Memorandum

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DATE:	July 30, 2007
TO:	Karen Cowan, Chair, Nitrogen and Selenium Management Program
CC:	Daniel Apt, RBF
SUBJECT	Selenium Site-Specific Objective: Procedural and Technical Elements

Introduction

Pursuant to the scope of work for the *Development of a Site-Specific Objective (SSO) for Selenium in the Newport Bay Watershed*, March 2, 2007, this technical memorandum defines the procedural and technical elements that are necessary for the development of the selenium SSO.

The procedural elements address:

- The process for approving and adopting the SSO once it is submitted by the Nitrogen and Selenium Management Program (NSMP) Working Group (Working Group) to the Santa Ana Regional Water Quality Control Board (Regional Water Board) in June 2009;
- The technical information that must be included as a part of the June 2009 submittal in order to support the adoption of the SSO; and
- The compliance options that may be available for the dischargers[1] subject to the General Waste Discharge Requirements for Short-Term Groundwater-Related Discharges and De Minimus Wastewater Discharges to Surface Waters Within the San Diego Creek/Newport Bay Watershed (Order No. R8-2004-0021) (hereinafter referred to as the short-term groundwater discharge permit or Order No. R8-2004-0021) when the permit is renewed in December, 2009.

[1] "Dischargers" is defined as an entity discharging the type of waste as defined in Finding 6 of Order No. R8-2004-0021.

The technical elements describe the data adequacy for the modeling effort and address:

- Goals and justification for the development of the SSO
- Assessment areas
- Modeling requirements
- Using the model for the SSO process
- Data gaps
- Model methods
- Risk factors for selenium
- Assessing model performance

Procedural Elements

SSO Adoption Process

The State Water Resources Control Board (State Water Board or SWRCB) and Regional Water Boards have the discretion to develop and adopt site-specific water quality objectives (WQO) for California Toxic Rule (CTR) constituents where the statewide objectives appear over or under protective of designated beneficial uses (*Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California,* Sec. 5.2 at p. at pp. 31-33 also referred to as the State Implementation Policy or SIP). This process may be initiated by the dischargers, who choose to conduct studies necessary to support the development and adoption of a site-specific objective concurrently with actions necessary to achieve compliance with final effluent limitations (Id.).

The proposed selenium SSO for the Newport Bay watershed will require adoption of the SSO through an amendment to the applicable Water Quality Control Plan (Basin Plan). Basin Plan amendments adopted by the Regional Water Board that contain a change in water quality standards must also be approved by the State Water Board, the Office of Administrative Law (OAL), and the US Environmental Protection Agency (EPA), in accordance with federal and state requirements before becoming effective. (Water Code § 13240 et seq; Govt. Code § 11353 ; Clean Water Act § 303(c)(3) codified at 33 U.S.C. §1313(c)(3).)

To initiate the selenium SSO adoption process, the NSMP Working Group[2] will submit a request and a detailed technical report to the Regional Water Board in June 2009. The various steps in the SSO adoption process are summarized below and an estimated timeframe is provided in **Attachment A**. The timeframe is based on a submittal of the selenium SSO and adoption request from the Working Group to the Regional Water Board on June 17, 2009 and outlines the basic process considering a number of statutory timelines associated with a Basin Plan amendment that includes the adoption of a SSO. However, it is recognized that a number of issues can cause delays or that the process may be accelerated by involving the regulatory and/or resource agency staff early on. Therefore, the timeline is subject to change.

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[2] The NSMP Working Group consists of staff level technical representatives of watershed stakeholders that include state, county, and city agencies, water districts, and private entities that have agreed to fund and implement a work plan to address selenium and nitrogen groundwater-related inflows in the Newport Bay watershed. There are currently over 20 Working Group members.

Regional Water Board

When the Regional Water Board receives a request to take some action (such as the Working Group's request for the adoption of a selenium SSO), they have up to 60 days before the Regional Water Board's failure to act can be petitioned to the State Water Board. (Water Code §13320.) If the Regional Water Board staff determines that it is appropriate for the Regional Water Board members to consider adopting the SSO as developed through the Working Group's coordinated efforts, and therefore, amend the Basin Plan, the Regional Water Board must hold a public hearing. (Water Code §13244.) However, before the Regional Water Board members can take an action on the Basin Plan amendment, there are a number of technical reports and informational items that must be made available for review by the Regional Board Members and the public.

The necessary documents include: a technical staff report; a Substitute Environmental Document (SED) that includes the environmental checklist required under the California Environmental Quality Act (CEQA) (23 CCR §3777); and, a draft of the proposed amendment(s) to the Basin Plan. The required documents are discussed below.

Regional Water Board Staff Technical Report

The staff report shall:

- Summarize the necessity for the site-specific objective Basin Plan amendment (Govt. Code §11353 (b)(2)(C)
- Describe the existing conditions
- Describe the technical basis for the proposed site-specific objective
- Include the external scientific peer review report for the scientific portions of the proposed action (Health & Safety Code §57004.)
- Provide information as required by Water Code §13241
- Include a discussion of the environmental and economic analyses in the SED (see below)
- Provide reasonable alternatives to the proposed activity (23 CCR §3777)
- Discuss the application of antidegradation policies and findings, as needed
- Address federal regulatory requirements for establishment of water quality standards (40 CFR §131.10 through §131.22.)
- Describe the program of implementation (Water Code §13242) that includes:
    - A description of the nature of actions which are necessary to achieve the objectives, including recommendations for appropriate action by any entity, public or private;
    - A time schedule for the actions to be taken; and
    - A description of surveillance to be undertaken to determine compliance with objectives.

Substitute Environmental Document (SED)

The SED must include:

- An environmental checklist (23 CCR §3775 et seq., Appendix A)
- Discussion of potential environmental impacts of the proposed amendment, including the environmental and economic impacts of reasonably foreseeable methods of compliance (Public Resources Code §21159.)
- Brief Description of the proposed amendment. (23 CCR §3777(a)(1).)
- Discussion of reasonable foreseeable alternatives to the proposed adoption of an SSO. (23 CCR §3777(a)(2); and, Public Resources Code §21159.)
- Discussion of mitigation measures to minimize any significant adverse environmental impacts of the amendment that were identified on the environmental checklist. ((23 CCR §3777(a)(3)), and Public Resources Code §21159.)

Draft Basin Plan Amendment

The draft Basin Plan amendment should include:

- Identification of the changes to the Basin Plan in underline/strikeout format
- A draft Resolution for the Basin Plan amendment

Public Review Process

The Regional Water Board's consideration of a SSO for adoption must follow the public participation requirements associated with the adoption of a Basin Plan amendment (Water Code §13244), CEQA compliance (23 CCR§ 3777), and federal regulatory requirements for the adoption of water quality standards (40 CFR 131.20(b).)

Two public notices are required for a Basin Plan amendment that include the adoption of a new or different water quality standard:

- A Notice of Filing under CEQA that informs the public of the availability of the environmental document (23 CCR §3777) ; and,
- A Notice of Public Hearing under the Water Code that is required to inform the public of the Basin Plan amendment. (Water Code §13244.)

Once the Notice of Filing has been provided, the Regional Water Board may not take any action until after 45 days have elapsed, allowing for public comment. The Regional Water Board must prepare written responses to comments that are received at least 15 days prior to the scheduled hearing. (23 CCR §3779.) If the draft Basin Plan amendment is substantially revised, the Regional Water Board is required to repeat the public notice and review process prior to taking action.

After the Regional Water Board has approved the SSO Basin Plan amendment, the amendment and all supporting documentation (referred to as the Administrative Record) are transmitted to the State Water Board. Attachments include, among other things:

- Copies of hearing notices and filing notices
- Staff reports (draft/final with explanation and rationale for changes between versions)
- SED and environmental checklist
- Public comments and responses
- Copies of hearing exhibits
- List of interested parties

- Documents relied on by the Regional Water Board in adopting amendment (see below under Past Submittal Packages)
- Adopted Basin Plan amendment
- Signed resolution
- Concise summary of regulatory provisions

State Water Board Review

The State Water Board reviews the Regional Water Board's submittal for completeness and compliance with OAL's requirements, as well as technical, policy, and legal consistency. The State Water Board may approve the amendment to the Basin Plan or return it to the Regional Water Board for further consideration and resubmission to the State Water Board at a later date. (Water Code §13245.) Below is a summary of the State Water Board process.

1. State Water Board must act on the submission within 60 days of receipt of the complete administrative record.[3] (Water Code § 13246(a).)
2. If the State Water Board returns the amendment with deficiencies, upon resubmission, State Water Board has 90 days to act on the resubmission. (Water Code §13246(a).)(Id.)
3. State Water Board must either approve the submittal or remand the submittal to the Regional Water Board for further consideration and resubmission to the State Water Board. Upon resubmission, the State Water Board may approve, or after a public hearing in the affected region, revise and approve the amendment. (Water Code § 13245.)[4]
4. State Water Board adds its record of approval to the Regional Water Board's Administrative Record and submits it to OAL.

The State Water Board's Administrative Record typically includes:

- Regional Water Board's transmittal letter
- State Water Board hearing agenda
- Draft State Water Board and adopted Regional Water Board resolutions
- Mailing lists for the State Water Board (hearing)
- Exhibits presented at State Water Board hearing
- Transcripts or recording of any State Water Board meeting agenda item discussed
- Meeting agenda
- Copies of comments received and responses
- State Water Board resolution approving the amendment

[3] This provision applies to a Basin Plan amendment that is not part of an action related to a total maximum daily load (TMDL). If the Basin Plan amendment is part of a TMDL, the State Water Board is allowed more time if the TMDL is considered to be exceedingly complex. (Water Code §13246(b).)

[4] It is unclear whether Water Code 13245 requires a hearing if there are no further Basin Plan revisions. (telephone conversation with Jennifer Fordice, April 30, 2007).

The State Water Board submits the following to OAL[5]:

- Full Administrative record (both from the Regional Water Board and State Water Board approvals.)
- Summary of regulatory provisions adopted or approved (prepared by Regional Water Board for SSO)
- Summary of necessity for regulatory provision (taken from the Regional Water Board staff report)
- Certification by Chief Counsel of State Water Board that action was taken in compliance with applicable laws
- Seven copies of OAL's Form STD 400 Notice of Publication/Regulation Submission

Office of Administrative Law Approval

The Office of Administrative Law is the final reviewing agency for regulatory actions in California prior to EPA review, if the action requires EPA approval, such as SSOs. Basin Plan amendments must be approved by the OAL (Govt. Code § 11353). Government Code 11349.3 defines OAL approval process. The process is as follows:

1. OAL must either approve or disapprove the action within 30 working days of receipt. The action is deemed to be approved if OAL does not act within 30 days. (Govt. Code §11349.3, as applied pursuant to Govt. Code §11353(b)(4).)
2. If OAL approves action, it files it with the Secretary of State
3. OAL's review of the Basin Plan amendment is to determine compliance with the standards of necessity, authority, reference, consistency, clarity, and non-duplication. (Govt. Code §11353(b)(4).)
4. OAL reviews responses to comments to determine compliance with federal public participation requirements. (Govt. Code §11353(b)(4).)
5. If OAL disapproves action, it returns it to the State Water Board with a notice of the reasons for disapproval. (Govt. Code §11349.3, as applied pursuant to Govt. Code §11353(b)(4).)
6. OAL can return the Basin Plan to the Regional Water Board or State Water Board for correction depending on nature of disapproval. (Govt. Code §11349.4, as applied pursuant to Govt. Code §11353(b)(4).)
7. If the State Water Board disagrees with OAL's disapproval, the State Water Board may seek review by the Governor's office. (Govt. Code §11349.5, as applied pursuant to Govt. Code §11353(b)(4).)

Several deficiencies may result in disapproval or delay of the action by OAL. The two primary reasons OAL will disapprove or delay a regulatory rulemaking are outlined below:

1. Regulatory language does not meet one or more of the six factors as is required (necessity, authority, reference, consistency, clarity, and non-duplication). (Govt. Code §11353(b)(4).)
2. State or federal public participation requirements are not met. (Govt. Code §11353(b)(4).)

[5] The State Water Board can not transmit the package to OAL and EPA concurrently. They must submit to OAL first and then to EPA once approved by OAL (phone conversation with Erik Spiess, State Water Resources Control Board, Office of Chief Counsel).

CEQA Notice of Decision

After the Regional Water Board adopts the Basin Plan amendment and the State Water Board and OAL approve the adoption of the SSO, the Regional Water Board files a CEQA Notice of Decision with the Secretary of Resources for public inspection of at least 30 days. (23 CCR §3781.)

EPA Approval

After approval by OAL, the State Water Board transmits the amendment and administrative record with the Chief Counsel's Certification to EPA Region IX for approval[6].

1. Amendments must be submitted to EPA within 30 days of final state approval and certification. (40 CFR §131.20(c).)
2. EPA notifies State within 60 days if it approves the action, or 90 days if disapproving action. (40 CFR § 131.21(a).)
3. If EPA disapproves the amendment to the Basin Plan, EPA must provide the State with an explanation of what changes are needed. (131.21(a)(2).)

The SSO is not effective until the state has received a letter from EPA stating that the adoption of the objective has been approved. If approved, the state SSO would be effective and the federal CTR criterion would also be effective until de-promulgated. Although the state and federal standards can co-exist, the more stringent of the two will be used for permitting purposes.

If the selenium SSO for the Newport Bay watershed is more stringent then the CTR criterion, it is not necessary for the CTR to be amended as the CTR does not apply when state regulations contain a criterion that is more stringent then that contained in the CTR. (40 CFR §131.38(c).) However, if the selenium SSO is less stringent than the CTR criterion, then the SSO is not effective for federal purposes until EPA has de-promulgated the CTR selenium water quality criterion as it applies to the Newport Bay watershed.[7]

Although the CTR de-promulgation process time frame can vary greatly, the steps generally include:

1. Federal Rulemaking Notice – Propose the change to the CTR and request public comment;
2. Obtain public comment for 30 days;
3. Federal Rulemaking Notice – Respond to comments and finalize the action.

Once the de-promulgation process has been completed, the SSO becomes the federal criterion.

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[6] The approval of the SSO will be subject to section 7(a) consultation provisions in the federal Endangered Species Act. If this is a routine consultation, then the USFWS consultation will occur within 135 days pursuant to statutory requirements.

[7] The California Toxics Rule is a federal regulation subject to the provisions of the federal Administrative Procedures Act. (5 U.S.C. §552.) Thus, amendments to the CTR must comply with the federal rulemaking process. The amendment to the federal rule will be subject to section 7(a) consultation provisions in the federal Endangered Species Act. Since this consultation will occur after the initial consultation associated with the approval of the SSO it is expected that this would be expedited.

SSO Submittal Package

The NSMP Working Group needs to anticipate the scope of materials necessary to support the Regional Water Board's review of the SSO submittal and adoption and implementation of the SSO. The Regional Water Board staff must prepare a technical staff report and a substitute environmental document for consideration by the Regional Water Board members and the public before a decision to amend the Basin Plan can be made. (Legal requirements associated with the technical staff report and the substitute environment document are discussed above.) The Regional Water Board will utilize the stakeholder's SSO submittal to develop the staff report. Thus, the Working Group will want to have a number of regulatory requirements met within the SSO submittal package as summarized below.

Federal Rule Summary

Since EPA is the final reviewing agency for an SSO, the submittal package to the Regional Water Board should also meet federal rules governing site-specific objectives. Federal regulations require that States submit to EPA the "methodologies used for site-specific criteria development, any general policies applicable to water quality standards, and any revisions to the standards." (40 CFR §131.20(c).) In addition, water quality criteria must be based on "sound scientific rationale . .. ." (40 CFR §131.11.) Lastly, States should establish numeric criteria "based on 304(a) Guidance modified to reflect site-specific conditions [and] [o]ther scientifically defensible methods." (40 CFR §131.11(ii),(iii); See also EPA's Water Quality Standards Handbook (1994), Chapter 3, Water Quality Criteria.)

External Peer Review

Health and Safety Code Sec. 57004 requires external peer review of the scientific basis of a Basin Plan amendment before adoption by the Regional Water Board. Pertinent parts to Section 57004 include:

- A definition of "scientific basis";
- Provisions governing agreements for conducting the external scientific peer review;
- Limitations upon the scientific peer reviewer(s); and
- Conditions for final actions by the Regional Water Board to adopt the final version of a rule.

Although the NSMP Working Group received technical review from an Independent Advisory Panel to assist in the determination of whether or not the Working Group should pursue the development of site-specific objective (SSO) for selenium, the Panel members can not serve as the external peer reviewers. The primary reason why they can not serve is because the peer review statute forbids a person from participating as an external scientific peer reviewer for the scientific portion of the rule if that person participated in the development of the scientific basis or scientific portion of the rule. (Health & Safety Code §57004(c).)

The Regional Water Board must ensure that external peer review is conducted on the proposed SSO for selenium prior to any final agency action taken by the Regional Water Board.

Water Code Sec. 13241

California Water Code section 13241 identifies six factors that the Regional Water Board must be considered when establishing a water quality objective. Thus, the submittal needs to obtain sufficient information for the Regional Water Board to consider the following factors:

- Past, present and probable future beneficial uses of water;
- Environmental characteristics of the hydrographic unit under consideration, including the quality of water available thereto;
- Water quality conditions that could reasonably be achieved through the coordinated control of all factors that affect water quality in the area;
- Economic considerations;
- The need for developing housing within the region; and
- The need to develop and use recycled water

Water Code Sec. 13242

- In addition to considering the factors as identified above, California Water Code section 13242 requires the Regional Water Board to adopt a program of implementation for achieving the water quality objectives. The program for implementation is required to contain, at a minimum, the following elements: A description of the nature of actions which are necessary to achieve the objectives, including recommendations for appropriate action by any entity, public or private;
- A time schedule for the actions to be taken; and
- A description of surveillance to be undertaken to determine compliance with objectives.

Antidegradation Policy: Conformance with Federal and State Antidegradation Policies

The federal antidegradation policy requires the State to develop and adopt a statewide antidegradation policy. (40 CFR §131.12.) The State's antidegradation policy (SWRCB Resolution 68-16) has been determined to be consistent with the federal regulatory requirement. Application of the federal antidegradation policy, and therefore the State's policy, is triggered when there is a lowering of surface water quality. (Memorandum to Regional Board Executive Officers from William R. Attwater, Chief Counsel, State Water Resources Control Board (October 07, 1987) at p. 3.)

The adoption of an SSO that is less stringent than an established objective may be considered to lower water quality. (Letter to Gerard Thibeault from Catherine Kuhlman, Acting Deputy Director, Water Management Division, U.S. EPA, Region IX (October 21, 1992).) If it is determined that adoption of the SSO will lower water quality, the subsequent antidegradation analysis, if necessary, will vary on a case-by-case basis. In some cases, a simple analysis will suffice, while in others, a comprehensive analysis may be required. No antidegradation analysis is required if the Regional Water Board determines that there is no reason to believe that ambient water quality will be reduced. Even then, antidegradation findings, and the basis for these findings, must be documented in the administrative record for a proposed site-specific objective.

In the case of a proposed selenium SSO for the Newport Bay watershed, a review must be conducted to determine whether the implementation of the objective would result in a lowering of water quality in any areas of the watershed, such as those surface waters where current ambient selenium quality conditions are relatively good. If a lowering of water quality would result, then an antidegradation analysis would be required.

A simple analysis would suffice if the Regional Water Board finds that the change in water quality would be insignificant, that is, minor or temporally or spatially limited. Findings to support this conclusion would have to be included in the administrative record for the SSO. A comprehensive antidegradation analysis would be required if the Regional Water Board finds that the change in water quality is significant. The lowering of water quality can be allowed, provided that the comprehensive analysis demonstrates that it (1) will not unreasonably affect present and anticipated beneficial uses (SWRCB Resolution 68-16.); (2) will not result in water quality less than that prescribed in policies (Id.); and, (3) is consistent with maximum benefit to the people of the state. Implementation of best practicable treatment and control of all discharges is a prerequisite to consideration of allowing lower water quality where the water is considered to be of high quality. (SWRCB 68-16.)

California Environmental Quality Act (CEQA)

The Regional Water Board will prepare a SED that includes an Environmental Checklist for the proposed Se SSO Basin Plan amendment. The SED, along with the technical report(s) and response to comments, will address CEQA and, in part, public participation requirements. The Regional Water Board is expected to utilize the Working Group's SSO submittal to develop both the technical staff report(s) and SED. Thus, the Working Group should provide the requisite information and analysis within the SSO submittal package, as summarized below.

State regulations require a Basin Plan amendment proposed for Regional Water Board approval to be accompanied by a completed Environmental Checklist and a written report containing (1) a brief description of the proposed activity; (2) reasonable alternatives to the proposed activity; (3) analysis of the impacts of those alternatives and comparison to the impacts associated with the SSO; and (4) mitigation measures to minimize any significant environmental impacts of the proposed activity. (23 CCR §3777.)

Although in the past the environmental checklist and limited supporting information were deemed sufficient to meet the requirements of CEQA, in the case *City of Arcadia v. State Water Resources Control Board* the court held, in part, that the Regional Water Board failed to prepare adequate documentation and therefore failed to comply with CEQA. (135 Cal.App.4th 1392, 1426 (2006).) The court held that a full environmental impact report (EIR), tiered EIR or the functional equivalent, were necessary because evidence in the record supported a fair argument that the project may have a significant environmental impact.

The case has had far-reaching effects regarding the environmental documentation that is required from the Regional Water Boards and has resulted in the need to conduct a much more thorough analysis. Thus, it is anticipated that the Regional Water Board will need to prepare a Substitute Environmental Document that resembles a full EIR and alternatives analysis for the selenium SSO Basin Plan amendment. Based on recent Regional Water Board submittals, the SED shall at a minimum include:

- A completed environmental checklist (23 CCR §3777);
- A brief description of the proposed activity (23 CCR §3777);
- Analysis of reasonably foreseeable environmental impacts;
- Analysis of reasonably foreseeable alternatives for the proposed activity and for means of compliance (23 CCR §3777; and Public Resources Code §21159);

- Analysis and inclusion of reasonably foreseeable mitigation measures to minimize any significant adverse environmental impacts of the proposed activity (23 CCR §3777; and Public Resources Code §21159);
- An environmental analysis which shall take into account a reasonable range of environmental, economic, technical factors, population, geographic areas, and specific sites. (Public Resources code §21159.)

Examples of Past Submittals to Regional Water Boards

Under Regional Water Board direction, past submittals of TMDL packages (which would be similar to those items necessary for an SSO) have included the following:

- A list of all references in the TMDL report
- Hard copies of each document referenced in the report, including the page referenced, or the whole document if the whole document was referenced
- Agendas for all meetings and the meeting notes for each meeting
- Spread sheets, data, and any models and calculations used as part of the study on Compact Disk.

Summaries of elements of related SSO report and submittal packages are identified below.

Copper SSO for San Francisco Bay

The draft copper SSO staff report for the San Francisco Bay (March 2, 2007) included the following:

- Regulatory Authority
- Project Description
  - Definition and Necessity
  - Project Objectives
- Project Background
  - Physical Setting
  - Sources and Loads
  - Transport and Transformation
  - Ambient Conditions
  - Technical Uncertainties
- Technical Background
  - Need for SSO
  - SSO and Translators
  - Special Studies & Calculations
  - SSO Recommendation
  - Impairment Assessment Findings
  - Potential Impact of Effluent Limits
- Implementation Plan
  - Control Measures for Sources in Watershed
  - Measures to Resolve Remaining Uncertainties
  - Ambient Monitoring and Concentration triggers
  - Information to Support Management Strategy
  - Basin Plan Language Update
- Regulatory Analysis
  - California Water Code 13241
  - Peer Review
  - Environmental Analysis
  - Antidegradation
- References
- Attachments – Basin Plan Update, Tables and Figures, Environmental Checklist

Based on past SSO technical report submittals, it is likely that the NSMP Working Group technical report will be structured similarly and incorporate information from and/or reference the following primary NSMP supporting documents. It should also be recognized that additional work efforts will supplement the primary NSMP supporting documents; however, these will provide much of the foundation of the technical report.

The X's below generally indicate that the NSMP primary supporting document(s) will provide much, if not all, of the information that should be included for each main report section (Introduction, Project Description, Project Background, etc.). A more detailed analysis of what should be included in the technical report and the information available in the primary NSMP supporting documents will be developed during Year 3. The detailed analysis will also identify the technical appendices which will include other NSMP-based documents that are relevant such as the selenium speciation report.

Report Sections	**Primary NSMP Supporting Documents**										
	Order R8-2004-0021 & NSMP Work Plan	Identification of Data Gaps for Se	Conceptual Model for Se	Sources and Loads for Selenium	Monitoring Data & Bioavailability of Se	Assessment of Technologies & Pilot Testing	Modeling and BMP Implementation Plan	Water Quality Credit Trading	Rationale for Se SSO	Development of Se SSO	Independent Advisory Panel Reports
Introduction • Regulatory Authority • Report Organization	X										
Project Description • Definition and Necessity • Project Objectives	X				X	X			X		X
Project Background • Physical Setting • Sources and Loads • Transport and Transformation • Ambient Conditions • Technical Uncertainties	X	X	X	X	X	X					

Report Section	Primary NSMP Supporting Documents										
	Order R8-2004-0021 & NSMP Work Plan	Identification of Data Gaps for Se	Conceptual Model for Se	Sources and Loads for Selenium	Monitoring Data & Bioavailability of Se	Assessment of Technologies & Pilot Testing	Modeling and BMP Implementation Plan	Water Quality Credit Trading	Rationale for Se SSO	Development of Se SSO	Independent Advisory Panel Reports
Technical Background • Need for SSO • SSO and Translators • Special Studies & Calculations • SSO Recommendation • Impairment Assessment Findings • Potential Impact of Effluent Limits									X	X	
Implementation Plan • Control Measures for Sources in Watershed • Measures to Resolve Remaining Uncertainties • Ambient Monitoring and Concentration triggers • Information to Support Mgmt Strategy • Basin Plan Language Update							X	X		X	
Regulatory Analysis • California Water Code 13241 • Peer Review • Environmental Analysis • Antidegradation											X
References	X	X	X	X	X	X	X	X	X	X	X
Attachments – Basin Plan amendment, SED with Environmental Checklist, Reports											

Time Schedule Compliance Options

The short-term groundwater discharge permit (Order No R8-2004-0021) for the Newport Bay Watershed contains discharge limitations for selenium. However, the permit allows the dischargers participating in the NSMP Working Group five years to comply with interim performance based limits, which include a determination if an SSO for selenium is warranted and, if warranted, the development of an SSO. Pursuant to the permit, the SSO must be developed and submitted to the Regional Water Board by June 17, 2009. This schedule is based on the compliance date specified in the permit for compliance with the final numeric selenium effluent limitations. The schedule was also based on the compliance schedule provisions of the CTR and SIP, which allows up to five years from the date of permit issuance to achieve compliance with final effluent limitations based on the CTR objectives. However, the SSO will not have gone through the entire adoption process by December 20, 2009, when the permit expires. As such, subsequent renewal of the permit must require immediate compliance with the numeric effluent limitations unless permit compliance relief can be obtained.

The dischargers essentially have four (4) options that would allow them time necessary to come into compliance with the selenium SSO. The options presented below may be exercised individually or in conjunction with each other and are as follows:

Option 1: The Regional Water Board adopts an enforcement order pursuant to the California Water Code concurrently with issuance of a renewed permit for short-term groundwater discharges.

The Regional Water Board has the discretion to adopt enforcement orders that may extend the compliance schedule for a permit limitation as long as the discharger(s) is complying with the enforcement order. There are two enforcement order provisions in the California Water Code that the Regional Water Board may consider using in this circumstance.

- A time schedule order (Water Code §13300) OR
- A cease and desist order. (Water Code §13301)

In both cases, the Regional Water Board will require the dischargers to submit a detailed time schedule of specific actions the dischargers intend to take to correct or prevent a violation of applicable discharge limitations.

In California, the violation of an effluent limitation in an NPDES permit may be subject to mandatory minimum penalties (Water Code §13385.). The Regional Water Board's adoption of an enforcement order may protect dischargers from mandatory minimum penalties as long as certain requirements are met. To avoid the application of mandatory minimum penalties, the enforcement order must:

1) Specify the actions the discharger is required to take to correct the violations;

2) Be for an effluent limitation that is a new, more stringent, or modified regulatory requirement that has become effective after the date of the waste discharge requirements and new or modified control measures are necessary in order to comply with the effluent limitation, and the new or modified control measures cannot be designed, installed and put into operation within 30 calendar days;

3) Establish a time schedule for bringing the waste discharge into compliance with the effluent limitation that is as short as possible; and

4) Not exceed five years in length. If the compliance schedule exceeds one year from the effective date of the order, the schedule must include interim requirements and compliance dates. The interim requirements must include effluent limitation for the pollutant(s) of concern and actions and milestones leading to compliance with the effluent limitation.

(Water Code §13385(j)(3).)

A time schedule order or cease and desist order adopted concurrently with the adoption of a renewed short-term groundwater discharge permit, may allow additional time to bring the discharge into compliance with the selenium discharge limitations. The enforcement order would require that the dischargers implement a plan and schedule to achieve compliance. This schedule would likely allow for the adoption of a site-specific objective for selenium and the development of a plan for the dischargers to come into compliance with effluent limitations based on the SSO.

The primary draw back from using the enforcement order options are that they may not protect dischargers from citizen suits that claim the dischargers are in violation of the short-term groundwater discharge permit's discharge limitations for selenium after December 20, 2009. While the dischargers are protected from the state's assessment and application of mandatory minimum penalties, the dischargers may be challenged by non-governmental interests claiming that they are in violation of the permit effluent limitation and therefore subject to the citizen suit enforcement provisions contained in the Clean Water Act.

Option 2: The Regional Water Board adopts a revised TMDL and/or an implementation plan for the existing TMDL. In this case, the U.S. EPA would need to approve the TMDL and the compliance schedule provisions pursuant to Clean Water Act provisions 303(c) for those provisions to become effective. The short-term groundwater discharge permit would be amended to reflect the new compliance schedule provisions.

The Regional Water Board's adoption of a TMDL or a TMDL implementation plan that contains a compliance schedule provision that is subsequently submitted to US EPA for review and approval may also provide the basis for additional compliance schedule relief. The State Water Board has recently advised that compliance schedule provisions in a TMDL implementation plan that differ from existing compliance schedule authorizations must be submitted to US EPA for review and approval pursuant to Clean Water Act sections 303(c) and 303(d)[8]. This position has been recently been reiterated through communications issued to the State by US EPA in its review of the Mercury TMDL for the San Francisco Bay.[9]

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[8] Memorandum to Celeste Cantu, Executive Director, State Water Resources Control Board from Michael Lauffer, Chief Counsel, State Water Resources Control Board (September 15, 2006), p. 6.

[9] Letter from Alexis Strauss, Director, Water Division, US EPA Region IX to Song Her, Clerk to the Board, State Water Resources Control Board (April 2, 2007).

> [W]e noted that the implementation plan allows up to 20 years to achieve final municipal and stormwater waste load allocations (WLAs), and that if this schedule is to be implemented through compliance schedules in NPDES permits, the State will need to submit to EPA, and EPA will need to approve, a compliance schedule-authorizing provision under Clean Water Act Section 303(c). The provision will need to be approved before the State can allow dischargers to exceed water quality-based effluent limitations (WQBELs) based on final WLAs in permits, including the watershed permit on which the Regional Water Board is currently taking comment. The implementation plan contains language, which indicates the Regional Water Board's rationale to allow for implementation (compliance) schedules of up to 10 years to achieve interim WLAs and up to 20 years to achieve final WLAs. Any authorizing compliance schedule provision must be consistent with EPA regulations at 40 CFR §122.47, which require that the compliance schedule be appropriate, require compliance as soon as possible, and include interim requirements at specified time intervals. Therefore, when the State Water Board submits the compliance schedule-authorizing provision to EPA, it should clearly indicate how these requirements have been satisfied, or how they will be satisfied during the permit process.

Thus, in the case of the San Francisco Bay's mercury TMDL, EPA has indicated that if the TMDL implementation plan includes compliance schedules that are intended to be implemented in NPDES permits, then EPA must approve the compliance schedules under its Clean Water Act authority. The same analysis would hold true for a selenium TMDL for the Newport Bay watershed that includes compliance schedules that are intended to be implemented in NPDES permits.

Option 3: The Regional Water Board includes a compliance schedule in the site-specific objective.

In accordance with the SIP, the short-term groundwater discharge permit authorizes a compliance schedule for the final selenium discharge limitations. (SIP at p. 20.) The permit establishes individual deadlines for tasks included in the Work Plan and allows dischargers until December 20, 2009 to complete actions necessary to comply with the final discharge limitations, which includes the development and adoption of a site-specific selenium objectives.

The SIP limits the duration of compliance schedules with effluent limitations based on CTR criteria for point source dischargers to five years from the date of permit issuance or modification. (SIP at p. 20.) However, the SIP recognizes that a SSO may contain a compliance schedule that is separate and distinct from the compliance schedule adopted into a permit pursuant to the SIP. "A Regional Water Board may include a compliance schedule in a water quality standard based on a site-specific objective. Such a compliance schedule is separate and distinct from the compliance schedules established by this Policy." (SIP, footnote 7 at p. 32.) If included as a part of the SSO, the compliance schedule would need to be approved by EPA and meet federal regulatory requirements that govern schedules of compliance. (40 CFR §122.47.)

Option 4: The US EPA amends the CTR and extends the compliance deadline for selenium as it is applied to the San Diego Creek/Newport Bay Watershed.

Although unlikely, another option for consideration would be for EPA to amend the CTR through its federal rulemaking process. The EPA would need to amend the compliance schedule provisions contained in 40 CFR §131.38(e)(6) by extending the five-year compliance schedule limitation as well as the sunset clause contained at 40 CFR §131.38(e)(8). The State Water Board would need to review and revise the SIP if necessary to address CTR modifications approved by EPA. Even if pursued by these agencies, any such modifications by EPA, and thence the State Water Board, are not likely to be accomplished within the time frame needed to address the existing compliance schedule issues.

* * * * *

Ideally, one or more of these options (Options 1 – 4) would be implemented by the Regional Water Board prior to December 20, 2009 or concurrently with the permit renewal. Once the selenium discharge limitations become effective, dischargers become immediately liable for any violation thereof and the Regional Water Board will need to consider the federal regulatory anti-backsliding provisions before adopting a new limitation that is less stringent than the limitation currently in existence. (40 CFR §122.44(l).) It is very difficult to adopt a less stringent limitation if the discharge has complied with the more stringent limitation at any time in the past. However, there are exceptions to the anti-backsliding regulations, including the development of a TMDL that allows less stringent effluent limitations to be specified provided that water quality standards are achieved. (Clean Water Act §303(d)(4)(A), as codified by 33 U.S.C. 1313(c)(d)(4)(A).) Antidegradation requirements would also have to be considered. (Id.) In short, compliance schedule relief would ideally be provided prior to the effective date of the selenium effluent limitations, either through an enforcement order or the adoption and approval of a TMDL implementation plan that includes a compliance schedule (subject to EPA approval).

Technical Elements

Introduction

This task is iteratively linked to Task 5.2.3, Model Design, Calibration, and Revision. The modeling work builds on the database and summaries of the last few years beginning with the Conceptual Model (CH2M HILL, 2006a), documentation of Sources and Loads and associated data gaps (CH2M HILL, 2006b), the Bioavailability report (CH2M HILL, 2006c), and the description of the Multiple Lines of Evidence Approach to BMP Implementation (CH2M HILL, 2007). The latter report provides a summary of watershed assessment areas that is described in further detail below.

Previous reports have described the locations and extent of screening-level toxicity threshold exceedances for selenium concentrations in water, sediment, and biota tissues. For modeling purposes, the information used in those reports is summarized by assessment areas and season to better understand changing exposure and risk from selenium throughout the watershed. In so doing, the database is specifically designed to meet the data needs for modeling and to describe data gaps.

Goals and Justification

There must be clear goals for the development of the SSO. In addition, any modeling or other scientific evaluations of watershed data must be structured in support of those goals. The primary concerns relate to the appropriateness of adopted water quality criteria for selenium to adequately describe the levels of protection needed for the Newport Bay watershed freshwater and marine habitats. The important questions relating to the goals for the Newport Bay watershed SSO are:

- What evidence is used to justify an SSO? And;
- What values are reasonable for a protective SSO for the watershed and Bay?
- If a SSO is justified, are multiple SSOs required based on differences in habitats or should the SSO be one value, protective of all habitats?

Possible justifications for the SSO, as developed from the NSMP work products, are twofold:

1. Loadings to Newport Bay do not result in concentrations exceeding marine ambient water quality criteria (or risk) even though water quality in the creek typically exceeds freshwater criteria.
2. Selenium concentrations in the watershed exceed water quality criteria but the selenium appears to be of low physical, chemical, or bio-availability.

The following sections describe the data analysis and modeling approach to be used in addressing questions regarding SSO goals and justifications.

Assessment Areas

Assessment areas were created based on the fact that selenium exposure and risk in the watershed fall into logical categories based on significant differences in receptor occurrence and food chain availability, habitat value, and selenium concentrations, similar to the combined hazard rating scores in the San Francisco Bay model (Presser and Luoma, 2006). The assessment areas (shown in **Figure 1**) are grouped into four general categories (**Table 1**).

The concept for creating assessment areas, as quantified in the BMP Multiple Lines of Evidence report (CH2M HILL, 2007), is that some areas of this urban watershed provide limited habitat value although they have intermittently elevated selenium concentrations. Alternatively, the areas of greatest habitat value (off-channel wetlands, lower reach of San Diego Creek, and the bay) have relatively lower ambient selenium concentrations but may have greater food-chain risk because of higher habitat value and greater abundance of fish and birds. These assessment areas naturally group into four generalized categories based on habitat and average selenium concentrations (**Table 1**).

Currently, the habitat categories in **Table 1** are grouped broadly, on the basis of best professional judgment resulting from field visits to the sites. In the future, habitats may be categorized through standard photo documentation and/or GIS quantification of channel and riparian area lengths and widths.

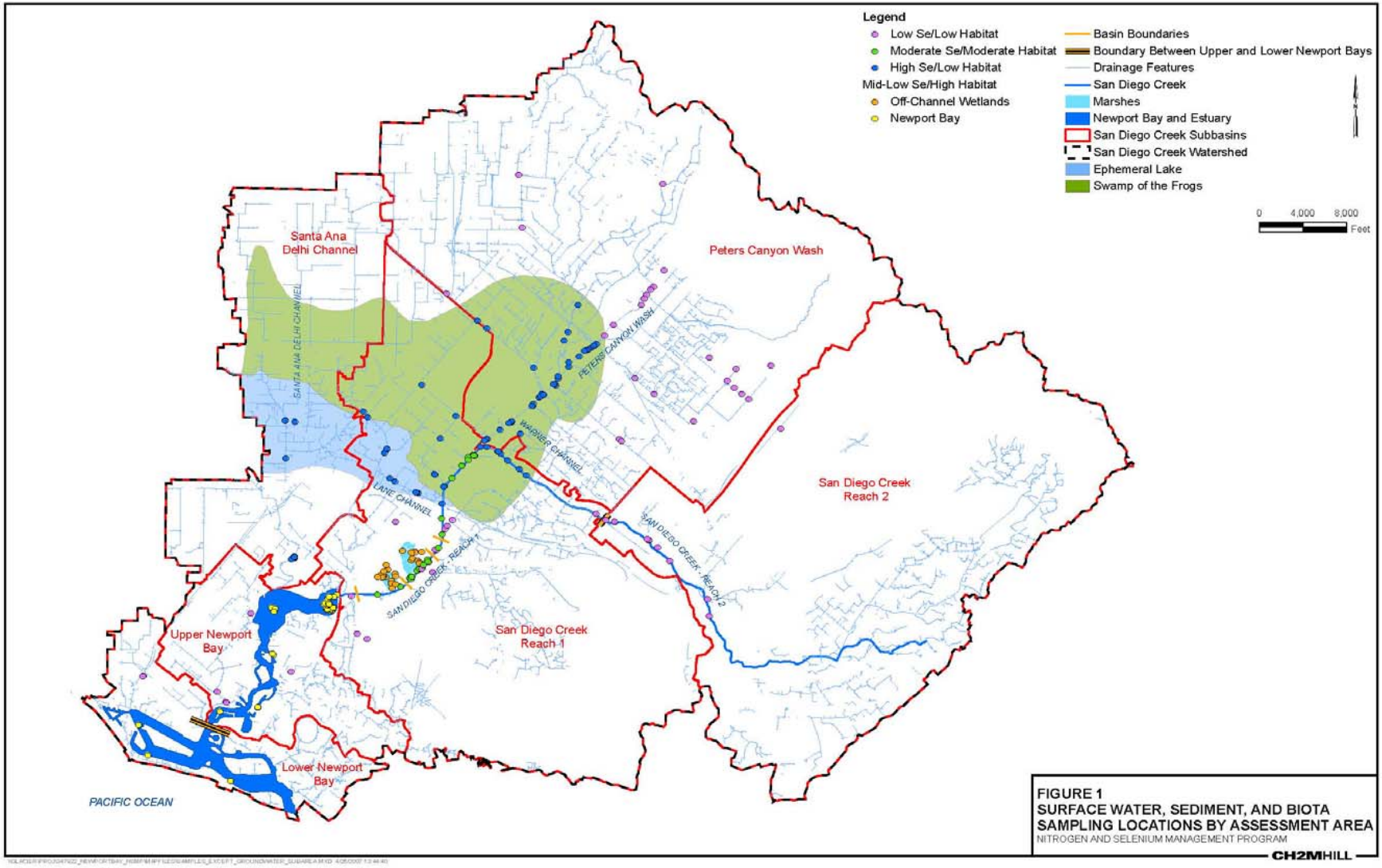

Figure 1. Surface Water, Sediment, and Biota Sampling Locations by Assessment Area

Table 1. Newport Bay Watershed Assessment Areas for Selenium SSO Modeling

Assessment Area	Habitat Type	Receptors	Preliminary Selenium Concentrations*	Assessment Category
Upper SDC (above Swamp of Frogs)	Channelized; riparian	Riparian; limited shorebirds and waterfowl; limited fish	Low	Low Se/Low-medium Habitat
Upper PCW (above Swamp of Frogs)	Channelized; limited substrate and riparian	Limited shorebirds and waterfowl; limited fish	Low	Low Se/Low Habitat
Non-marsh drains (outside of Swamp of Frogs)	Concrete channels; intermittent water	Limited, temporary	Medium	Low Se/Low Habitat
Marsh drains (draining Swamp of Frogs)	Concrete channels; intermittent water	Limited, temporary	Highest	High Se/Low Habitat
Lower SDC	Open channels, pools	Riparian; shorebirds, waterfowl, and piscivorous birds common; abundant fish	High	Moderate Se/Moderate Habitat
Lower PCW	Sloping channel; limited substrate and riparian; shallow	Limited shorebirds and waterfowl; limited fish	Highest	High Se/Low Habitat
SADC	Concrete channel; intermittent water	Limited, temporary	Medium	High Se/Low Habitat
Off-channel wetlands	Freshwater wetlands, open water	Shorebirds and waterfowl; limited fish	Medium-high	Mid-Low Se/High Habitat
Upper Bay	Open water, tidal, estuarine	All categories	Low-medium	Mid-Low Se/High Habitat
Lower Bay	Open water, tidal, estuarine	All categories	Low	Mid-Low Se/High Habitat
Upper Bay channels	Concrete channels; intermittent water	Limited, temporary	Low	Low Se/Low Habitat
Lower Bay channels	Concrete channels; intermittent water	Limited, temporary	Low	Low Se/Low Habitat

*Mean concentrations: Low = < 3, medium = 3 - 12, high = 12 – 20, highest = > 20 ug Se/L

Modeling Requirements

In order to effectively model selenium transport, fate, exposure, and risk in the watershed, input values are needed for seasonal concentrations of selenium in water, waterborne particulates, surficial sediment (approximately top 3 inches, i.e., most bioavailable zone), aquatic invertebrates, fish, and birds (including their eggs). In addition, seasonal flow and loading data from the watershed to Newport Bay are needed. Data gaps have been identified as part of the Sources and Loads and Bioavailability reports (CH2M HILL 2006b and 2006c). Specific needs of the Presser and Luoma (2006) model as adapted for Newport Bay watershed include:

- Conceptual model of selenium transfer pathways for all assessment areas and categories of the watershed
- Seasonal pattern of waterborne selenium concentrations and loads, including dissolved and particulate fractions, throughout the watershed. Loading will have to be compared to in-bay concentrations to verify the loading and bay blending portion of the model.
- Patterns of waterborne selenium chemical speciation (selenate, selenite, organic forms)
- Seasonal and interannual patterns of waterborne selenium concentrations and loads
- Surficial sediment concentrations of selenium in areas of abundant receptors and primary food chain exposures
- Selenium speciation in suspended matter
- Knowledge of the presence, absence or abundance of species that are potential sources of selenium for predators
- Biodynamic modeling for invertebrates, including assimilation efficiency, ingestion rates, and efflux rates
- Food chain biota tissue concentrations of selenium (in algae, plants, aquatic invertebrates, fish)
- Larger fish and bird tissue concentrations of selenium (predators)
- Choice (for model) of key species of dietary items and predators for predictions of uptake, exposure, and risk.

Understanding the biotransfer of selenium is essential for evaluating the effects of selenium on ecosystem resources. The linked approach presented in the San Francisco Bay-Delta Selenium Model (Luoma and Presser, 2000; Presser and Luoma, 2006) considers progressive modeling of selenium through water-column loads, concentrations, and speciation; particulate matter transformation and bioavailability; the biodynamics of bioaccumulation in prey; and trophic transfer to predators (**Figure 2**). This approach can conceptualize and model selenium through site-specific foodwebs and determine the vulnerability of predators important to ecosystems. This approach can be used to generate forecasts of how selenium moves through a watershed and estuary based on selected management and regulatory options (**Figure 3**).

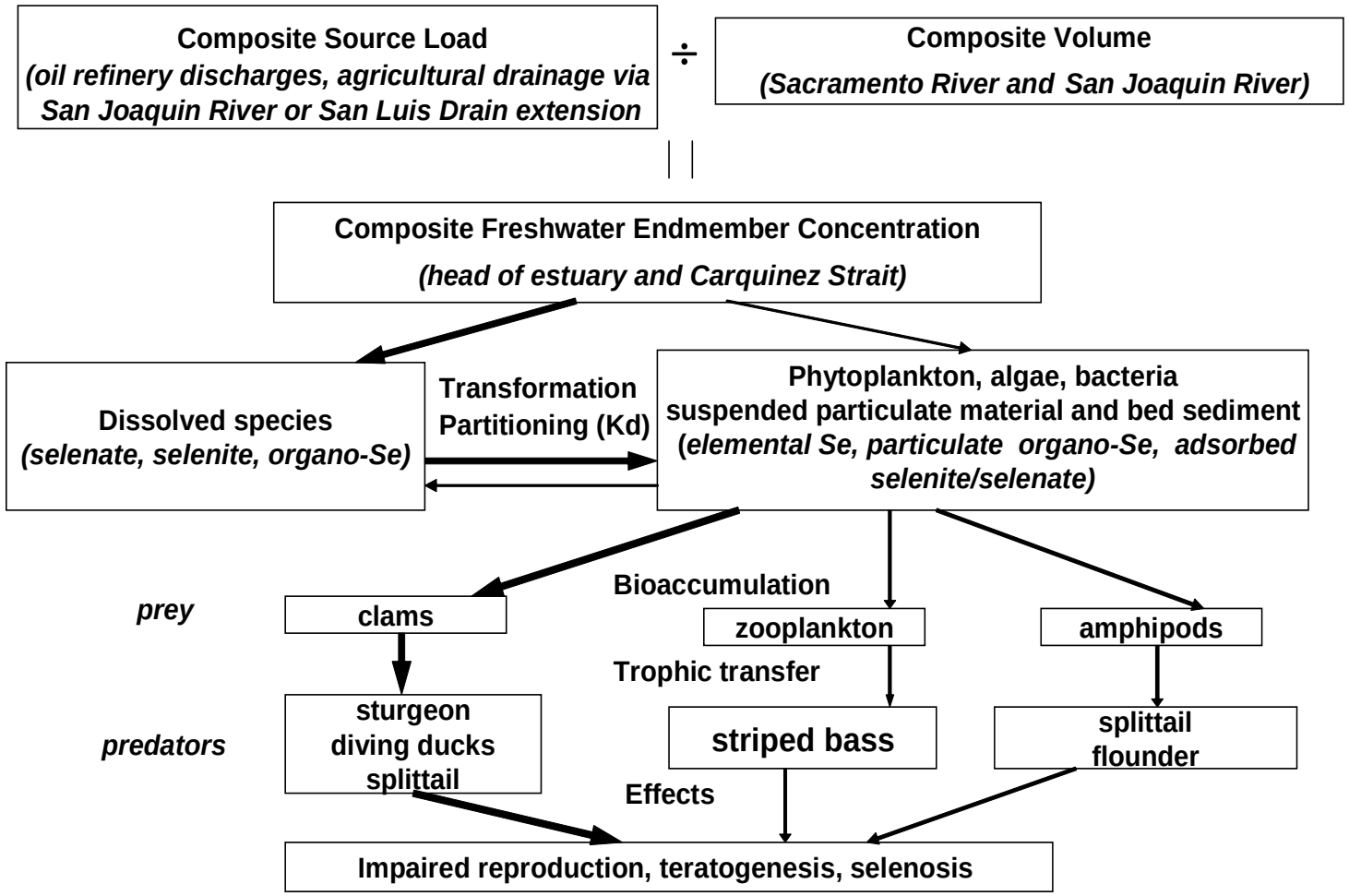

Figure 2. Conceptual model describing linked factors that determine the effects of selenium on ecosystems. The sequence of relations links environmental concentrations to biological effects.

Figure 2. Bay-Delta Selenium Conceptual Model

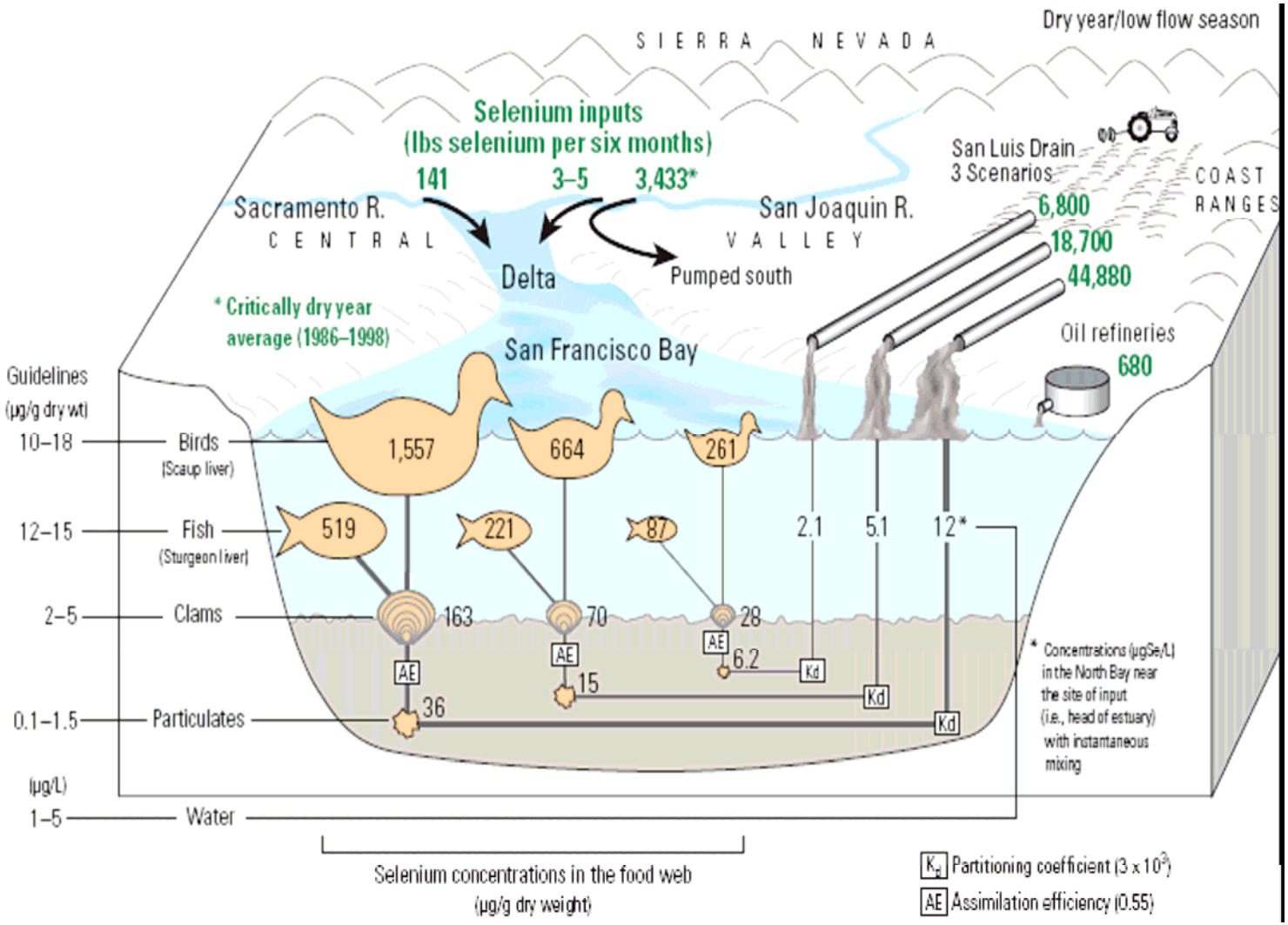

Figure 3. Example: Bay-Delta Selenium Model Output; Loads and Concentrations.

Two important components of the approach presented in the Bay-Delta Selenium Model are the partitioning of selenium between water and sediment (Kd) and the biodynamic bioaccumulation model. Uptake of dissolved selenium and recycling of selenium can result in efficient partitioning in particulate material (i.e., phytoplankton, detritus, and sediment). The distribution coefficient (Kd) is the ratio of selenium per unit mass particulate material to selenium per unit volume water in equivalent units. Speciation of dissolved selenium and transformation reactions of dissolved selenium to particulate selenium have a combined influence on the distribution of selenium. The model uses partitioning coefficients representative (from the literature) of different watershed and estuary environments, and brackets the range of such coefficients seen in each type of environment. Knowledge of speciation also is used in selecting possible transformation coefficients.

Selenium bioaccumulates in foodwebs principally through dietary exposure, with tissue selenium attributable to dissolved exposure making up only a small percentage of overall selenium. Biodynamics (kinetic bioaccumulation models) best represents how selenium is processed through food webs (Stewart et al., 2004; Schelkat et al., 2004; Luoma and Rainbow, 2005; **Figure 4**). Biodynamic modeling is based on the physiology of invertebrates ingesting particulate matter. Factors for modeling are derived from laboratory experiments that determine assimilation efficiency (AE), ingestion rate (IR), growth (g), and efflux rate (ke).

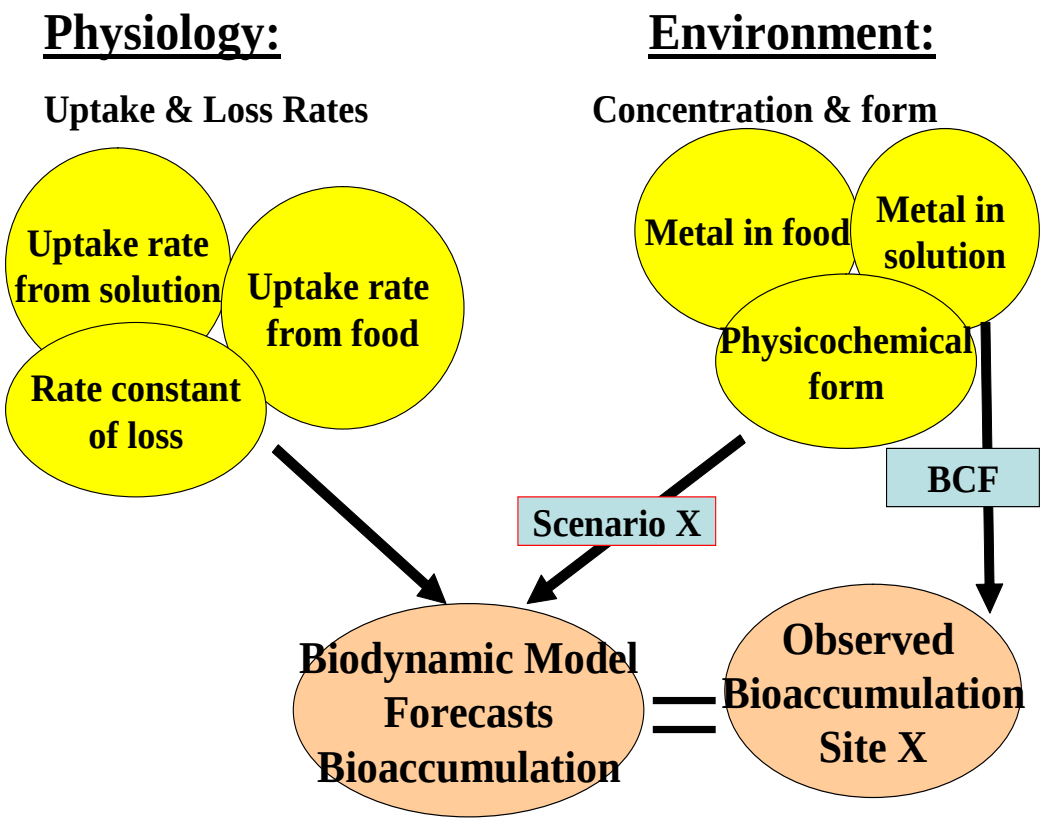

Figure 4. Diagram of Basic Model Structure

Using the Model for the SSO Process

An early stage in the SSO process will be clearly identifying the factors that will be used to technically evaluate and justify an SSO. Two considerations in determining a specific value for an SSO are compliance with criteria and bioavailability. It is well established that many freshwater values exceed the EPA ambient water quality criteria of 5 µg/L. Average dissolved concentrations are below criteria in the most upstream reaches, but are more elevated from the area with known Se inputs from groundwater and from that area downstream. Designations quantifying "low, moderate, high, and highest" could aid evaluations of downstream trends. In addition, water concentrations from upper and lower Newport Bay are well below the EPA salt water criteria of 71 µg/L. An important use of the Presser-Luoma model will be to evaluate if the salt water criteria are relevant. In this case, one calculation would employ dissolved concentrations that approach the criteria using speciation from the Bay to define partition coefficients. Invertebrate bioaccumulation will be calculated for several such concentrations. Bioaccumulation would be evaluated based upon real data from other estuarine ecosystems and risk posed to predators by such concentrations.

Special characteristics of the watershed will be considered when evaluating bioavailability in the model. For example, the presence of some high Se concentrations in invertebrate food items may be limited to areas of the watershed with limited bird foraging habitat or intermittently wet channels that provide limited fish habitat. Exposure and risk must take foraging areas into account. Invertebrates other than bivalves may be primary receptors to consider for food chain effects in the freshwater portions of the watershed. In addition, it has been suggested that the aerated and less organically-enriched flowing water habitats of the watershed act to limit Se bioavailability by favoring less bioavailable species. The limited data on watershed Se speciation support that hypothesis, and such information will be taken into account.

Preliminary evaluations suggest that existing speciation, partitioning, and physiological data from the Bay (and its life forms) could be used to forecast Se bioaccumulation by at least some invertebrate species known to occur in the Bay. Scenarios could be constructed where bioaccumulation is forecast from water concentrations ranging from values lower than those presently occurring to concentrations approaching the criterion. Such scenarios would be useful in helping test whether compliance is an adequate basis for concluding that the Se entering the Bay are not of concern. The California Fish and Game (CDFG) data from the Bay (not yet available) will be useful in validating the modeling exercise.

In contrast, modeling in the watershed will be more complex. Fewer physiological coefficients exist for local species and biological data on Se concentrations are scattered among a variety of species with a limited number of station-to-station Se consistencies. A careful comparison of data among sites and times will be necessary in the early stages of analysis to develop methods for this evaluation. CDFG data will be a useful addition here as well. A similar effort will be necessary to develop comparisons among fish and bird egg data.

Several additional considerations will be necessary in evaluating bioavailability:

Habitat: Preliminary characterization suggests habitat utility for birds and fish (defined by some measure of how intensively the habitat is used) may vary widely among locations in the watershed. Quantification of such differences could be useful in developing risk management strategies for different locations. It will also be necessary that managers, in discussions with the technical team, make some decisions about how to protect specific habitats. What are criteria for defining the most vulnerable habitats and which habitats fit that designation? Should one value based on the most sensitive habitat make up the SSO? Can multiple values be justified for the watershed in order to facilitate risk management strategies?

Which species to protect: While birds are an obvious, high profile concern in this habitat, preliminary data suggest that fish may be exposed to higher concentrations of Se relative to literature-derived risk levels than are birds. Science-based policy decisions are necessary to determine risk management strategies that protect both and evaluate any tradeoffs involved. As a hypothetical example, if birds are less exposed because the large ranges over which they feed dilute exposures to Se, then physical protection of bird habitat within the watershed may be more important than elimination of Se exposure. But the same strategy may not alleviate exposures of fish. In addition, fish exposure and risk may be highly affected by storm events and scouring of the channels that may act to completely restructure the freshwater community on a periodic basis. A holistic analysis will be necessary to evaluate such tradeoffs.

Are some windows of time more important than others: The small amount of biological Se concentrations comparing wet and dry seasons shows the highest concentrations in the former; but loadings and dissolved concentrations over several years show very inconsistent differences between the wet and dry seasons. Models might be useful in evaluating the causes of such differences. Ecological analysis could help determine if there are important temporal windows for the species of most concern in the watershed. Policy decisions will be necessary to determine if the modeling and analysis of field data would be more important from some time periods than from others.

Data Gaps

Some areas of the watershed are well characterized in terms of receptors, habitats, and selenium exposure, but others are not. In particular, the habitat value and bird use of some of the areas of highest selenium concentrations are not known, although they are assumed to show low use. Seasonality of selenium exposure and risk is poorly known. The conceptual models could be redone to reflect the four general assessment categories (five, if the bay and off-channel wetlands are considered separately). The individual species (fish, birds) at greatest risk and/or consistently exhibiting the highest levels of selenium bioaccumulation are not yet identified from the watershed and bay. The estimation of assimilation efficiencies and partitioning coefficients in the model require a through knowledge of concentrations in water, particulates, sediment, and various biota categories (e.g., Presser and Luoma, 2006).

Current Newport Bay watershed data gaps for development of a selenium SSO include:

- A better understanding of selenium speciation for water and waterborne particulate fractions in all environments.
- Seasonality in waterborne selenium concentrations and flows in smaller channels. It is assumed that selenium monitoring data from the main creek stations are adequate to describe seasonal loading to the bay.
- Water column stratigraphy and seasonality of selenium concentrations throughout the bay, in dissolved and particulate forms.
- A more thorough database of particulate selenium concentrations in the channels, main creek, and the bay.
- A description of the synoptic pattern of surficial sediment selenium concentrations throughout the bay, including deeper as well as shoreline concentrations and post-dredging conditions.
- Estimates of Newport Bay selenium transport and fate, including sequestration, sedimentation, permanent sediment burial, and volatilization (this data gap may need to be approached through literature review).
- More complete information on bioaccumulation of selenium by Newport Bay species, including invertebrates and fish (water column and benthic), and birds and their eggs. (When the 2006 data from CDFG are added to the database this data gap will be defined better.)

Currently the data base for selenium bioaccumulation, in general, is limited to spring/summer collections and can not be used to examine seasonal patterns of biological uptake versus waterborne concentrations and load. Data on selenium levels in water column and benthic invertebrates in the main part of Newport Bay (except for shoreline, intertidal bivalve and snail samples) are generally lacking.

Model Methods

1. Define risk based upon the types of data available from the watershed and Bay.

One step narrowing the choices for an SSO to a suite of values consistent with local conditions is to interpret existing data relative to risk. The section "Risk Factors for Se", below defines some risk levels for different kinds of data. The table uses a range of values for each risk level, based upon all suggestions in the literature on Se effects. Regulatory policy may dictate specific values within each range. The range is provided purely to provide perspective. But the task involves providing risk rankings based upon existing conditions (available data for invertebrates, fish and bird eggs), once the concentrations that define different risks are agreed upon. This could be done for each category of the habitat. Water data (means, median, 75th percentile, 95th percentile) and sediment data can also be included in a ranking discussion. For each category of habitat the uncertainties should be explicitly stated.

For example:

- Are the biomonitor species both representative and good choices for risk evaluation?
- Is more biomonitor data needed?
- Do different measures of risk contradict each other?

2. Define species-specific bioaccumulation factors for invertebrates

Species accumulate bioaccumulative chemicals like selenium in relation to their concentration in the surrounding water, sediment, or diet. Generic, literature-derived bioconcentration factors from water (BCFs) and bioaccumulation factors from diet (BAFs) are highly variable. Instead, it is useful to compare species-specific BCFs (comparisons between tissue concentrations and dissolved concentrations) or BAFs, (comparison of bioaccumulated Se in an organism to Se concentrations in its food) or biota-sediment accumulation factors (BSAFs) among habitats, if information is not available for more specific modeling calculations. Variability in the field-estimated accumulation factors might be indicative of important differences in bioavailability, if supported by speciation (inferred transformation) or other data. For example, reduced or enhanced bioavailability is one of the major considerations in an SSO. BCF or BSAF factors might be useful in modeling, where physiological constants are not available.

3. Define BAFs for fish and bird eggs

Same as above, but use invertebrate dietary items (BAFs from invertebrates) as a basis for the calculation.

4. Modeling bioaccumulation in invertebrates

Bioaccumulation models will be used to address questions about potential choices of an SSO. More than one modeling approach can be used and outcomes can then be compared among one another. The modeling approach would use the following steps (although the order can be changed for different objectives):

Model inputs:

1. Choice of water concentration
2. Choice of selenium speciation (based upon measured speciation in different locations of the watershed)
3. Choice of transformation constant (guided by experience elsewhere and range of data from this watershed).
4. 4. Choice of freshwater target species: surrogates
    a. For biodynamic modeling, data are available for freshwater clams, *Corbicula fluminea*, which are likely to occur in a watershed of this nature. Some freshwater clam Se data were collected (very likely from this species, which has been found in the watershed) and can be used to help calibrate the model.
    b. For biodynamic modeling, data are also available for a freshwater zooplanktonic crustacean (*Dapnia* sp.). This is a more uncertain approach, but would be worthwhile as a comparison.

    c. We may be able to glean some data for the freshwater insects known as water boatmen (Corixididae) that could be used in biodynamic modeling. They have been sampled from several San Diego Creek and wetland locations. More supportive literature values will be necessary.
5. Choice of target species: species that have been surveyed.
    a. A second modeling approach is to use species-specific BAFs or BSAFs from this watershed as an approach to evaluating bioaccumulation if information necessary for modeling is not available.
    b. For biodynamic modeling data is available to model clams, mussels, amphipods, zooplankton, etc. under different load and concentration scenarios for the Bay.
6. Outcome: Compare modeled bioaccumulation to risk factors ("diet") under different concentration and speciation scenarios that might be reasonable for this watershed.
7. Establish relationships among fish, bird eggs and invertebrate Se for this watershed.
8. Use what relationships can be derived from San Diego Creek along with relationships from elsewhere to derive bioaccumulated concentrations in predatory fish and birds. Compare to risk factors.

5. Weight of evidence

Guidelines or thresholds have been recommended for water, particulates, diet, and tissue (e.g., Presser and Luoma, 2006; see next page). A weight-of-evidence approach considers degree of risk estimated from each of these in aggregate. Levels of certainty associated with a statement of hazard can then be assessed:

- The greatest certainty occurs if waterborne, particulate, bioaccumulation, and predator lines of evidence point to serious risks and are accompanied by direct observations of teratogenesis or reproductive impairment. However, it should be recognized that reproductive impairment due to selenium toxicity may be difficult to discern from background effects. It would be expected that obvious teratogenesis would occur only in the most highly contaminated areas.
- A strong level of certainty is possible if data are available from all links in the chain of processes and point to the same conclusion, even if no data on (observations of) reproductive impairment are available. In such cases, toxicity may occur at a frequency that falls below our ability to observe the effects with standard monitoring programs.
- Moderate certainty results if more than one line of evidence from a chain of evidence is contradictory with others, or if data is available from several but not all lines of evidence;
- Low certainty results if the hazard evaluation is based on only one line of evidence or if there is no clear weight of evidence toward one conclusion.

Risk Factors for Se: Literature Examples

Although relationships of diet, fish tissues and bird tissues with toxicity have been studied in the field and laboratory, there is not a simple consensus among toxicologists on a precise value for dietary or bioaccumulated Se concentrations that would be protective; although specific values are proposed, some of which are included below. The controversy over specific guidelines or thresholds is intense. Often each participant in the dialogue makes different assumptions about such factors as:

- Degree of acceptable toxicity (EC_{10} vs EC_{50}),
- What species to protect (most sensitive surrogate; most sensitive found habitat; average species),
- Choice of life stage and endpoint,
- Whether to consider risk to individuals or risk to populations,
- Whether to accept field studies or should risk levels be based purely upon well constrained toxicity tests

The debate can also be very specific about guidelines in terms of what fish (or bird), what effect level, and what life stage. Rather than try to resolve those, the ranges are presented below attempt to identify the boundaries for different general categories of risk that come out of that dialogue. Some recent data like that from Holm et al. (2005) and Harding et al. (2005) (as cited in tables 13, 14, 15 in Presser and Luoma, 2006) are not usually included in the choices of thresholds, but are included in the ranges below.

For the purposes of this discussion we will define four categories of risk. R1 to R4 will be used to designate ascending risk (highest risk at R4). We give the range of concentrations for each measure that various authors cite as supported by the literature. All data reported here are presented as dw, assuming ww values were corrected for 80% water. "Diet" = invertebrate concentrations that might threaten their predators. DMG = Dietary Metal Guideline. BMG = Biological Metal Guideline or tissue residue guideline for the fish or birds themselves.

R1: No adverse effects likely

Diet: ≤ 3 µg/g Se in prey [DMG all prey]

BMG Fish: < 3 ug/g Se dw, whole body

BMG Birds: <4 ug/g Se dw

R2: Some effects on individuals detectable. Effects on sensitive populations possible but uncertain. *Deformities, reproductive difficulties and mortality of larvae were observed at the low end of this range, but not in all circumstances. The probability of toxic effects, in at least some species, increases toward the higher end of the range. Experiments are least ambiguous toward the higher end of the range.*

Diet: 2 – 10 µg/g Se dw [DMG all prey]

BMG Fish tissue: 4 - 10 µg/g Se dw

BMG Bird eggs: 6 - 15 ug/g Se dw

Some specific guidelines suggested include:

- 2-5 ppm dw diet of fish (mainly based on 50% mortality at 5.1 ppm dw diet in lab study of winter stress in juvenile bluegill, Lemly, 1993);
- 3.6 to 5.7 ppm dw diet in birds (based on 4.87 ppm dw diet in birds, 10% effect level in mallards, hatchability; confidence intervals 3.56 to 5.74 ppm dw, Ohlendorf, 2003);
- 4-6 ppm dw whole-body fish tissue [based on 4.5 ppm dw fish tissue whole body 10% effect level (the 40-50% mortality is the 5.8 ppm dw whole body level) mortality in winter stressed bluegill, interpretation of Lemly, 1993 by Skorupa et al., 2004];
- 6 ppm dw bird egg (based on 3% hatchability effect level in sensitive species, stilts, Skorupa, 1998a, b; 1999);
- 6.4 – 16.5 ppm dw in birds eggs (based on 12.5 ppm dw in eggs, 10% effect level in mallards, hatchability; confidence intervals 6.4 to 16.5 ppm dw, Ohlendorf, 2003)

R3: Deformities in some species and reproductive failure in sensitive species. *Risk of eventual extirpation of a sensitive population is high. But correlations between tissue concentration and effects can be highly variable in some circumstances; probably because of differences in sensitivity among individuals and species. Population dynamics is crucial in probability of extirpation. Long-lived, low fecundity populations that are exposed to concentrations in this range could be lost eventually (e.g. sturgeon in San Francisco Bay)*

Diet: 10 – 20 µg/g Se dw [DMG all prey]

BMG Fish tissues: 10 - 40 µg/g Se dw

BMG Bird eggs: 20 – 40 µg/g Se dw egg

R4: Expect evidence of gross deformities and examples of reproductive failure. *Probability of multiple populations collapsing increases above these concentrations.*

Diet: >20 µg/g Se dw [DMG all prey]

BMG Fish tissues: >40 µg/g Se dw

BMG Bird eggs; > 40 µg/g Se dw

Assessing Model Performance

Model performance can be assessed through continued monitoring of the watershed and bay, particularly for those key components predicted as part of model input and output. At a minimum, the monitoring should include waterborne selenium concentrations of dissolved and particulate fractions, fish tissue measurements, and bird egg sampling. Invertebrate tissue sampling would help verify the model, as well.

Monitoring should be conducted and summarized annually with a review of results after three years to assess the need for model adaptations and alterations to better match field data.

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Attachment A
Estimated Timeline for Selenium Site Specific Objective Approval and Adoption

	Task Description	FY 2009 - 2010													FY 2010 - 2011											
		June	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	April	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	April	May
Regional Water Board	NSMP Working Group submits request to Regional Water Board for the adoption of a selenium site specific objective.	●	**6/17 Selenium SSO Adoption Request Submitted**																						
	Regional Water Board receives request and evaluates for 60 days. After 60 days, if the Regional Water Board provides no information back to the NSMP Working Group, the Working Group may consider petitioning the State Board (Water Code § 13320). Note: Although unlikely in this situation, this is the process as provided in the Water Code. The timeframe provides for 30-60 days for this evaluation, but assumes that it will be about 30 days and that the time is used to assist in completing the next step.	●	———	●	- - - - -																				
	Regional Water Board completes the necessary documents (technical report, SED, and draft Basin Plan amendment). This assumes a 30-60 day time period to complete the package and assumes that the Regional Water Board has begun process for CEQA determination under 23 CCR 3777(a).		●	———	●	- - - - -																				
	Regional Water Board issues public notices (Notice of Filing and Notice of Public Hearing) regarding availability of the draft documents, including the technical report, SED, Basin Plan amendment, etc., and provides for a 45 day public comment period.		★	●	———	●	If the RWQCB makes substantial changes to the Basin Plan amendment a second opportunity for public comment must be provided.																			
	Assume that the Regional Water Board prepares the response to comments within 30 - 60 days after the close of the public notices.					●	- - - - -	●																		
	Regional Water Board hearing for the adoption of the selenium SSO and draft Basin Plan amendment.						★●	**11/30 SSO Adoption Hearing** (Last meeting date for 2007)																		
	Regional Water Board transmits package to State Water Board. Assume transmittal occurs within 30 days of the public hearing.							●	———	●	**Permit Expires**														
State Water Board	State Water Board receives Administrative Record from Regional Water Board and "acts on" submittal within 60 days (Water Code § 13246(a)). If the State Water Board remands the amendment, they have an additional 90 days to act on the resubmission.								●	———	●														
	State Water Board publicly notices item and includes on agenda. Item may be approved or remanded to Regional Water Board. Assume that this is 60-75 days.									★	●	———	●	Timeframe based on the time that this took for the Calleguas Creek Metals TMDL.											
	State Water Board submits action to OAL. Assume transmittal occurs within 90 days of the hearing.												●	———	●										
OAL	OAL has 30 days to approve or disapprove the action. (Govt. Code § 11349.3 & § 11353(b)(4)) Once approved OAL files action with the Secretary of State.														●	———	●	Timeframe based on the time that this took for the Calleguas Creek Metals TMDL.							
	Regional Water Board files CEQA Notice of Decision with the Secretary of Resources for public posting (30 days).																●	———	●						
EPA	State Water Board has 30 days to transmit Basin Plan Amendment with Chief Counsel's Certification to EPA Region IX.																●	———	●						
	EPA has 60 days to notify state of approval or 90 days of disapproval. The timeframe assumes an approval in this case. Assumes ESA Section 7(a) consultation occurs during this timeframe w/in 135 days.																	●	- - - - -	- - - - -	- - - - -	●			
	EPA notifies State Water Board/Regional Water Board of approval.													●						●	———	●			
	EPA depromulgates CTR Selenium criteria Assume depromulgation requires 11 months (See Cu SSO San Francisco Bay. Fed. Register Nov. 6, 2003, Vol. 68, No. 215, p. 62744-62747). Basic steps outlined below.																								
	EPA develops Federal Rulemaking Notice - Propose the change to CTR and request public comments. Assumes ESA Section 7(a) consultation occurs during this timeframe.																				●	———	●		
	EPA issues Federal Rulemaking Notice - Propose the change to CTR and request public comments. Assume 30 day period for comments.																								
	EPA develops Federal Rulemaking Notice - Respond to comments and finalize action.																								
	EPA issues Federal Rulemaking Notice - Respond to comments and finalize action.																								
	Selenium SSO is state objective and federal criterion.																								
	Solid line - likely timeframe; Dashed line - potential timeframe																								
	★ Opportunity for public input																								

Attachment A
Estimated Timeline for Selenium Site Specific Objective Approval and Adoption

Task Description		FY 2011 - 2012											
	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	April	May	June
NSMP Working Group submits request to Regional Water Board for the adoption of a selenium site specific objective.													
Regional Water Board receives request and evaluates for 60 days. After 60 days, if the Regional Water Board provides no information back to the NSMP Working Group, the Working Group may consider petitioning the State Board (Water Code § 13320). Note: Although unlikely in this situation, this is the process as provided in the Water Code. The timeframe provides for 30-60 days for this evaluation, but assumes that it will be about 30 days and that the time is used to assist in completing the next step.													
Regional Water Board completes the necessary documents (technical report, SED, and draft Basin Plan amendment). This assumes a 30-60 day time period to complete the package and assumes that the Regional Water Board has begun process for CEQA determination under 23 CCR 3777(a).													
Regional Water Board issues public notices (Notice of Filing and Notice of Public Hearing) regarding availability of the draft documents, including the technical report, SED, Basin Plan amendment, etc., and provides for a 45 day public comment period.													
Assume that the Regional Water Board prepares the response to comments within 30 - 60 days after the close of the public notices.													
Regional Water Board hearing for the adoption of the selenium SSO and draft Basin Plan amendment.													
Regional Water Board transmits package to State Water Board. Assume transmittal occurs within 30 days of the public hearing.													
State Water Board receives Administrative Record from Regional Water Board and "acts on" submittal within 60 days (Water Code § 13246(a)). If the State Water Board remands the amendment, they have an additional 90 days to act on the resubmission.													
State Water Board publicly notices item and includes on agenda. Item may be approved or remanded to Regional Water Board. Assume that this is 60-75 days.													
State Water Board submits action to OAL. Assume transmittal occurs within 90 days of the hearing.													
OAL has 30 days to approve or disapprove the action. (Govt. Code § 11349.3 & § 11353(b)(4)) Once approved OAL files action with the Secretary of State.													
Regional Water Board files CEQA Notice of Decision with the Secretary of Resources for public posting (30 days).													
State Water Board has 30 days to transmit Basin Plan Amendment with Chief Counsel's Certification to EPA Region IX.													
EPA has 60 days to notify state of approval or 90 days of disapproval. The timeframe assumes an approval in this case. Assumes ESA Section 7(a) consultation occurs during this timeframe w/in 135 days.													
EPA notifies State Water Board/Regional Water Board of approval.													
EPA depromulgates CTR Selenium criteria Assume depromulgation requires 11 months (See Cu SSO San Francisco Bay. Fed. Register Nov. 6, 2003, Vol. 68, No. 215, p. 62744-62747). Basic steps outlined below.													
EPA develops Federal Rulemaking Notice - Propose the change to CTR and request public comments. Assumes ESA Section 7(a) consultation occurs during this timeframe.													
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EPA develops Federal Rulemaking Notice - Respond to comments and finalize action.													
EPA issues Federal Rulemaking Notice - Respond to comments and finalize action.													
Selenium SSO is state objective and federal criterion.													
Solid line - likely timeframe; Dashed line - potential timeframe													
★ Opportunity for public input													

Timeframe based on the time that this took for the Copper SSO in San Francisco Bay.