POC LOADS MONITORING – LANDUSE/SOURCE AREA SPECIFIC EMC DEVELOPMENT

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ESTIMATED COST: **$80,000 (2014 special studies budget)**
OVERSIGHT GROUP: Sources Pathways and Loading Work Group (SPLWG) / Small Tributaries Loading Strategy Team (STLS)

PROPOSED DELIVERABLES AND TIMELINE

Deliverable	Due Date
Task 1: Project Management	Sep 2013 – Dec 2014
Task 2: Purchase, prefabricate and install field equipment	Oct 2013
Task 3: Wet weather fieldwork	Nov 2013 – Apr 2014
Task 4: Laboratory analysis	Dec 2013 –Jun 2014
Task 5: Data management	Jun-Jul 2014
Task 6: Reporting	Jul-Oct 2014

BACKGROUND

The PCB and Hg TMDLs for San Francisco Bay call for improved stormwater loading information and increased application of urban Best Management Practices (BMPs) for reducing pollutant loads and impacts. Since it is impossible to monitor all stormwater inputs to San Francisco Bay (there are more than 450 urban watersheds presently identified), the first report of the SPLWG recommended a combination of monitoring and extrapolation using modeling to develop regional loads estimates (Davis et al., 2001). In addition, Davis et al. identified a need to evaluate the efficacy of local and regional BMPs for influencing stormwater loads trends. These needs are now reflected in the Municipal Regional Stormwater NPDES Permit (MRP) (SFRWQCB, 2009), in the 2009 Small Tributaries Loading Strategy (STLS, 2009), and in the Small Tributaries Loading Strategy Multi-Year Plan (BASMAA, 2012).

To estimate regional loads, the STLS documents the consensus recommendation to develop a regional watershed spreadsheet model (RWSM) using the methods of Ha and Stenstrom (2008). Data inputs for such a model include rainfall, runoff coefficients, and land use based contaminant event mean concentrations (EMCs). Such empirical monitoring studies have been performed in Southern California by Tiefenthaler et al. (2008) who selected eight representative land use classes based on management needs. They found statistical differences between industrial, recreational, and open space land use classes for suspended sediment, copper, lead, and zinc and no statistical difference between commercial and any category of residential urban land use or transportation.

Unfortunately these Southern California data are not directly applicable to the Bay Area, where PCBs and Hg are the pollutants of highest concern. In the Bay Area, older industrial areas are hypothesized to be more polluted with PCBs than other urban landscapes, whereas for mercury, a broader distribution is hypothesized that includes industrial and commercial areas with higher imperviousness, and older urban areas.

In 2010 and 2011 the TRC funded the first, second, and third years of development of that modeling platform (Lent and McKee, 2011; Lent et al., 2012). The outcomes of the first year included the development of two parallel hydrological models, one using land use based runoff coefficients and the other using imperviousness based runoff coefficients. The model outcomes were compared to empirical observations in 18 calibration watersheds. Preliminary loads of PCBs, Hg, and sediment were also generated but confidence was low. In 2011, the TRC provided another $20k to further the development of the model to finalize the hydrological component. In parallel, a literature review was completed as part of the y1 report (Lent and McKee, 2011). Land use and source specific classes were recommended for the regional watershed spreadsheet model (RWSM) structure, existing EMC data from local sources and literature were reviewed and compiled, and methods for land use/ source area specific EMC estimation were proposed. In addition, recommendations were given for improvement of the GIS data shape and line files that will become the basis of the model structure.

During calendar year 2012, the STLS recommended using the $80k funding to complete the following:

- Develop a Copper test case RWSM (status: completed; report section in the RWSM report presently being prepared),
- Complete GIS layer development for the basis of the PCBs and Hg RWSM (status: completed; GIS layers available and report section in the RWSM report presently being prepared),
- Estimate PCB and Hg EMC data for the land use and or source areas developed in the GIS layers (status: completed; report section in the RWSM report presently being prepared),
- Complete and document Version 2 of the PCB and Hg RWSMs (status: in progress),
- Ensure that the STLS EMC spreadsheet model development is developed with strong step wise communication, and with coordination with other BASMAA efforts, in particular the Clean Watersheds for Clean Bay (CW4CB) project and other permit related efforts (status: ongoing).

At this time, the $80k budget set aside LANDUSE/SOURCE AREA SPECIFIC EMC DEVELOPMENT in 2013 remains available for allocation. We are about to recommend allocating those funds for the following purposes:

- Further QA of GIS layers
- Further computations of PCB and Hg EMC data using inverse optimization methodologies for the land use and source areas developed in the GIS layers
- Completing model runs for mercury and PCBs, develop user interface, and documentation including recommendations from model weaknesses and how those could be addressed with a field monitoring or other methods.

At this time, empirical field data collection of EMC data for specific land uses or source areas has not been implemented but we are aware of large weaknesses in the currently available input data for the first comprehensive PCB and Hg model runs.

<u>The objective of this study</u> is to generate event mean concentration data for the input side of the Regional Watershed Spreadsheet model.

APPLICABLE RMP MANAGEMENT QUESTIONS

Level I RMP, Q3: What are the sources, pathways, loadings, and processes leading to contaminant-related impacts in the Estuary?

Level II RMP, Q3C: What is the effect of management actions on loads from the most important sources, pathways, and processes?

Level III SPL Q2: What is the watershed-specific and regional total water flow, load of sediment, and load contaminants entering the Bay from the urbanized small tributaries and non-urban areas draining to the Bay from the nine-county Bay Area and are there trends through time?

Level IV STLS Q1: Impairment: Which are the "high-leverage" small tributaries that contribute or potentially contribute most to Bay impairment by pollutants of concern?

Level IV STLS Q2: Loads: What are the loads or concentrations of pollutants of concern from small tributaries to the Bay?

Level IV STLS Q4: Support management actions: What are the projected impacts of management actions on loads or concentrations of pollutants of concern from the high-leverage small tributaries and where should management actions be implemented in the region to have the greatest impact?

SAMPLING DESIGN / METHODS

Desktop methods

Step 1. Update as needed the 2013 data base on local and international data on soils and water concentrations in relation to land use and source areas for Hg and PCBs,

Step 2. Apply further back-calculation methods using including inverse optimization or other methods,

Step 3. Provide regular updates and feedback opportunities to STLS, including discussion of proposed back-calculation methods,

Step 4 Perform sensitivity analysis, and develop error bars around results (or professional judgment to assign errors or ranges)

Step 5. Prepare a short (<5 page) summary of methods and results for inclusion in the model documentation

Field methods

Task 1: Project management

Task 2: Purchase, prefabricate and install ISCO auto sampling equipment (yet to be determined if triggered by stage or turbidity or a combination) at two EMC sampling locations

Task 3: Carry out fieldwork during 4 wet season storms at these EMC sites.

Task 4: Complete laboratory analysis of water samples

Task 5: Complete data management/quality assurance

Task 6: Complete interpretative report

BUDGET

$80,000 (detail to be determined through STLS team meetings)

REFERENCES

BASMAA, 2012. Small Tributaries Loading Strategy Multi-Year Plan (MYP) Version 2012B. A document developed collaboratively by Arleen Feng (ACCWP) for BASMAA with support from Chris Sommers (EOA/SCVURPPP) and other BASMAA members and SFEI members of the Small Tributaries Loading Strategy Work Group of the Regional Monitoring Program for Water Quality in the San Francisco Estuary (RMP): Lester McKee, Alicia Gilbreath, Ben Greenfield, Jennifer Hunt, Michelle Lent, Aroon Melwani. Submitted to the Water Board, September 2012, in support of compliance with the Municipal Regional Stormwater Permit, provision C.8.e. http://www.waterboards.ca.gov/sanfranciscobay/water_issues/programs/stormwater/MRP/2012_AR/BASMAA/BASMAA_2011-12_MRP_AR_POC_APPENDIX_B4.pdf

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