STORWATER LOADS MONITORNG

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ESTIMATED COST: $300,000 (preliminary pending STLS July 8 meeting)
OVERSIGHT GROUP: Sources Pathways and Loading Work Group (SPLWG)

PROPOSED DELIVERABLES AND TIMELINE

Deliverable	Due Date
Task 1. Project Management (write and manage sub-contracts, track budgets)	Sep 2010 – May 2011
Task 2. Equipment purchase and prefabrication	Aug 2010
Task 3. Fieldwork	Oct 2010 – Jan 2011
Task 4. Laboratory analysis	Nov 2010 – Feb 2011
Task 5. QAQC / data management	Mar 2011
Task 6. Draft and final report (per MRP requirements)	Mar 2010; May 2011

Background

The San Francisco Bay Hg and PCB TMDLs call for a reduction in loads by 50 and 90% respectively. In response, the Municipal Regional Permit for Stormwater (MRP) (SFRWQCB, 2009) (Provision C.8.e.) calls for better quantification of loads of sediments and trace contaminants on a watershed basis and regionally. Consistent with this, the RMP Small Tributaries Loading Strategy (STLS) outlines 4 major questions:

1. Impairment:
   Which are the "high-leverage" small tributaries that contribute or potentially contribute most to Bay impairment by pollutants of concern?
2. Loads:
   What are the loads or concentrations of pollutants of concern from small tributaries to the Bay?
3. Trends:
   How are loads or concentrations of pollutants of concern from small tributaries changing on a decadal scale?
4. 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?

Monitoring concentrations and loads in relation to climate and land use in strategically chosen watersheds in the urbanized Bay Area will likely form the basis for answering all of these questions, however there is still conflicting evidence on how to prioritize watersheds to monitor.

The RMP, through its SPLWG, has been conducting tributary loading studies for nine years. The focus has been to provide information on sediment and pollutant transport processes in urban watersheds around the Bay (McKee et al., 2004; 2005; 2006a; 2006b; Davis et al. 2007; Oram et al. 2008; David et al. 2009). Most of the sampling effort has been focused on three SPLWG identified priority locations using a turbidity surrogate methodology recommended by McKee et al. (2001) and McKee et al. (2003): Mallard Island on the Sacramento River; Guadalupe River in San Jose; and the Zone 4 Line A flood control channel in Hayward.

During 2010 the STLS is carrying out two tasks to support the development of a draft multi-year watershed loading sampling plan. The first of these tasks "develop criteria and rank watersheds" used GIS to support a statistical classification of watersheds in the Bay Area. Preliminary results provide evidence that there are at least 4 distinct classes. It was envisioned that this task along with existing information on contaminant distributions in soils and sediment, and logistical factors would provide the rationale for choosing watersheds to monitor. The second task "Optimize sampling for loads and trends" is taking advantage of existing highly temporally resolute (5-15min) data available in Guadalupe River and Z4LA. These are being statistically resampled using a range of sampling designs and loads estimators (mathematical formula for loads calculations). Preliminary outcomes support the logical notion that more samples covering a greater number of storms or the use of the turbidity surrogate method provide loads with the greatest accuracy and the least bias. Cost analysis versus accuracy and bias showed that indeed the turbidity surrogate methods are the most cost effective for the least bias and greatest precision. It was then envisioned that, based on these results, the draft multi-year watershed loading sampling plan will be written that will contain recommendations for sampling location, sampling design (frequency), and analytes. Based on discussions at the June 14 Small Tributaries Loadings Strategy (STLS) meeting, it was concluded that insufficient evidence exists to select watersheds to monitor beginning October 2010. Instead, the Team supported a wet season reconnaissance sampling plan. This study follows that intent and is designed to support the Small Tributaries Loading Strategy by providing empirical data to rank watersheds. Ranking will also be supported by the outcomes of the Bay margins conceptual model and BASMAA decisions on pilot areas for increased management.

Applicable RMP STLS / MRP Management Questions

1. Impairment
   Which are the "high-leverage" small tributaries that contribute or potentially contribute most to Bay impairment by pollutants of concern?
2. Loads:
   What are the loads or concentrations of pollutants of concern from small tributaries to the Bay?
3. Trends:
   How are loads or concentrations of pollutants of concern from small tributaries changing on a decadal scale?

Approach

While the details of the number of stations, where these stations would be, the sampling frequency, analyte list (including ancillary data) are yet to be worked out (pending July 8 meeting), the starting framework to be discussed is as follows:

Watershed selection:	Based on Greenfield et al., 2010 (watershed clusters #1, #2, #3, and #6). Within strata selection based on factors such as %old industrial, %imperviousness, soil and sediment concentrations, watersheds where greater management effort is likely, existing flow data, logistics, statistical validity, and other factors such as knowledge of hot spots.
Number of stations:	With in budget limits ($300k?), at least 4 stations per strata but perhaps 3 stations in several strata and 5-6 stations in the other two strata.

Sampling Frequency: Minimum of 5 samples per station (better 6 or 7) during storm flow (ideally 2 storms) resulting from (predicted) 0.25 inches of rain in the urbanized (usually lower elevation) portion of the watershed. Focus would be on storms prior to January 31st as we has evidence that these are the "dirtiest" and so that interpretation can occur in early spring to support BASMAA and Water Board decision making.

Analytical list: Default is MRP category 1 analytes but logistically the list would ideally be smaller for small watersheds and could be more inclusive (for example include dioxins and some cat 2) in larger or selected watersheds.

Ancillary data: Turbidity (grab), stage (manually read staff plate installed before wet season), velocity (in larger watersheds where logistics allow)

Data interpretation: Primary method is envisioned to be graphical (example below excerpted from Z4LA y1 report) but the collection of stage data will also allow rudimentary flow-weighting of samples (knowing that at a minimum flow increases by a factor of stage squared). Watersheds will be ranked based on this storm data from most contaminated to least contaminated for each analyte. We expect to be able to group the watersheds in to high, medium and low categories. We know from experience in Z4LA, Guadalupe and Coyote that the sampling design will be sufficient to this level of interpretation or better.

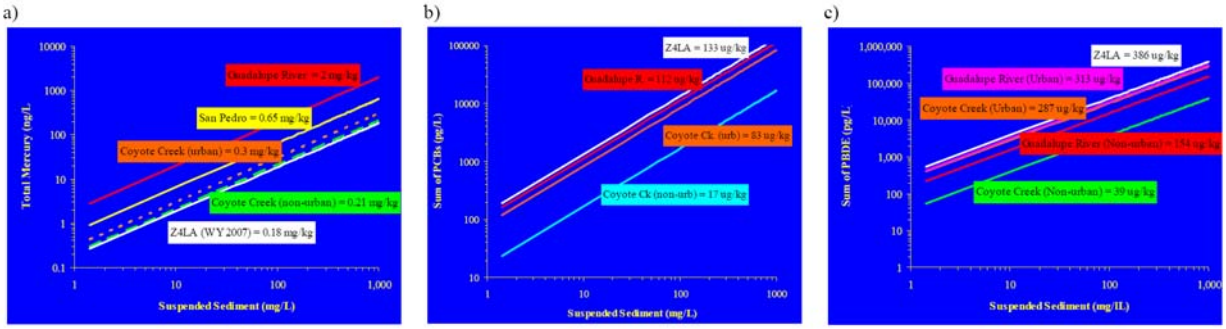

Figure 35. Estimated particle concentrations (represented by the gradients of the regression lines) for watershed systems in the Bay Area based on ratios between suspended sediment concentrations and contaminant concentrations. a) Mercury, b) PCBs, and c) PBDEs. Note, for Guadalupe River not all years showed a contrast between urban runoff and non-urban runoff because of climatic factors and perhaps because only 20% of the watershed is in non-urban land uses downstream from the reservoirs.

Proposed Budget (Preliminary for planning purposes only).** **The scenario presented represents a preliminary seemingly possible option pending STLS team discussion on July 8, 2010).**

		Scenario
	Number of stations	17
	Number of storms	1
	Number of samples per storm	5
	Total number of samples	85
Summary		
Equipment purchase and installation		$6,600
Field expendables+ travel+ shipping costs		$7,851
Laboratory		$122,315
Labor		
Project Management		$18,680
Field work		$64,720
Data management		$59,500
Data interpretation		$21,050
	Total	$300,716

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