

DEVELOP AND UPDATE SPREADSHEET MODEL – YEAR 2

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ESTIMATED COST: \$20,000 (2010 special and pilot studies budget)
OVERSIGHT GROUP: Sources Pathways and Loading Work Group (SPLWG)

PROPOSED DELIVERABLES AND TIMELINE

Deliverable	Due Date
Task 1. Refine runoff model, as needed	2/15/2011
Task 2. Extend pollutant model, as needed	3/30/2011
Task 3. Develop BMP modeling capabilities	5/31/2011
Task 4. Presentation to SPWLG, internal documentation of model improvements	10/31/2011

BACKGROUND

To accurately assess total contaminant loads entering San Francisco Bay, it is necessary to estimate loads from local watersheds. Presently Hg loads entering the Bay from urban stormwater described in the San Francisco Bay TMDL have been estimated by the Water Board by combining BASMAA bed sediment data with estimates of regional suspended sediment loads. In the case of PCBs, the mass loads in the Bay TMDL were derived from scaling existing data by area (from the Guadalupe and Coyote Creek watershed) up to the region as a whole. Although these methods were arguably appropriate for planning and TMDL development, part of the implementation plan of these TMDLs is to improve estimates of regional scale loads and to assess how these loads might be reduced. These needs are now reflected in the municipal stormwater permit (MRP) (SFRWQCB, 2009) and in the 2nd and 4th questions of the RMP Small Tributaries Loading Strategy (STLS).

“Spreadsheet models” of stormwater quality provide a useful and cheap tool for estimating regional scale watershed loads. These models are based on the simplifying factor that unit area runoff for homogeneous sub-catchments have constant concentrations, and thus have advantages over models such as HSPF and SWMM that require large calibration data sets which take money and time to collect. Such a model was developed for the Bay Area previously (Davis et al., 2000); however, at that time, there was only local land use specific data on pollutants of concern (POCs) for a drought period late 80s and early 90s, and there was no local data on Hg and PCBs. More recently, a spreadsheet model was developed for a watershed in Los Angeles that was able to predict mass emissions to within 8% of measured Zn loads and described options for loads reduction through a focus on “high leverage” areas (Ha and Stenstrom, 2008).

Objective:

The overall objective of this proposed study is to calculate mass emissions for the local watersheds draining into the San Francisco Bay, to provide the basis for refined annual load estimates. A GIS-based model is in the process of being developed to calculate stormwater volumes and POC loads on a long-term average monthly basis. (Eventually the model should operate on a storm event basis, but a massive precipitation data compilation effort will be necessary to achieve this on a regional scale.) In the face of limited land-use specific POC concentration data for the Bay Area, recent stormwater

literature will be used to provide these estimates. In 2010, a project is being conducted that will develop the rationale for land use specific monitoring and loads estimates, and reconnoiter and select sites. Based on the outcomes of this work, monitoring is slated in the strategy to begin in 2011, making it possible in 2012 to make great improvements in the spreadsheet model and the first dynamic model (being developed for the Guadalupe watershed due to the richness of data there (STLS task 1&5). The ultimate objective of both of these models is to improve regional loads estimates and to provide tools to simulate (in time and space) the potential applications of suites of BMPs or management scenarios. In 2010, the first version of the spreadsheet model will likely be completed for water, sediment and total mercury (the richest local data sets at a regional scale). In 2011, we intend to improve the model by adding literature data (mixed with some local data) on other trace contaminants (priority determined by WG) (see details below).

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 Q2: What are the annual loads or concentrations of pollutants of concern from small tributaries to the Bay?

METHODOLOGY

The base rainfall-runoff model is currently being developed as an update and refinement of the regional loads model developed by Davis et al. in 2000. Once the base model is complete, some MRP category 1 contaminants (e.g., suspended sediment and mercury) will be incorporated. Continuation funds in 2011 will allow for further development and refinement of the model, such as extending the model to include the rest of the MRP category 1 contaminants. The actual uses of the continuation funds will depend on the results of year 1 of the project and on the priorities set by the WG. Some potential uses of continuation funds include:

- Testing more runoff coefficients
- Calibrating runoff coefficients to local conditions
- Adding more POCs into model
- Testing a range of land-use specific EMCs from literature
- Updating model with local land-use specific EMCs
- Developing BMP modeling capabilities

The STLS team (indorsed by the WG in May 2009) suggested setting aside \$10,000 per year to allow for updating the model. When the local land-use based POC concentrations become available, >\$10,000 will likely be needed to allow for calibration and optimization of the EMCs using the methods described in Ha and Stenstrom (2008).

BUDGET (TO BE ADJUSTED AS NEEDED)

Proposed Cost (all labor)		
Task 1	Refine runoff model	\$4,000
Task 2	Extend pollutant model	\$6,000
Task 3	Develop BMP modeling capabilities	\$6,000
Task 4	Presentation to WG, internal documentation	\$4,000
Total for the second year		\$20,000
Subsequent years		\$20,000*

* Depends on objectives set by the WG each year.

REFERENCES

- Davis, J.A., L. McKee, J. Leatherbarrow, and T. Daum. 2000. Contaminant Loads from Stormwater to Coastal Waters in the San Francisco Bay Region: Comparison to Other Pathways and Recommended Approach for Future Evaluation. San Francisco Estuary Institute, Richmond, CA.
- Ha, S.J. and M.K. Stenstrom. 2008. Predictive Modeling of Storm-Water Runoff Quantity and Quality for a Large Urban Watershed. *J. Environ. Eng.*, 134(9), 703-711.
- 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. 279pp.
http://www.waterboards.ca.gov/sanfranciscobay/board_decisions/adopted_orders/2009/R2-2009-0074.pdf