1) Priority Margin Unit Conceptual Model Development

Oversight group: PCB Strategy Team
Proposed by: Jay Davis, SFEI

Funding requested for 2015: $100,000

Introduction and Background

The RMP PCB Strategy Team formulated a PCB Strategy in 2009. The Team recognized that a wealth of new information has been generated since the PCBs TMDL Staff Report (SFBRWQCB 2008) was prepared. The Strategy articulated management questions to guide a long-term program of studies to support reduction of PCB impairment in the Bay. The PCB Team recommended two studies to begin addressing these questions. The first recommended study was to take advantage of an opportunity to piggyback on the final year of the three-year small fish mercury sampling in 2010. The second study recommended was a synthesis and conceptual model update based on the information that had been generated since the writing of the TMDL Staff Report.

The small fish monitoring revealed extremely high concentrations of food web PCBs in several areas on the Bay margins (Greenfield and Allen 2013), and highlighted a need to develop a more detailed conceptual model than the one-box model used as a basis for the TMDL. A model that would support the implementation of actions to reduce loads from small tributaries, a primary focus of the TMDL, would be of particular value. A revised conceptual model was developed that shifted focus from the open Bay to the contaminated areas on the margins where impairment is greatest, where load reductions are being pursued, and where reductions in impairment in response to load reductions would be most apparent (Davis et al. 2013).

The margins appear to be a collection of distinct local food webs that share some general similarities but are largely functionally discrete from each other. Monitoring, forecasting, and management should therefore treat these margin locations as discrete local-scale units. Local-scale actions within a margin unit, or in upstream watersheds, will be needed to reduce exposure within that unit. Better characterization of impairment on the margins through more thorough sampling of sediment and biota would help focus attention on the margin units where the need for action is greatest ("priority margin units"), and will also provide an important performance measure for load reduction actions taken in local watersheds. The Synthesis recommended a focus on assessing the effectiveness of small tributary load reduction actions in priority margin units, and provided an initial foundation for these activities.

The 2014 update of the PCB Strategy calls for a multi-year effort to implement the recommendations of the PCB Synthesis pertaining to identifying margin units that are high priorities for management and monitoring, development of conceptual models and sediment mass balances for margin units downstream of watersheds where management actions will occurand monitoring in these units as a performance measure. A thorough and thoughtful planning effort is warranted given the large expenditures of funding and effort that will be needed to implement management actions to reduce PCB loads from urban stormwater.

The work proposed for 2015 would consist of planning activities to prioritize margin units and select an optimal subset for detailed conceptual evaluation and monitoring. This would be followed by the implementation of monitoring in the one or two units of greatest interest in 2016, in parallel with development of conceptual models and monitoring plans for the other few units of greatest interest.

Study Objective and Applicable RMP Management Questions:

The objective of this study is to develop sensitive monitoring strategies to detect the effectiveness of watershed management actions in reducing PCB impairment in selected priority margin units (PMUs).

PCB Strategy questions addressed:

4. What is the total maximum daily load of PCBs that can be discharged without impairment of beneficial uses?
9. What are the effects of management actions on the potential for adverse impacts on humans and aquatic life due to Bay contamination?

RMP Management Questions addressed:

4. Have the concentrations, masses, and associated impacts of contaminants in the Estuary increased or decreased?
    B. What are the effects of management actions on the potential for adverse impacts on humans and aquatic life due to Bay contamination?

Study Approach

The proposed multi-year effort would include a year of planning activities in 2015 to:

1. prioritize and identify the margin units to focus on,
2. develop conceptual models and sediment mass balances for the one or two highest priority units, and
3. continue planning efforts to develop a multi-year workplan in support of the anticipated update of the TMDL in 2020.

Expected outcomes for the 2015 effort will be the identification and conceptual evaluation of one or two priority margin units that will be selected for monitoring, and the development of a monitoring strategy for these units.

It will be extremely valuable to begin implementation of baseline monitoring of the selected margin units in advance of the management actions. Initiating monitoring of the units will therefore be a priority for activities in 2016-2019. The monitoring will be designed to maximize sensitivity to detecting reduced impairment in the margin units. Identification and evaluation of additional priority margin units will also occur in parallel to the initial monitoring of the first one or two units. After the planning effort is completed, monitoring will continue to establish initial baseline conditions, and then to track improvement in response to management actions.

Tasks for 2015

Task 1: Prioritize margin units and select units for intensive evaluation ($30K)

This work would be done by the PCB Strategy Team with staff support from SFEI. An initial survey and prioritization of all the margin units will be conducted. Properties of the margin units to be evaluated will be determined through Team discussion. Data gathering and analysis will be needed to support the prioritization effort, including evaluation of data on contamination in the watersheds and in the Bay, mapping information to link watersheds with margin units, and mapping to delineate boundaries of margin units. All margin units will be considered in this prioritization phase, not just those for which data are already available. It is anticipated that task 1 will require two to three meetings of the PCB Strategy Team.

Timing and Deliverables: Some planning and data compilation will begin in 2014. Data analysis will begin in January 2015. A brief report on the prioritization effort will be drafted by March 2015.

Task 2: Develop conceptual site models and first order mass balances for the highest priority margin units ($60K)

The one or two highest priority margin units (PMUs) will be evaluated in detail in 2015. The following approach will be applied to each PMU. A relatively large Conceptual Site Model Workgroup (CSMW) will be assembled that includes members of the PCB Strategy Team, along with experts on potential biotic indicators, sediment movement from watersheds to margins to the open Bay, and local conditions. This CSMW will meet two to three times to develop and document conceptual understanding and a monitoring plan for the PMU. While ideally the site model evaluations will conclude that it is possible to detect reduced concentrations in the Bay, it is also possible that the CSMW will conclude that this is not feasible with a realistic effort given the relative magnitude of the reduced loading, the reservoir of PCBs already in the PMU, and environmental variation. Schedules for CSMW activities will be established with input from workgroup members and interested parties.

As conceptual models are developed for these PMUs, consideration will be given to whether a general model or family of models can be developed that could apply to margin units more broadly.

The labor required to conduct tasks 1 and 2 is difficult to estimate because this is a novel effort and the data gathering and analysis to be done will be determined through Strategy Team and CSMW discussions. If funds remain from task 1 after the task is completed, they will be applied to task 2. More detailed budgets will be developed and subject to Strategy Team, TRC, and Steering Committee approval as planning proceeds.

Timing and Deliverables: The goal will be to prepare technical reports documenting conceptual site models and monitoring plans for at least one PMU, and perhaps two PMUs, by December 2015. Whether two PMUs is possible depends on the amount of data gathering and analysis needed to develop a sediment mass balance and conceptual model for PMU #1.

Task 3: Development of multi-year plan in support of the TMDL $10K

Funds for this task would enable SFEI to continue to convene the PCB Strategy Team to allow discussions of plans for the next iteration of the TMDL and RMP activities that can inform the TMDL, and for any small-scale synthesis of information that is needed to support these discussions. The plan will include a multi-year plan schedule of budgets and deliverables aimed at providing a technical foundation for the next iteration of the TMDL. Depending on the outcomes of the site model evaluations, this RMP expenditure for continued Strategy Team discussions may need to be augmented or complemented by other forums for discussing TMDL revision.

Timing and Deliverables: An updated PCB multi-year plan in June 2015. The plan will include a multi-year plan schedule of budgets and deliverables.