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Work Element 6. Modeling Program Development And Implementation

The purpose of this work element is develop models to forecast the nutrient and carbon sources, pathways, and loads to SF Bay and simulate the ecological response to those loads and other environmental factors in the Bay. These models will be used to engage stakeholders in discussion of options for nutrient management under a variety of different scenarios. Previous work elements will define conceptual models and scenarios of interest (Work Element 1), and management endpoints of concern (Work Element 2).

Activities Update

Click right and left arrows to scroll through activities. *Note*: Timeline dates are approximate

Task 6 Timeline [1]

Task 6.1. Modeling of External Sources

Task 6.1.a Basic Loading Estimates or Modeling

Building on the loading conceptual model and loading data compiled in Tasks 2.3 and 2.4, respectively, initial nutrient load estimates will be calculated. To the extent feasible, spatially explicit (e.g., subembayments) and temporally-explicit nutrient loads will be quantified. The nutrient sources considered will include: POTW discharges; stormwater discharges; flows from the San Joaquin and Sacramento Rivers entering through the Delta, along with other smaller downstream tributaries; exchange across the Golden Gate; and direct atmospheric deposition. Nutrient fluxes from Bay sediments to the water column will also be considered. Initial estimates of POTW loads will be based on treatment technologies employed (expected effluent nutrient speciation and concentrations) and flow.

When historical data is available, these data will be used to refine POTW loads. In addition, the Water Board is requiring a two year effluent characterization data collection effort (July 2012 through 2014) by Bay area municipal wastewater dischargers and industrial dischargers. These data will be used to further refine load estimates.

Task 6.1.b Review models for Estimating Nutrient/ Organic Carbon Loads

This task will review existing models or types of models that can be used to estimate the sources and pathways of nutrient load to the Bay and summarize the data requirements. The task will begin by identifying the types of questions that the model(s) or empirical data must answer. The intent is to review models and tools that can assist in decision-making on nutrient management strategies and test the cost-effectiveness of implementation scenarios. This work element will feed into the development of a modeling strategy.

Subtasks include:
• 6.1a.1 Basic Nutrient loading estimates/modeling External Nutrient Loads to SF Bay [2] External Nutrient Loads to SF Bay [3]
• 6.1a.2 On-going updates or refinements of load estimates
• 6.1b Review models to estimating nutrient loads

Task 6.1 - Subtasks Completion [4]
Chart omitted.

Task 6.2. Modeling of Load-response

Task 6.2.a. Basic Numeric Modeling and Scenario Analysis

The purpose of this task is to develop and apply basic numeric biogeochemical models, as an early step in modeling efforts, to inform future model development and data collection. The models will be used to quantitatively synthesize existing data; develop nutrient budgets; support evaluation of proposed indicators as part of the NNE; test appropriate management endpoints; determine how key processes should be modeled and assess the relative importance of and uncertainty related to those processes; and identify major data gaps at an early stage to inform the monitoring program and the need for special studies. In addition, these models may be used to evaluate biological responses under future scenarios (e.g., changes in nutrient loads, changes in major physical drivers affecting productivity, decreases in suspended sediment concentrations).

Initial model development will focus on Suisun Bay and South Bay or Lower South Bay. A technical advisory group consisting of regional and national experts would be convened to develop a modeling study plan. A key task of this group will be to identify the main questions to be addressed through the modeling work, approaches for incorporating key processes into the model, and the appropriate model platform(s). It should be emphasized that the model(s) developed and used in this task are not intended to be the final models that may ultimately be required for the Bay (which may be more complex and computationally intensive), but rather as scoping tools.

Task 6.2.b. Review of existing models and available model approaches to model the ecological response of the Bay to nutrient loads and other co-factors.

This task will produce a review of available models and/or modeling platforms that will be the basis for developing a modeling strategy for the Bay. A work group will identify the management questions and endpoints (indicators) of concern and relevant spatial and temporal scales, focusing on hydrodynamic,

water quality (dissolved oxygen, nutrients, carbon) and a phytoplankton-zooplankton production and phytoplankton speciation models. A review will be conducted of existing Bay and Delta hydrodynamic and water quality models or other applicable types of models, from simple spreadsheet to complex dynamic simulation models, their data needs, and advantages and disadvantages.

Subtasks include:
• 6.2a Basic numeric modeling and scenario analysis
• 6.2b Review existing models/platforms for hydrodynamic and water quality modeling
Nutrient Modeling Approach [5] Nutrient Modeling Approach [6]

Task 6.2 - Subtasks Completion [7]
Chart omitted.

Task 6.3. Develop and Implement Modeling Strategy

The purpose of this task is to synthesize information generated from Tasks 6.1 and 6.2 tasks to develop a modeling strategy for the Bay. The strategy will identify questions to be answered by the models and what policies will be informed; types of models needed (e.g. external loads, bay hydrodynamic and water quality); potential modeling platforms; amount of data required and estimates of cost; and schedule. Information will be presented as cost/benefits of model options with trade-offs in terms of what indicators can be modeled at varying levels of accuracy/precision or timescales. The strategy will also address what partnerships need to be created to build and maintain a model.

Subtasks include:
• 6.3a Identify key management questions to be addressed by modeling
• 6.3b Identify priority modeling studies to answer management questions
• 6.3c Refine hydrodynamic model
• 6.3d Develop water quality model
• 6.3e Implement modeling strategy using advanced hydronamic/water quality model

Task 6.3 - Subtasks Completion [8]
Chart omitted.

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