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Arnold Schwarzenegger
Governor

TO: Gerald Bowes, Toxicity and Peer Review Section Manager
DIVISION OF WATER QUALITY

FROM: Dominic Gregorio, Ocean Unit Chief
DIVISION OF WATER QUALITY

DATE: October 18, 2007

**SUBJECT: PEER REVIEW REQUEST SEDIMENT QUALITY OBJECTIVES FOR
ENCLOSED BAYS AND ESTUARIES OF CALIFORNIA**

The Division of Water Quality requests, by transmittal of this memorandum, that the State Water Resources Control Board (State Water Board) initiates an external peer review of the proposed narrative sediment quality objectives (SQOs), and the multiple line of evidence approach to interpret the narrative objective, per the requirements of Health and Safety Code Section 57004.

In 1989, Porter-Cologne Water Quality Control Act was amended to require the State Water Board to develop SQOs as part of the Bay Protection and Toxic Hotspots Cleanup Program, a comprehensive program to protect existing and future beneficial uses within California's enclosed bays and estuaries. Several factors prevented the State Water Board from developing SQOs during the ten years that the Bay Protection Program was funded. In 1999, a lawsuit was filed against State Water Board for failing to adopt SQOs in accordance with Porter-Cologne. As a result the Court agreed with the petitioners, and required the State Water Board to develop adopt and submit the SQOs to the Office of Administrative Law by February 29, 2008.

As you know, U.S. Environmental Protection Agency (USEPA) and others initiated work in the 1980s to develop chemical specific sediment criteria. These attempts have all failed as stand-alone tools, primarily because the bioavailability of pollutants in sediment is so highly variable that the utility of such tools is extremely limited unless supported by other indicators such as sediment toxicity and benthic community measures. Many state and Federal programs rely on these "weight of evidence" or "multiple line of evidence approaches" to assess sediment quality including the State Water Board's Bay Protection and Toxic Hotspots Cleanup Program, and the two largest nationwide estuarine monitoring programs (USEPA's Environmental Monitoring and Assessment Program and the NOAA's National Status and Trends Program), as well numerous regional monitoring programs.

California Environmental Protection Agency

The State Water Board has concluded the first phase of development and has circulated a Draft Staff Report Water Quality Control Plan for Enclosed Bays and Estuaries Part 1 Sediment Quality (Draft Staff Report) that describes the technical and regulatory basis for the proposed plan, the proposed SQOs and interpretive tools and indicators and implementation policy. The proposed narrative SQOs would be applicable to all enclosed bays and estuaries, including but not limited to the following waters:

- Humboldt Bay
- San Francisco Bay
- Los Angeles/Long Beach Harbor
- Los Alamitos Bay/Huntington Harbor
- Newport Harbor
- San Diego Bay

The proposed regulatory provisions are described in Attachment 1. Based upon the content of the draft plan staff believes that peer review should be directed toward the technical issues and questions relative to the protection of benthic life as described in Attachment 2. I therefore recommend that the State Water Board solicit reviewers with expertise in toxicology, sediment chemistry, benthic community ecology, and risk assessment with a focus sediment quality related research or science. Attachment 3 lists those individuals who have participated in the State Water Boards SQO development program. Because the State Water Board is under a Court ordered deadline to develop and adopt SQOs, it is advisable that reviewers must provide comments within 30 days of receipt of the staff report and supporting documents. The contact person for this program is Chris Beegan (916 341-5577 or cbeegan@waterboards.ca.gov).

Attachment 1 Summary of Proposed Action Item

Attachment 2 Scientific Issues To Be Addressed By External Peer Review

Attachment 3 SQO Program Participants

Attachment 1 Plain English Summary of the Proposal

The proposed regulatory provisions consist of:

- A narrative sediment quality objective intended to protect benthic invertebrates from community degradation and/or toxicity as a result of direct exposure to toxic pollutants in sediment.
- Sediment chemical indicators and numeric thresholds developed to assess the risk from the direct exposure of toxic pollutants in sediment.
- Sediment toxicity indicators and numeric thresholds developed to assess both exposure and biological effects of toxic pollutants in sediment.
- Benthic community indicators and thresholds intended to assess the health of the benthic community.
- An approach to integrate the sediment chemical indicator, sediment toxicity indicator, and benthic community indicator into a robust classification of sediment quality that can be applied to determine the sediment quality at a station relative to the narrative sediment quality objective.
- And a proposed policy of implementation to ensure the SQO and interpretive tools are implemented appropriately.

The proposed regulatory provisions also include a narrative sediment quality objective established to protect humans from contaminants in sediment that accumulate in fish tissue. This narrative will be interpreted using existing standard USEPA and OEEHA risk assessment methodology and therefore does not require peer review.

The proposed regulatory provisions would be applicable only to Bays and Estuaries of California

Attachment 2
Scientific Issues To Be Addressed
By External Peer Review

The State mandate for external scientific peer review (Health and Safety Code Section 57004) states that the reviewer's responsibility is to determine whether the scientific portion of the proposed rule is based upon sound scientific knowledge, methods and practices.

We request that you make this determination for each of the following issues that constitute the scientific basis of the proposed regulatory action. An explanatory statement is provided for each issue to focus the review

1. **The exposure-receptor relationship selected for protection. Are benthic invertebrates important, ecologically relevant receptors to protect from direct exposure to toxic pollutants in sediments within bays and estuaries of California?**

Benthic invertebrates are routinely used to assess sediment quality because of the diverse feeding modes and life histories represented within a healthy benthic community and the limited mobility, relatively long life span and ecological importance for higher trophic levels and nutrient cycling. Section 5.3 of the Draft Staff Report Water Quality Control Plan for Enclosed Bays and Estuaries Part 1 Sediment Quality (Draft Staff Report) describes the rationale for protecting benthic invertebrates from direct exposure to pollutants in sediments.

2. **Approach to assess the exposure-receptor relationship: Are multiple lines of evidence appropriate to assess the potential risk to benthic invertebrates from toxic pollutants in sediment within bays and estuaries of California?**

As described in the memorandum to Dr. Bowes, pollutant bioavailability is highly variable in sediment. Because no current tools are capable of directly measuring the bioavailability of each pollutant in sediment, a multiple line of evidence approach was selected to assess the potential risk of exposure and biological effects to benthic invertebrates. Section 2 and Section 5.5 of the Draft Staff Report describe the rationale for using an approach based upon multiple lines of evidence. Although peer reviewed literature is well cited in the Draft Staff Report, the multiple line of evidence approach has also been adopted for use by EPA and states agencies as described in the documents below.

U.S. EPA 2004 The Incidence and Severity of Sediment Contamination in Surface Waters of the United States, National Sediment Quality Survey EPA-823-R-04-007.

"Studies have shown that overall, an integration of several methods using the weight of evidence is the most desirable approach for assessing the effects of

contaminants associated with sediment...monitoring and development of sediment management programs should be planned and implemented to support weight-of-evidence assessments”.

Ingersoll CG, MacDonald DD. 2002. A guidance manual to support the assessment of contaminated sediments in freshwater ecosystems. Volume III: Interpretation of the results of sediment quality investigations, EPA-905-B02-001-C

“Contaminated sediments have the potential to adversely affect sediment –dwelling organisms, wildlife, or human health. Whenever practical, multiple lines of evidence (i.e., data on multiple indicators of sediment quality conditions) should be used to assess the quality of fresh water sediments”.

New Jersey Department of Environmental Protection 1998. Guidance for Sediment Quality Evaluations

“These three components (contaminant concentration, sediment toxicity, community measures), measured at potentially site-impacted and reference locations, provide complementary data, because no single component can be used to predict the measurement of the other components. For example, sediment chemistry provides information on the identification and extent of contamination but not on biological effects. Sediment toxicity testing provides direct evidence of sediment toxicity but cannot discriminate among contaminants nor predict actual in-situ responses. In-situ responses of resident biota, measured by in-fauna community surveys can provide direct evidence of contaminant-related effects, but only if confounding effects unrelated to contamination can be excluded, such as differences in habitat quality. Thus, a sediment evaluation program must be based on this “triad” approach to provide a weight of evidence for determining if adverse effects are occurring, and if so, whether they are due to the site in question”.

Crane, J.L., et al 2000. Development of a framework for evaluating numerical sediment quality targets and sediment contamination in the St. Louis River Area of Concern, EPA-905-R-00-008.

“The Minnesota Pollution Control Agency utilizes a number of sediment quality assessment tools to characterize the sediments on both a random and site-specific basis...The information gained from these studies is evaluated, using a weight-of-evidence approach, for making management decisions about contaminated areas.”

3. Individual Lines of Evidence:

- a. **Are the proposed sediment toxicity indicators appropriate for assessing both the potential risk of exposure from toxic pollutants and the biological effects in benthic invertebrates within bays and**

estuaries of California? The technical team evaluated a variety of acute and sublethal toxicity tests for use. Staff has proposed using both acute and sublethal sediment toxicity tests based analysis of data collected from embayments in California to adequately characterize potential toxicity in sediment. Section 5.5.2 of the Draft Staff Report describes the rationale for using these tests and numeric thresholds. The technical report titled *Evaluation of Methods for Measuring Sediment Toxicity in California Bays and Estuaries* (Bay, S.M., D.J. Greenstein, and D. Young. 2007) Southern California Coastal Water Research Project Technical Report 503 provides more details regarding the selection of test organisms, and the development of thresholds.

- b. **Are the proposed sediment chemistry indicators appropriate for assessing the potential risk of exposure from toxic pollutants to benthic invertebrates within bays and estuaries of California?** The technical team evaluated a variety of existing national sediment quality guidelines, existing guidelines recalibrated through the use of regional and statewide data only following the published methodology, and new indicators developed specifically for this program. Staff have proposed using two chemical indicators; a Logistic Regression Model developed from paired toxicity data and chemistry data collected within California Bays to assess the potential risk of sediment toxicity; and the Chemical Score Indicator developed from paired benthic community and chemistry data collected within California Bays to assess the risk of benthic community degradation. Section 5.5.3 of the Draft Staff Report describes the rationale for using these tests and the development of numeric thresholds.
- c. **Are the proposed benthic community indicators appropriate for assessing the biological effects through benthic community condition within bays and estuaries of California?** The technical team considered five benthic community indexes, three of which have been applied previously in bays of California and two that had not. Staff has proposed using a combination of four benthic indexes to assess the health of benthic communities. Section 5.5.4 of the Draft Staff Report describes the rationale for using these indexes and development of the numeric thresholds. The technical report titled *Evaluation of Five Indicators of Benthic Community Condition in Two California Bay and Estuary Habitats* (Ranasinghe, J.A., S. B. Weisberg, R. W. Smith D. E. Montagne, B. Thompson, J. M. Oakden. D.D. Huff D. B. Cadien, and R. G. Velarde 2007) Southern California Coastal Water Research Project Technical Report 524 provides more details regarding the selection of indexes and the development of thresholds. A second report titled *The Level of Agreement Among Experts Applying Best Professional Judgment to Assess the Condition of Benthic Infaunal Communities* (SCCWRP Technical Report 523) served as the basis for developing a data set that

could be used as a standard by which different metrics and indexes could be assessed.

4. Integration Framework: Is the integration framework appropriate for determining if a station meets the narrative objective?

Current applications of MLOE usually rely on best professional judgment to integrate the results of the sediment toxicity, chemistry and benthic condition into an overall station level determination (described in the technical report titled *Evaluating the Consistency of Best Professional Judgment in the Application of a Multiple Lines of Evidence Sediment Quality Triad, SCCWRP Final Draft Technical Report*). The technical team evaluated two frameworks one based on equal weighting of the lines of evidence and the other; non-equal weighting logic based approach that considers the potential for exposure and the magnitude of biological effects. Staff has proposed this non-equal weighting approach described in Section 5.5 of the Draft Staff Report to make station level determination relative to the narrative objective. This framework is described in greater detail in the document titled *A Framework for Interpreting Sediment Quality Triad Data* (Bay, S.M. and S.B. Weisberg) Southern California Coastal Water Research Project Draft Final Technical Report.

- 5. Is the implementation of the narrative SQO appropriate, given the limitations of the individual tools and potential uncertainty associated with sediment quality assessment?** The application of a multiple line of evidence approach to regulatory programs is very unique and poses some serious challenges for the State Water Board because most programs have been developed based for water quality, where a single line of evidence is appropriate. In addition, there are existing programs that may have some limited overlap with the States proposed SQOs, such as the USEPA/USACE dredging program but are driven by entirely different factors and attempt to achieve very different goals. As a result, Staff considered a variety of technical and regulatory or policy related to develop the implementation language. Much of this language was guided in part by a series of sediment quality principles developed by the Advisory (stakeholders) Committee early in the process. Section 5.6 and 5.7 of the Draft Staff Report describe the issues considered for implementation and why the proposed alternative was selected.

Reviewers are not limited to addressing only the specific issues presented above, and are asked to contemplate the following questions

- 1. In reading the staff technical reports and proposed implementation language are there any additional scientific issues that are part of the scientific basis of the proposed rule not described above?**
- 2. Taken as a whole is the scientific portion of the proposed rule based upon sound scientific knowledge methods and practices?**

Reviewers should also note that some proposed actions may rely significantly on professional judgment where available scientific data are not as extensive as desired to support the statute requirement. In these situations, the proposed course of action is favored over no action.

The preceding guidance will ensure that reviewers have an opportunity to comment on all aspects of the scientific basis of the proposed Board action. At the same time reviewers also should recognize that the Board has a legal obligation to consider and respond to all feedback on the scientific portions of the proposed rule. Because of this obligation, reviewers are encouraged to focus feedback on scientific issues that are relevant to the central regulatory elements being proposed

Attachment 3 List of Participants

State Water Resources Control Board Staff

Mr. Chris Beegan, Program Manager, Division of Water Quality
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Scientific Steering Committee

The Scientific Steering Committee (SSC) is responsible for independently assessing the soundness and adequacy of the technical approach, the tools and indicators developed specifically for the SQO program and ensuring that all findings and conclusions presented by the Technical Team are well supported by appropriate analyses and studies.

Dr. Todd Bridges Director, Center for Contaminated Sediments of the U.S. Army Engineer Research and Development Center, USACE, Vicksburg, MS
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The Science Team was responsible for developing the technical approach, tools and indicators for the State Water Boards SQO Program.

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Science Team participants provided technical input or participated in studies that focused on the development of a specific indicator or study. Many of these participants are coauthors on technical papers and reports.

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These committees consisted of stakeholders and regulatory agency staff that provided input on the technical approach and implementation of the SQOs.

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