RMP Special Study Proposal: Regional Model Development to Support Stormwater Management

Summary: The 2018 STLS Trends Strategy identified developing a regional model to assess the trends in Pollutants of Concern (POC) loads as a priority, and laid out a multi-year plan to obtain initial answers by 2022. In addition to POCs, this regional model will be used to estimate stormwater sediment and Contaminants of Emerging Concern (CECs) loads. The first task of the multi-year plan - developing a Modeling Implementation Plan (MIP) to guide model development - was completed in 2019. Following the approval of the MIP, this proposal is for funding in 2020 to implement the second task of the multi-year plan - developing a regional model for hydrology. Model development will follow the procedures outlined in the MIP. The hydrology model, once established, will be used as a basis for modeling sediment, POCs, and CECs in subsequent years.

Estimated Cost: $100K
Oversight Group: STLS/SPLWG
Proposed by: J Wu and L McKee (SFEI)
Time Sensitive: Yes - this is the second year of a sequential four-year study

Proposed Deliverables and Timeline

Deliverable	Due Date
Collect model input and calibration data	07/2019
Model setup	09/2019
Hydrology calibration	12/2019
Sediment calibration	03/2020
Draft documentation and reporting	05/2020
Final documentation and reporting	07/2020

Background

The San Francisco Bay Hg and PCB TMDLs call for a 50% reduction in Hg loads by 2028 and a 90% reduction in PCB loads by 2030. In supporting these TMDLs, the Municipal Regional Permit for Stormwater (MRP) (SFRWQCB 2009, SFRWQCB 2015) called for the implementation of control measures to reduce PCB and Hg loads from small urbanized tributaries. In addition, the MRP has identified additional information needs associated with improving understanding of sources, pathways, loads, trends, and management opportunities of POCs. In response to the MRP requirements and information needs, the Small Tributary Loading Strategy (STLS) was developed which outlined a set of evolving management questions (MQs) that have been used as the

guiding principles for the region's stormwater-related activities (SFEI, 2009; Wu et al., 2018):

Q1. What are the loads or concentrations of Pollutants of Concern (POCs) from small tributaries to the Bay?

Q2. Which are the "high-leverage" small tributaries that contribute or potentially contribute most to Bay impairment by POCs?

Q3. How are loads or concentrations of POCs from small tributaries changing on a decadal scale?

Q3.1 What are the trends in source control, use patterns, or mass removal in tributary watersheds?

Q3.2 What are the trends in concentration or loads at small tributary locations?
- Individual watersheds
- Regional scale

Q3.3 What are the current and projected trends in concentration or loads in relation to specific management actions?

Q4. Which sources or watershed source areas provide the greatest opportunities for reductions of POCs in urban stormwater runoff?

Q5. What are the measured and projected impacts of management action(s) on loads or concentrations of POCs from small tributaries, and what management action(s) should be implemented in the region to have the greatest impact?

Over the past decade, considerable effort, including field monitoring and modeling, has been made by the RMP and BASMAA to address these management questions. These efforts have mostly focused on addressing Q1, Q2, and Q4. Questions remain as to how loads at the regional scale have and will change at a decadal scale as a result of management actions in relation to TMDL goals (Q3). In recognition of the need to answer Q3, in particular Q3.2, the STLS team updated the Strategy in 2018 to include a trends component. The new Trends Strategy document identified the development of a regional watershed model as the initial focus of POC trends evaluation. In addition to addressing Q3, this regional modeling effort will also directly support Q1, Q2, and Q4 by providing updated estimates of POC concentrations and loads for all watersheds in the region. The regional model could also provide a mechanism for evaluating management actions and could be used to evaluate management impact on future trends of POC loads or concentrations in support of Q5.

Beyond POC questions, this new regional model will also be used to support other RMP workgroups that have similar management questions, in particular Sediment Workgroup (SWG) and Emerging Contaminants Workgroup (ECWG). The model can be used to estimate stormwater sediment and Contaminants of Emerging Concern (CECs) loads from small tributaries to the Bay.

The 2018 Trends Strategy included a multi-year workplan that laid out how to obtain initial answers to trends questions by 2022. The first step of this plan, completed in 2019, was to develop a Modeling Implementation Plan (MIP) to guide model development, which included model platform and development procedures and a timeline. The MIP was reviewed by STLS in April 2019 and is presently in SPLWG review (May 2019). This proposal is for funding in 2020 to implement the second year of the multi-year workplan and develop a regional model for hydrology, following procedures outlined in the MIP. The hydrology, once established, will be used as basis for modeling sediment, POCs, and CECs in subsequent years.

Study Objectives and Applicable RMP Management Questions

The study will provide information essential to understanding spatial and temporal characteristics of hydrology, at the scales of both individual watersheds and the region as a whole. The objectives of the project and how the information will be used are shown in Table 1, relative to the RMP's high-level management questions.

Table 1. Study objectives and questions relevant to RMP management questions.

Management Question	Study Objective	Example Information Application
Q1: What are the loads or concentrations of Pollutants of Concern (POCs) from small tributaries to the Bay?	Develop a regional hydrology model to serve as the basis for sediment, POC, and CEC modeling.	Model will produce POC concentrations and loads at each individual watershed.
Q2: Which are the "high-leverage" small tributaries that contribute or potentially contribute most to Bay impairment by POCs?		POC load estimates produced by the regional model at each individual watershed will be used to compare the contribution of different watersheds and source areas.
Q3: How are loads or concentrations of POCs from small tributaries changing on a decadal scale?		Timeseris of POC loads will be used to assess trends at both individual watersheds and the region as a whole.
Q4: Which sources or watershed source areas provide the greatest opportunities for reductions of POCs in urban stormwater runoff?		Model outputs of flow, sediment, POC, and CECs loads will help identify high yield areas that can be targeted for management actions.

Q5: What are the measured and projected impacts of management action(s) on loads or concentrations of POCs from small tributaries, and what management action(s) should be implemented in the region to have the greatest impact?		Various management actions, both existing and planned or anticipated, will be evaluated in the model through scenario runs.

Approach

After approval of the Modeling Implementation Plan, a phased approach will be employed to develop the regional model, starting with hydrology, followed by suspended sediment, POCs, and then CECs. This task represents the first phase of model development and will cover hydrology only. A standard model application process will be followed to develop the model.

- Collect and process model input data - meteorological data to drive model simulation and GIS data to represent watershed characteristics
- Set up the model with proper temporal and spatial scales
- Collect observed flow data at Bay area stations to support model calibration and verification
- Calibrate the model to observed data for hydrology
- Process and interpret model outputs of flow at regional and watershed scales
- Document model development

Budget

The following budget represents estimated costs for this special study (Table 2).

Table 2. Proposed budget.

Expense	Estimated Hours	Estimated Cost
Project Staff	490	$80,000
Senior Management Review	40	$10,000
Project/Contract Management		
Data Technical Services		
GIS Services	80	$10,000
Grand Total	610	$100,000

<u>Budget Justification</u>

Labor Costs: 490 hours of staff time to set up, perform calibration/verification, process model results, and write up a brief technical report; 80 hours of GIS staff time to collect and process GIS data; 40 hours for senior staff contributions and review.

Reporting Costs: RMP staff will produce a model development report to document all aspects of model development, including input data, key assumptions, calibration/verification, and model results.

Reporting

A Model Development Report will be prepared as a draft for SPLWG by May 2020 and finalized by July 2020.

References

SFRWQCB, 2009. California Regional Water Quality Control Board San Francisco Bay Region Municipal Regional Stormwater NPDES Permit, Order R2-2009-0074, NPDES Permit No. CAS612008. Adopted October 14, 2009. http://www.waterboards.ca.gov/sanfranciscobay/water_issues/programs/stormwater/Municipal/index.shtml

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Wu, J., Trowbridge, P., Yee, D., McKee, L., and Gilbreath, A., 2018. RMP Small Tributaries Loading Strategy: Trends Strategy 2018. Contribution No. 886. San Francisco Estuary Institute, Richmond, CA. https://www.sfei.org/sites/default/files/biblio_files/STLS%20Trends%20Strategy%202018%20FINAL.pdf