Recommendation 25: 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. Issues of spatial and temporal representativeness are discussed in more detail in the Section 4.1. Recommendation 25 includes the remainder of Section 4.3 and Table 1.

A two-tiered approach is recommended where data are analyzed to determine whether there is:

- clear evidence of impairment (Tier 1) or,
- incomplete evidence and/or evidence of possible adverse effects or potential for future impairment (Tier 2). A Tier 2 analysis could still support listing, even though the data requirements of Tier 1 are not met.

Table 1 provides a diagram of assessment criteria for determining whether a constituent would be placed in Tier 1 or Tier 2 with respect to each data category. The two-tiered approach applies generally. Other data and information not identified in the two-tiered approach may be relevant to the assessment and should be used. Such data or information may or may not support conclusions reached based solely on data that falls into Tier 1 or Tier 2. The basis for any conclusions that conflict with what the Tier 1 or Tier 2 assessment would suggest should be clearly documented.

Table 1. Criteria for Tiered Assessment Process for Toxic Substances Data

	Water Quality	Sediment Quality
Tier 1 Impairment to Aquatic Life	>10% samples* exceed CTR, NTR, or Basin Plan objectives OR Adequate data set indicates Basin Plan toxicity objectives exceeded, water TIEs or equivalent evidence clearly demonstrate toxicant	sediment triad or TIE studies clearly demonstrate toxicant that is causing non-attainment of standards OR >25% samples# exceed high SQGs (or other appropriate values)
Tier 2 Possible Impairment to Aquatic Life	two or more samples* exceed applicable CTR or NTR values within six years OR Adequate data set indicates Basin Plan toxicity objectives exceeded	>10% samples above <i>both</i> low SQGs OR toxicity evident and sediment chemistry results suggest cause, but no TIEs
Comment Impairment is established by: one Tier 1 category, the two Tier 2 categories, or one Tier 2 category and Board determination of concern	see CTR for full discussion of acute and chronic values; Freshwater metals values are hardness dependent	High SQGs = PELs/ERMs/AETs; low SQGs = ERLs/TELS Acronyms: SQG= Sediment Quality Guide, PEL=Probable Effects Level, ERM= Effects Range-Median, AET= Apparent Effect Threshold, ERL= Effects Range-Low, TEL= Threshold Effects Level

Tier 1 generally consists of a minimum number of 10 samples within each category (except Basin Plan Water Quality Objectives). If insufficient data exist then assessment defaults into Tier 2 or may be inconclusive.

*10% and "two or more" from EPA 305(b) guidance (1997), section 3.2.4 on toxics in water samples.

#25% from Consolidated Assessment and Listing Methodology guidance (EPA draft report 2001b).

Sediment Quality Guide values as presented for fresh and saline waters in Buchman, 1999 (NOAA-SquiRT Tables), BPTCP (1998), or similar appropriate reference.

Rationale: The sections below present discussion of the basis for judgments in conducting the assessment.

Tier 1 Sufficient evidence in one category establishes impairment.

Water Column

Dissolved water column concentrations should be compared to acute and chronic California Toxics Rule (CTR), National Toxics Rule (NTR), pertinent Basin Plan water quality objectives, or applicable criteria or guidelines that are used to evaluate compliance with narrative water quality objectives (EPA 305b Guidance, 1997). Most aquatic life criteria allow an exceedance rate of once every three years on the average. If greater than 10% (i.e. an exceedance rate that is 100 times greater than generally allowed) of sample results exceed either acute or chronic values, then sufficient evidence generally exists that the standards designed to protect aquatic life beneficial uses are not being attained.

A Tier 1 assessment consists of a minimum of two exceedances of applicable criteria and a minimum sample size of ten. At least two exceedances must occur to confirm that the water quality problem is recurrent. Since many monitoring programs are conducted on a monthly or quarterly basis, a minimum sample size of ten generally provides sufficient temporal coverage to cover multiple seasons, if not multiple years.

If Regional Basin Plan toxicity objectives are exceeded in an adequate data set, that is also adequate evidence of impairment. If a TIE or equivalent evidence identifies a chemical cause of toxicity, that alone is adequate evidence of impairment. The process described in the "Toxicity" section should be used to determine the test species and extent of data that indicates impairment.

Sediment

Sediment TIE studies and triad studies determine if one or more chemicals are present at levels which do not support beneficial uses. Triad studies require three measurements (sediment toxicity, infaunal analysis and sediment chemistry) to evaluate sediment effects on aquatic life. If two of the three portions of a triad study indicate benthic community degradation (e.g., defined as a negative value by the Bay Protection Toxic Clean-up Program [BPTCP]⁸), this is considered evidence of impairment, although additional analysis will be needed to clarify which pollutants cause the degradation.

To identify chemicals associated with impairment, sediment concentrations are compared to higher sediment quality guidelines (SQGs). Sediment Quality Guidelines are used as indicator values of narrative objectives present in most Regional Basin Plans (e.g., objectives in the form of "waters shall not contain settleable material...that...adversely affects beneficial uses"). Because higher SQGs are defined as those sediment concentrations "above which adverse effects are frequently expected" (Buchman, 1999), it is appropriate to use these as an indicator of impairment of beneficial uses. If greater than 25% of sample results exceed these higher SQGs, then sufficient evidence generally

⁸ BPTCP, 1998. Chemical and Biological Measures of Sediment Quality in the Central Coast Region, Final Report. California State Water Resources Control Board, Division of Water Quality, Bay Protection and Toxic Cleanup Program, New Series No. 5, October 1998.

exists that the narrative standards designed to protect aquatic life beneficial uses are not being attained.

In addition to individual SQGs for individual chemicals, a sediment guide quotient as described in the Bay Protection Toxic Cleanup Program, or other similar value, may also be used as an appropriate indicator of impairment when described in the listing rationale.

Tier 2 Requires evidence in *two categories* or information from adjacent segments to identify impairment.

If a chemical exceeds the screening criteria in Tier 2 with respect to two or more data categories, that is considered adequate evidence that the water body is impaired with respect to that chemical. This determination is based on a conclusion that the weight of available evidence indicates applicable numeric and/or narrative water quality standards are being exceeded and that designated beneficial uses may not be fully supported. The Tier 2 analysis may also consider other evidence of impairment, such as a water body adjoining impaired water segments and some evidence of impairment present for the individual segment. For example, evidence of potential impairment in the subject segment AND impairment evidence for one or more adjacent segments that is strong (e.g., Tier 1), may be considered reasonable evidence of impairment.

Water Column

A limited amount of either chemical or toxicity data warrants the use of further other lines of evidence from another category for a finding of non-attainment of standards. If water column chemistry data do not appear sufficient, water column toxicity data, sediment chemistry, or sediment toxicity data could be used to support the assessment. The evaluation includes consideration of the frequency and magnitude of these exceedances as well as the potential analytical error for these results relative to the relevant criteria. If the exceedance rate is less than 10% but greater than once every three years on the average (e.g., the allowable rate for most aquatic life criteria and standards), the Regional Board should make a finding of nonattainment of standards if it appears that the observed exceedance rate is sufficiently representative of existing conditions in the water body.

Sediment

Sediment concentrations are compared to low sediment quality guidelines (e.g., effects range low [ERL] and threshold effect levels [TELS]), and, if greater than 10% of sample results exceed *both* of those lower SQGs then the evidence suggests the chemical may threaten the aquatic life use in that water body. Because low SQGs are defined as those sediment concentrations “below which adverse effects are expected to occur only rarely” (Buchman, 1999)⁹, it is appropriate to use these as an indicator of threatened impairment of beneficial uses. If greater than 10% of sample results exceed these low SQGs, then

⁹ Buchman, M.F., 1999. NOAA Screening Quick Reference Tables, NOAA HAZMAT Report 99-1, Seattle WA, Coastal Protection and Restoration Division, National Oceanic and Atmospheric Administration, 12 pages.

appropriate combination with other lines of evidence (e.g., water column data, toxicity data) is necessary to determine that the narrative standards designed to protect aquatic life beneficial uses are not being attained. In sediment triad studies (as described above in Tier 1), when only two of three legs have been completed, at least one part must be for chemistry data in order to identify the pollutant(s) of concern.

4.4 Bioaccumulative Substances

This section presents an approach to determining whether bioaccumulative substances are causing nonattainment of water quality standards. The focus of this section is on interpretation of tissue data.

We refer to trace metals such as mercury and lead, and trace organic compounds such as DDT, PCBs and PAHs, as bioaccumulative substances because biota typically take in these substances at a greater rate than they can eliminate them, causing the substance to accumulate in biota over their lifetimes.

Recommendation 26: A water body should be listed if any one of the following three criteria is met:

- a. The water body has been posted with a fish or shellfish consumption advisory based on sampling in that water body. Advisories issued by the California Office of Environmental Health Hazard Assessment (OEHHA) or those issued by a local health agency based on risk assessment are appropriate. Impairment would pertain to beneficial uses related to human consumption, including, but not limited to, Commercial and Sport Fishing (COMM) or Shellfish Harvesting (SHELL).

OEHHA advisories would be the primary criteria for listing, since these actions are based upon risk assessments, but local agency advisories can be relied upon if they are based upon similar methodologies. In some cases, it may not be appropriate to list a water body as impaired 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 as impaired if more recent data or information indicate that designated beneficial uses are being attained and that the advisory is no longer representative of current conditions.

- b. Contaminant concentrations measured in aquatic organisms exceed appropriate standards for protection of human health. Screening values developed by the OEHHA and the USEPA are appropriate. The current values are listed in Table 2

below.¹⁰ Impairment would pertain to beneficial uses related to human consumption, including, but not limited to, Commercial and Sport Fishing (COMM) or Shellfish Harvesting (SHELL).

These values 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). A water body may be deemed impaired if the median value (50th percentile) or the weighted average of the bioaccumulation data set exceeds the screening for a particular contaminant¹¹. Temporal and spatial factors discussed in Section 4.1 should be considered. The number of organisms available for assessment purposes should be sufficiently representative of conditions in the water body.

The Regional Boards should review the assumptions used to develop the OEHHA and USEPA screening values and use different consumption rates or other factors based upon site-specific conditions to assess impairments if site-specific information is available.

- c. Contaminant concentrations measured in aquatic organisms exceed appropriate standards for protection of wildlife. Screening values developed by the National Academy of Sciences and the United States Fish and Wildlife Service are appropriate. The current values are listed in Table 3 below. Impairment would pertain to beneficial uses related to maintenance of aquatic habitat or healthy aquatic communities, including, but not limited to, Warm Freshwater Habitat (WARM), Cold Freshwater Habitat (COLD), Inland Saline Water Habitat (SAL), Estuarine Habitat (EST), Wetland Habitat (WET), Marine Habitat (MAR) or Wildlife Habitat (WILD).

The values in Table 3 apply to whole body samples collected in all types of waters (marine, estuarine, fresh). A water body may be deemed as impaired if the median value (50th percentile) or the weighted average of the bioaccumulation data set exceeds the screening for a particular contaminant¹². Temporal and spatial factors discussed in section 4.1 should be considered. The number of organisms available for assessment purposes should be sufficiently representative of conditions in the water body.

¹⁰ If EPA or OEHHA change the applicable values, any new values should be used in lieu of those set forth in this document.

¹¹ OEHHA uses a median when performing its human health risk assessments. A weighted average may also be appropriate when using analytical results from composites with differing numbers of individuals (i.e. the average of all composite results would be weighted by the number of individuals in each composite). Fish tissue criteria are generally based on long-term consumption of fish by humans or wildlife. Therefore, the pollutant concentration of a single individual fish consumed is not as critical as exposure from all fish consumed.

Table 2. Human Health Protection Criteria for Evaluation of Bioaccumulation Monitoring Data

Contaminant	OEHHA Screening Values ¹²	USEPA Screening Values ¹³
Arsenic	1.0 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 (TEQ)	0.3 ng/kg	

¹² Brodberg, B. and G. Pollock, 1999, Prevalence of selected target chemical contaminants in sport fish from two California lakes: public health designed screening study, CalEPA, OEHHA, EPA Assistance Agreement No. CX 825856-01-0.

¹³ USEPA, 2000, Guidance for assessing contaminant data for use in advisories, Volume 1, Fish sampling and analysis, Third Edition, USEPA 823-B-00-007.

Table 3. Wildlife Protection Criteria for Evaluation of Bioaccumulation Monitoring Data

Contaminant	NAS Guidelines ¹⁴	USFWS Guidelines
Arsenic		0.25 mg/kg
Copper		15 mg/kg
Mercury		0.3 mg/kg
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	
Hexachlorocyclohexane (total)	100 µg/kg	
Heptachlor	100 µg/kg	
Heptachlor epoxide	100 µg/kg	
Toxaphene	100 µg/kg	

4.5 Determining Compliance with Numeric Bacteriological Water Quality Objectives

This section describes the process that each Regional Board should go through when assessing whether or not numeric bacteriological water quality objectives (BWQOs) set to protect Water Contact Recreation (REC-1), Non-contact Water Recreation (REC-2) (recreational uses) and Municipal and Domestic Supply (MUN) beneficial uses are attained. This section does not apply to assessment of narrative bacteriological objectives or other aspects of the water quality standards that may be impacted by bacteria.

Background:

Each Regional Board has numeric BWQOs in its Basin Plan that have been set to protect recreational and municipal water supply beneficial uses. However, these objectives are not consistent across Regional Boards. Assessing attainment of water quality standards requires comparison of analytical bacteria results to these objectives listed in the Regions' Basin Plans.

¹⁴ National Academy of Sciences-National Academy of Engineering. 1973. Water Quality Criteria 1972 (Blue Book). USEPA Ecological Research Series. EPA-R3-73-033. U.S. Environmental Protection Agency, Washington, D.C.

The purpose of this section is to propose policy language by which Regional Boards will achieve consistency statewide in assessing inland water bodies for recreational and municipal water supply beneficial uses.

Recommendation 27: The following data requirements and processes should be used in assessment of compliance with BWQOs.

1. Data Requirements (also see data requirements in Section 4.1):

- a) Information other than bacteriological water quality monitoring data such as information on postings, advisories and other observations should not be used as the basis for determining compliance with numeric BWQOs. Such information may be used to support conclusions reached through the analysis of the bacteriological data.
- b) Because bacteria data must be compared to Basin Plan standards that often include a 30-day geometric mean objective using no fewer than four or five samples, the preferred frequency of sampling for bacteria is weekly. 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 bacteria fate and transport processes. Furthermore, if a limited data set with a small sample size is used, Regional Boards should carefully consider the assessment criteria (i.e. exceedance frequencies) to ensure that an impairment decision is made based on the water quality impairment being recurrent or persistent (see 2a. below). Year-around data from both wet and dry conditions is preferable. Where possible, water body fact sheets should indicate which samples were collected during rain events. Some variability in sampling frequency is acceptable since budget constraints and other factors can affect monitoring programs.
- c) The day of the week when sampling takes place is inconsequential. However, systematic sampling is preferred, consistent with the USEPA's 1986 recommendation for ambient water quality criteria for bacteria, which states that samples should be taken at evenly spaced intervals.

2. Data Analyses:

- a) The frequency of exceedance of bacteria objectives should be based on the Basin Plan objectives, or regional implementation procedures as contained in Basin Plans that are specific to bacteria objectives. Regional Boards should consider using appropriate statistical methods to determine whether applicable BWQOs are being met.

- b) Data should be grouped and analyzed on an annual basis. Annual analysis should be done since bacteria levels can vary significantly depending on water year type. The seasonality of an impairment does not need to be specified unless a Basin Plan specifies a seasonal recreational use for a water body.

3. Water Quality Objectives, Permanent Postings, Extent of Application and Freshwater Beaches:

- a) On the List, the pollutant listed should be “bacterial indicators” and, where appropriate, the specific analytical indicator(s) that demonstrated impairment should be listed. For example, if data indicate fecal coliform densities greater than the numeric objective, then the listing would be portrayed as bacterial indicators-fecal coliform.
- b) With respect to permanent postings, posting of a water body indicates that there is a problem that may be temporary, intermittent or ongoing. If there are insufficient data to show that the problem is persistent or recurrent, these water bodies should not be listed.
- c) With respect to engineered storm channels with limited public access and with potential REC-1 beneficial use designations, the numeric BWQOs set to protect REC-1 still need to be met unless a use attainability analysis is done to support removing the use designation or redesignating the water body with a conditional use.

4) Bacterial Indicators:

- a) The indicator(s) used should be those used as BWQOs in the Regional Basin Plans or in statewide water quality control plans. Measurement of *E. coli* may be substituted for fecal coliform for comparison with fecal coliform objectives if local studies have been completed to determine the appropriate conversion factor to use and depending on the precision of the methods used (see Noble *et al.* 1999 for a comparison of laboratory analytical methods).

4.6 Nutrients

This section describes the factors that should be considered in evaluating compliance with nutrient-related narrative water quality objectives.

Recommendation 28: Several relevant parameters—listed in Table 4 and 5—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 the parameters in Tables 4 and 5 below, as appropriate, for each beneficial use designation in combination with the decision process in the “Determining

Compliance with Water Quality Standards” flowcharts (Figures 1 and 2). Other scientifically defensible criteria may also be used.

Table 4 –Parameters To Be Used in Establishing Nutrient Impairment of a Lake or Reservoir*

Beneficial Uses	Relevant Parameters
Drinking water	<ul style="list-style-type: none"> • Chlorophyll a • Inorganic Nitrogen (nitrate) • Total Dissolved Solids • Total Nitrogen • Total Organic Carbon • Total Phosphorus • Transparency/ Turbidity
Aquatic life use support	<ul style="list-style-type: none"> • Biological Indicators (e.g., change from dominance by diatoms to dominance by blue-green algae) • Chlorophyll a • Dissolved Oxygen • Inorganic Nitrogen (ammonia) • pH • Total Nitrogen • Total Phosphorus • Transparency/ Turbidity
Recreation/Aesthetics	<ul style="list-style-type: none"> • Algae cover (e.g., periphyton or floating mass) • Blooms of taste/odor-causing algae • Blooms of toxin-producing algae • Chlorophyll a • Inorganic Nitrogen • Macrophyte coverage • Total Nitrogen • Total Phosphorus • Transparency/ Turbidity

* Use “Determining Compliance with Water Quality Standards” flowcharts (Figures 1 and 2) in combination with this table.

Table 5 –Parameters To Be Used in Establishing Nutrient Impairment of a River or Stream*

Beneficial Uses	Relevant Parameters
Drinking water	<ul style="list-style-type: none"> • Nitrate • Soluble Reactive Phosphorus • Total Nitrogen • Total Organic Carbon
Aquatic life use support	<ul style="list-style-type: none"> • Biological Indicators • Chlorophyll a • Dissolved Oxygen • Inorganic Nitrogen (ammonia) • Periphyton Biomass • pH • Soluble Reactive Phosphorus • Total Nitrogen
Recreation/Aesthetics	<ul style="list-style-type: none"> • Chlorophyll a • Inorganic Nitrogen • Periphyton Biomass (Algae cover) • Soluble Reactive Phosphorus • Taste • Total Nitrogen • Transparency/ Turbidity

* Use “Determining Compliance with Water Quality Standards” flowcharts (Figures 1 and 2) in combination with this table.

4.7 Temperature

This section presents a conceptual approach to determining whether elevated temperature levels are causing nonattainment of water quality standards.

Assessing whether a water body is meeting Regional and/or State temperature water quality objectives requires making a determination of natural receiving water temperatures. In most cases natural receiving water temperature is not defined; the Thermal Plan¹⁵ defines 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.”

Determination of “natural receiving water” temperatures is limited by the availability of historic temperature monitoring data that is considered representative of unaltered (call it “natural”) conditions for a given water body. When current and historic data are available that show a change from “natural” or “historic” conditions for a given water

¹⁵ California State Water Resources Control Board, 1972, *Water Quality Control Plan for the Control of Temperature in the Coastal and Interstate Waters and Enclosed Bays and Estuaries of California*, as amended

body in a manner or to a degree prohibited by applicable objectives, determination that temperature water quality objectives are not being met is fairly straightforward. However, when “historic” or “natural” temperature data are unavailable, alternative approaches must be considered to assess temperature impairment.

Recommendation 29: When data of sufficient quantity and quality (see Section 4.1 above) 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 State Board’s Thermal Plan should also be considered.

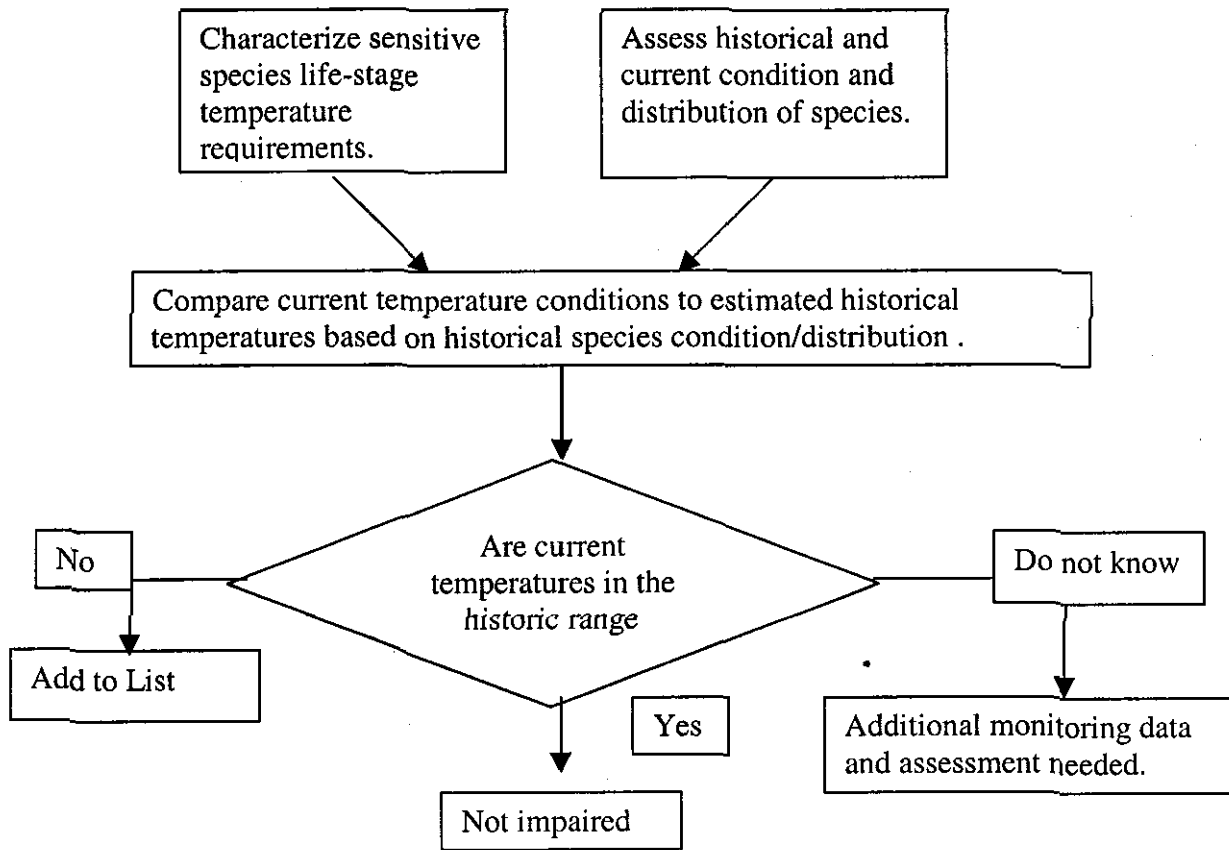
When “historic” or “natural” temperature data are not available, alternative approaches must be employed to assess temperature impairment. One such approach is presented here. This approach is based on the assumption that the beneficial uses associated with aquatic life are most sensitive to modifications 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 approach presented here involves comparing recent temperature monitoring data for a given water body to the temperature requirements of aquatic life in the water body (see the flowchart following this discussion). In many cases fisheries, particularly salmonids, represent the beneficial uses most sensitive to temperature. For this approach, some 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 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 can be used to infer past (historic) temperature conditions. Therefore, this approach is based on the assumption/hypothesis that a decrease in the population and distribution of the sensitive aquatic life species 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 temperature metrics reflective of the temperature requirements for the sensitive aquatic life species. 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. In this case, the MWAT of a particular water

body can be compared to MWAT growth requirements for salmonids¹⁶. Another measure of temperature requirements is the upper lethal limit, an acute temperature threshold. These thresholds vary for different species, and should be determined based on peer-reviewed literature. Other relevant temperature metrics may also be considered.

In summary, in the absence of “historic” or “natural” temperature data, a determination of temperature impairment can be made when there is a documented decrease in the population and distribution of the sensitive aquatic life species compared to past levels, coupled with current temperatures outside of the life stage temperature requirements for the sensitive species.



¹⁶ See, for example, Sullivan, K. et al. 2000. *An Analysis of the Effects of Temperature on Salmonids of the Pacific Northwest with Implications for Selecting Temperature Criteria*. Sustainable Ecosystem Institute.

4.8 Sedimentation

This section presents an approach to determining whether increased sediment loads are causing nonattainment of water quality standards.

Increased sediment can cause nuisance, turbidity, and adverse effects on many beneficial uses. Interpreting applicable water quality objectives for sediment is difficult since these objectives are typically narrative-based on the existence of a nuisance or an adverse effect on beneficial use from increased sediment loads over natural levels. They are also expressed as numeric objectives based on turbidity (a condition that has a variety of causes).

Regional Boards face a variety of challenges when determining whether a water body is impaired by sediment. Data that characterize conditions of beneficial use impairment or of excess sediment often do not lend themselves to conventional measures of data quality. Also, given the natural variability in sediment supply and transport capacity, representativeness of data is difficult to establish. Regional Boards face additional challenges in determining cause and effect relationships for sediment, since changes in sediment supply, transport capacity and channel form can produce similar effects in a water body. Linking these effects to an impact on a beneficial use is a further complication. Sediment is often one of many pollutants or forms of pollution potentially affecting beneficial uses associated with aquatic life. In those cases, it may be more appropriate to list for biological impairment, rather than for sediment, and follow up with a limiting factor analysis.

Background:

1. Water quality objectives are narrative for suspended sediment and settleable material and based on prohibitions against adverse affects to beneficial uses or causing "nuisance." Numeric and narrative standards for turbidity also exist, with narrative standards taking the form described above, and numeric standards involving an allowable amount above "natural" background.
2. Channel form and sediment deposits reflect a dynamic balance between sediment supply and transport capacity. Transport capacity is influenced by: a) streamflow; b) channel slope and cross-section; and c) channel roughness; or elements that concentrate or disperse flow energy. Land and water use activities each may cause significant changes to sediment supply and transport capacity greatly complicating correct determination of cause(s) for sedimentation (e.g., sediment supply, channel modification, flow alteration).
3. 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 streamflow, sediment, and in-channel and streamside vegetation and obstructions.

Recommendation 30: 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 are caused by sediment. A water body will be listed if any one of the following conditions is met:

1. Beneficial use impairment caused by increased sediment loads.
2. Nuisance caused by sediment loads (CWC, Section 13050).
3. Exceedance of turbidity objective, where turbidity is caused by increased suspended sediment loads.

The first condition requires a) evidence of beneficial use impacts, and b) evidence that the impacts are caused by increased sediment loads. If adverse sediment conditions are caused by changes in the flow regime, channel configuration, or reasons other than increased sediment supply, Regional Boards should list for these conditions in addition to sediment. Evidence of beneficial use impacts must 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 to establish these effects, as would documented declines in aquatic organism populations and aquatic community diversity. Evidence that the beneficial use effects are caused by sediment must describe the link between the documented impact and the presence of sediment in the water, or stored in the channel. This evidence must include documented occurrence of conditions that are recognized by the scientific community as having the impacts observed. For example, the filling of a stream's pools with fine sediment has been shown through scientific research to reduce rearing opportunities for certain fish and, as a consequence, to reduce their populations. Where no single condition is compelling, multiple lines of evidence may be relied upon to support the determination that an impact has occurred, or that the impact is caused by sediment.

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

Water bodies should 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 will be based on:

- Data collected from the waterbody over a period of time that accounts for the variable nature of sediment delivery and transport.

- Temporal representation: allow Regional Boards to establish on a case-by-case basis the temporal representativeness of the samples used to assess standards attainment. If the majority of samples are collected on a single day or during short-term natural events, the data shall not be used as the primary data set to support the listing.
- For drinking water: A documented increasing trend in turbidity-based closures of intakes to municipal supply system.

4.9 Habitat, channel, and flow modification

This section presents an approach to determining whether habitat, channel, or flow modifications are causing nonattainment of water quality standards.

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

Although they may affect beneficial use attainment, habitat modification, channel modification, and flow modification are not listed in Basin Plans as water quality objectives. (In some cases waste discharge prohibitions may affect habitat and channel modification.) The central question in assessment is whether waters should be listed as impaired by these factors when beneficial uses are clearly impaired by factors other than those included as water quality objectives in the Basin Plans. Some examples relevant to habitat, channel, and flow modification would be as follows:

- watercourses which do not support beneficial uses such as COLD, REC1 and REC-2, and SPWN solely because of flow depletion from dams and diversions
- watercourses which do not support beneficial uses solely because of channel modifications such as concrete lining of the channel
- watercourses that do not support beneficial uses solely because of impacts from invasive species such as arundo, hydrilla, and *Caulerpa taxifolia*.

Recommendation 31: 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.

4.10 Biological Monitoring and Assessments

This section discusses how biological monitoring and assessment information should be considered in determining whether a surface water is attaining water quality standards.

Bioassessment provides a tool for measurement of stream community health through population diversity, population composition (% taxa pollution tolerant, % taxa pollution intolerant), and other metrics that furnish measures of the health and integrity of the population.¹⁷ Biological assessment can include assessment of benthic macroinvertebrate, fish, and/or algal communities. The analysis of community composition can provide a direct assessment of instream biological integrity, and provides an opportunity to identify indicator species, i.e., species that respond predictably or characteristically in the presence or absence of degraded conditions.

Recommendation 32:

The assessment process below should be followed until biological standards (biocriteria) have been incorporated into a Regional Board's Basin Plan. After that time these standards would necessarily guide listing decisions for the affected geographic areas. Regional Boards (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 process below.

When the situation does not fit these guidelines, the situation should be assessed and the deviation from the standardized guidelines should be explained and documented.

- Identify appropriate reference sites within watersheds or ecoregions if in existence. Document methods for selection of reference sites.
- Conduct bioassessment sampling at reference sites using the most appropriate method(s) and index period(s). Document sampling methods, index periods, and Quality Assurance/Quality Control (QA/QC) procedures for the habitat being sampled and question(s) being asked. (Waters that do not have reference sites can still be sampled as baseline points for later trend analysis. Subsequent samplings can be compared to the initial sample conditions to determine trends toward further deterioration or improvement).
- Calculate biological metrics for reference sites, and develop Index of Biological Integrity (IBI) if possible.
- Conduct bioassessment sampling at other sites, and compare to reference condition or IBI if in existence. Evaluate physical habitat data and other water quality data, when available, to support any conclusion of impairment or nonimpairment. When data are available, use the "triad approach" of biologic, chemical, and toxicity testing to support conclusions inferred from biological signals.

¹⁷ USEPA. July 1999 Rapid Bioassessment Protocols for Use in Wadeable Streams and Rivers," 2nd edition, EPA 841-B-99-002

- Consult with qualified scientists to interpret data and incorporate their professional judgement. Attempt to obtain letters of agreement or other forms of peer review for the Regional Board's conclusions about water quality impairment(s) based on bioassessment data.
- Express bioassessment data using the most appropriate metrics. This could be different for each IBI or reference condition.
- Interpret case-by-case when necessary and explain and justify any deviations from the statewide approach.

5 AB 982 PUBLIC ADVISORY GROUP RECOMMENDATIONS

This section reviews the Regional Board¹⁸ recommendations on the Listing Policy relative to recommendations made by the AB 982 Public Advisory Group (PAG). The summaries of PAG issues below refer to issues identified in the July 2002 PAG Meeting Summary, and to comments by the PAG's "regulated" and "environmental" caucuses on State Board staff's July 2002 Concept Paper. The meeting summary and comments were included in the agenda packet for the PAG's October 22, 2002 meeting.

Scope of List and Policy

1. *PAG Issue:* The regulated caucus supports integration of the Clean Water Act Section 303(d) and 305(b) assessment processes. It supports the Concept Paper's direction for a multipart Section 303(d) list, but believes that the 303(d) list itself should only include waters for which TMDLs will be developed. The environmental caucus opposes a multipart list or separate lists and states that waters must stay on the list until they meet standards.

Regional Board Recommendations: The Regional Board recommendations center on a single "impaired waters" List, with a supporting database. The list and database would include waters requiring TMDLs and other types of impaired waters. If USEPA's regulations change to require a more circumspect list, the proposed single list structure would be amenable to extracting whichever waters are necessary to fulfill USEPA requirements. The Section 305(b) assessment process is outside of the scope of the Regional Board recommendations. Delisting is addressed in Recommendations 5, 11, and 13.

2. *PAG Issue:* The regulated caucus supports a "watch list" and policy direction on criteria for inclusion of waters on this list. The environmental caucus opposes use of a "monitoring priority list" or "probable clean waters list." The July meeting summary implies that some PAG members support the concept of "promoting" monitoring list waters to the 303(d) list if no additional data become available.

¹⁸ References to the Regional Board or Regional Boards are to the staff of the Regional Boards and do not reflect findings made or policies adopted by the Boards themselves.

Regional Board Recommendations: The concept of a “watch list” or “monitoring priority list” is outside of the scope of the current recommendations. The Regional Boards may provide separate recommendations on this issue at a later date.

3. *PAG Issue:* The environmental caucus states that the policy should not incorporate guidance on beneficial use dedesignation or water quality standards revisions.

Regional Board Recommendations: The Regional Boards favor exclusion of these topics from the policy (Recommendation 2) as they are relevant to standards setting, not standards attainment.

Reassessment of the Earlier Section 303(d) List

1. *PAG Issue:* PAG members have expressed concern about revision of the current Section 303(d) list under the new policy. The regulated caucus supports a one-time reassessment of all waters on the 2002 list. The environmental caucus believes that the policy should be applied to new listings only and that current listings should be evaluated as they come up in priority order.
2. *Regional Board Recommendations:* The Regional Boards support review of waters on the current (2002) Section 303(d) list for consistency with the new policy within the first two listing cycles following adoption of the new policy. The Regional Boards believe the List should be consistent with the new policy, but that the State and Regional Boards’ resources should not be unduly diverted from other important responsibilities to do so. See Recommendations 3 and 11.

Priority Ranking and Schedules

1. *PAG Issue:* The regulated caucus supports the Concept Paper’s priority ranking criteria and suggests that point source TMDLs be addressed first to minimize problems with interim permit conditions. This caucus supports a connection between priority ranking and scheduling, and recommends that explanations for priority ranking be included in water body fact sheets.

Regional Board Recommendations: The Regional Boards’ recommended priority ranking criteria are somewhat different from those in the Concept Paper, and the Boards also recommend that priorities and schedules should not be connected (Recommendations 14 and 15). The Regional Boards’ recommendations are for prioritized actions to address impairment. While scheduling will necessarily consider a water’s priority, scheduling involves a host of other administrative and practical considerations which are not encompassed in the process of identifying which waters are impaired waters, and their importance. Section 8 of

Recommendation 21 lists information to be included in fact sheets; this list does not currently include discussion of priority ranking.

Solicitation/"Readily Available Data"/Data Screening

1. *PAG Issue:* The regulated caucus supports approval of the list by both the State and Regional Boards, but opposes restrictions on the provision of new information at each stage of the process before State Board approval. The environmental caucus supports "transparency and consistency" in the assessment process.

Regional Board Recommendations: The Regional Boards recommend formal action on an impaired waters List by both the State and Regional Boards (Recommendations 8 and 9). The solicitation process is discussed in Section 3.1. The Regional Board recommendations are silent on whether new information/data should be accepted after the close of the solicitation process.

2. The regulated caucus supports the Concept Paper's Quality Assurance/Quality Control (QA/QC) requirements for data submittals. It suggests clarification that ambient receiving water data and information are the primary types of data to be used in the listing process. The caucus believes that "anecdotal information" should be used for listing only with additional supporting data or information. It recommends addition of local public agencies and watershed groups to the list of parties to be solicited.

Regional Board Recommendations: Section 4.1 (Recommendation 23) outlines general considerations related to the quality, quantity, and spatial and temporal representativeness of data to be used in the assessment process. The recommendations related to specific pollutants or stressors assume that data for all media (e.g., sediment and tissue data) will be used to evaluate impairment whenever they are available and of acceptable quality/quantity for use in the assessment process. Section 4.1 states that data and information not supported by a Quality Assurance Project Plan (QAPP) cannot be used by themselves to support listing or delisting, but may only be used to corroborate other data and information with appropriate QAPPs. Recommendation 19 states that the policy should specify certain categories of stakeholders be solicited, including government agencies and the public.

3. *PAG Issue:* The environmental caucus supports use of "reasonable" QA/QC guidance. This caucus recommends that Regional Boards actively seek out data rather than considering only data provided in response to solicitation. It also supports use of all data, regardless of age, and states that Regional Boards should establish requirements for spatial and temporal representation and minimum sample numbers on a case-by-case basis.

Regional Board Recommendations: Section 4.1 includes recommendations on QA/QC and on spatial and temporal representativeness of data. Recommendation 19 states that the policy should describe the types of information and data that will, at a minimum, be considered readily available. Recommendation 17 states that data not provided in response to the solicitation will not be considered readily available.

Assessment Methodology

1. *PAG Issue:* The regulated caucus supports development of a California-specific weight of evidence approach for assessment, drawing on many elements of work done in other states.

Regional Board Recommendations: The Regional Board recommendations encompass a “weight of evidence” approach that must be undertaken in the context of the applicable water quality standards. For example, see Recommendation 25.

2. *PAG Issue:* The regulated caucus supports the use of water body-specific information for listing as opposed to the use of modeled or projected information.

Regional Board Recommendations: The Regional Board recommendations do allow for listing on the basis of modeled or projected information in the absence of water body-specific evidence of impairment in some circumstances.

Documentation

1. *PAG Issue:* The regulated caucus recommends that the policy require all data to be reviewed and presented in the Section 305(b) report. Data not used for assessment of impairment should be included in the report with comments on why they were not used. The regulated caucus recommends that fact sheets provide information on the degree or magnitude of exceedance of standards.

The environmental caucus states that any documentation approach must be comprehensive enough to accommodate all types of data; the documentation approach should not have the indirect effect of excluding or making it difficult to submit a particular type of available data. The environmental caucus also recommends documentation of reasons for list deletions/rejections.

Regional Board Recommendations: The Section 305(b) report and the use of “leftover” data and information are outside of the scope of the Regional Board recommendations on policy direction for an impaired waters List. Recommendation 21 includes procedures for tracking information received in response to solicitation, and proposes the preparation of fact sheets for all water bodies recommended for listing, delisting, or changing existing 303(d) list information. Recommendation 21 (9) also recommends that fact sheets be

prepared for waters not proposed for listing, when some data or information indicated non-attainment of standards. Recommendation 21 (8), concerning the contents of fact sheets, does not specifically address magnitude of exceedance.

2. *PAG Issue:* The environmental caucus supports “leveraging” of the SB72 statewide stormwater reporting format.

Regional Board Recommendations: Recommendation 21 addresses the contents of fact sheets but not their format.

Listing, Delisting and “Not Listing” Factors

1. *PAG Issue:* The regulated caucus supports not listing for beneficial use impairment alone or exceedance of an objective alone (e.g., waters would not be listed if data showed no impairment of beneficial uses, even if violations of water quality objectives occurred). The environmental caucus opposes this concept. The regulated caucus supports (and the environmental caucus opposes) the Concept Paper’s proposal not to list for short-term events.

Regional Board Recommendations: Section 4.1 describes procedures for assessment of impairment in relation to water quality objectives, beneficial uses, and antidegradation considerations. California’s water quality standards include all three of these factors, and nonattainment related to any one factor should be considered impairment. The Regional Boards recommend that waters should not be listed if the nonattainment of standards is not persistent or recurrent. Waters would not be listed on the basis of spills or other one-time events if such events do not create persistent impairment, however evidence of such events must be included in the evaluation process.

2. *PAG Issue:* The environmental caucus believes that the policy should make it easy to list waters and hard to delist them, and that there should be separate criteria for each process. The caucus supports delisting for clearly faulty data but also wants affirmative data/information to show that the water body is not impaired.

Regional Board Recommendations: The Regional Boards propose using essentially the same factors and assessment process to delist (or not list) as to list (Recommendations 5 and 13). Waters would be listed if standards are not attained, and delisted or not listed if standards are attained. Considerations related to data quality/quantity and temporal/spatial representativeness would be the same for listing and delisting.

3. *PAG Issue:* The regulated caucus supports delisting when the impairment is due to natural conditions, and states that naturally impaired waters should be placed on a watch list to allow reevaluation of water quality standards. It also suggests special consideration for drought as a natural condition.

Regional Board Recommendations: The Regional Boards' recommended process for evaluating whether waters are attaining standards does not include an assessment of the source of the pollutants or pollution as a listing factor. (Recommendation 23).

Narrative Objectives

1. *PAG Issue:* The regulated caucus recommends that numeric criteria or guidelines should not be used in evaluation of narrative water quality objectives unless and until they are adopted as numeric objectives. The policy should include a process to determine when a water body is impaired based on narrative objectives, and translator mechanisms should follow the direction in Basin Plans.

Regional Board Recommendations: Recommendation 2 opposes the inclusion of direction on revision of standards in the policy. Section 4.1 provides general direction on selection of criteria for use in assessing compliance with narrative objectives and recommends the use of any specific direction in Basin Plans on determining compliance with water quality objectives. Some of the recommendations (e.g., Recommendation 26) address the use of certain criteria in preference to others.

2. *PAG Issue:* The regulated caucus disagrees with listing solely on the basis of Toxics Release Inventory (TRI) data, exceedance of drinking water Maximum Contaminant Levels (MCLs), beach postings/closures, and fish/shellfish consumption advisories. It is opposed to the use of trend data in Section 303(d) assessment and states that the Section 305(b) assessment and the State's Continuing Planning Process are the appropriate vehicles to address trends. The caucus also recommends that toxicity and nuisance should not be used as the basis for listing and that adverse biological response should not be used as the basis for listing unless there is a connection with a specific pollutant.

Regional Board Recommendations: The Regional Board recommendations do not address listing on the basis of TRI data alone; since the TRI provides only source data, listing would not be appropriate without water-body specific evidence of impairment. Regarding MCLs, all Basin Plans contain a "Chemical Constituents" objective that applies MCLs to ambient waters. If assessment of an ambient water body using the procedures in Section 4.1 shows violation of this objective, the water body should be considered impaired. Regarding the other listing/delisting factors mentioned in the regulated caucus comments, the Regional Boards support their use under specific circumstances. The use of consumption advisories is discussed in Recommendation 26. The use of toxicity data is discussed in both Recommendations 24 and 25. Recommendations 29 and 30 discuss the use of trend analysis for temperature and sediment issues.

Numeric Objectives and Binomial Model

1. ***PAG Issue:*** The regulated caucus supports use of the binomial model discussed in the Concept Paper for assessment of compliance with standards. The environmental caucus believes that assessment should use a variety of factors, and that one strategy such as the binomial model should not “trump” others.

Regional Board Recommendations: As noted in Section 1, the Regional Boards are opposed to the exclusive use of the binomial model, since its use can be inconsistent with the manner in which most of California’s water quality objectives are expressed. A more flexible process for assessing compliance with standards is proposed in Section 4.1.

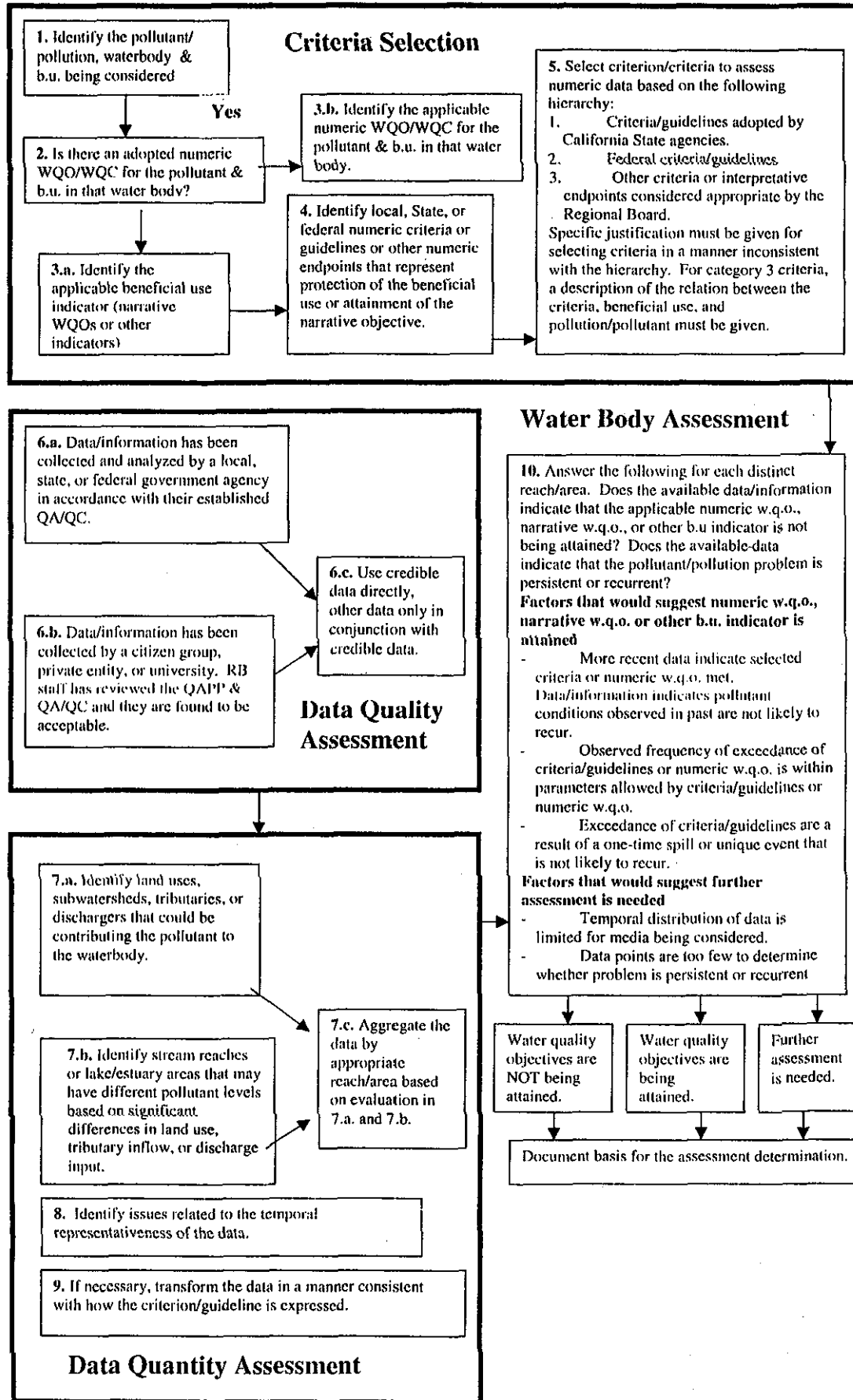
2. ***PAG Issue:*** Regarding listing for violation of bacteria objectives, the regulated caucus supports the use of a consistent trigger value that distinguishes between wet and dry weather conditions.

Regional Board Recommendations: Section 4.5 includes direction for fact sheets to note bacteria samples that were collected during rain events. However, it recommends that data should be grouped and analyzed on an annual basis, and that the seasonality of an impairment does not need to be specified unless a Basin Plan specifies a seasonal recreational use for a water body.

6 Potential Issues for Further Discussion

[This section is reserved pending TMDL Roundtable resolution of additional issues to address.]

Figure 1. Decision Process for Determining Compliance with Numeric and Narrative Water Quality Objectives, and Attainment of Beneficial Uses



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Figure 2. Decision Process for Determining Compliance with Antidegradation Requirements

