

## Special Study Proposal: Small Tributaries Loading Strategy Program

**Summary:** The goal of the Small Tributaries Loadings Strategy (STLS) Program over the next few years is to continue to provide information to RMP Stakeholders and the public that directly supports the identification and management of PCBs and Hg sources, concentrations, loads, and the determination of trends in relation to management efforts and beneficial uses in San Francisco Bay. These information needs are called for in the Draft Tentative Order of the second Municipal Regional Permit (MRP 2.0) issued on May 11, 2015 (SFRWQCB, 2015). Four elements are proposed to continue to support these needs:

- Small tributaries wet weather characterization
- Regional Watershed Spreadsheet Model (RWSM)
- Small Tributaries Loadings Strategy Trends (STLS\_T) support
- STLS coordination support

In addition, the STLS program will provide a suitable framework for supporting other RMP elements including providing information on concentrations in watersheds upstream from priority margin units (PMUs) and where needed, carrying out sampling for other analytes including emerging contaminants.

**Estimated Cost:** Option 1: \$311k; Option 2: \$416k

**Oversight Group:** STLS/SPLWG

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### PROPOSED DELIVERABLES AND TIMELINE

Task	Deliverable	Due date																
		2015					2016											
		S	O	N	E	J	J	F	M	A	M	J	J	A	S	C	N	E
1	Small tributaries wet weather characterization [MQ 1,2]																	
1a	Wet season monitoring		!	!		!		!	!									
1b	Quality Assurance & Data Management								!!									
1c	Interpretation & reporting													!!		!		
2	Regional watershed spreadsheet model (RWSM) y5 [MQ 4]																	
2a	Finalize work plan based on latest info. and priorities								!!									
2b	Compile latest data (GIS & stormwater data)									!	!	!						
2c	Recalibrate model, estimate loads, & update model report													!!	!	!!		
3	Watershed loadings trends strategy support [MQ 5]																	
3a	Sampling and Analysis Plan and Quality Assurance Project Plan (SAP & QAPP development)					!		!	!									
3b	Field season preparation								!!					!!				
3c	Fieldwork																	
4	Small tributaries loading strategy coordination support					!		!		!	!		!	!		!		

[MQ] = Management Questions given in the Municipal Regional Stormwater Permit (MRP 2.0)

! = STLS check in for review and course corrections

!! = STLS/SPLWG oversight and review

### Background

The San Francisco Bay Hg and PCBs TMDLs call for a reduction in loads by 50 and 90% by 2028 and 2030, respectively. In response, the first Municipal Regional Permit for Stormwater (MRP) Provision C.8.f. (SFRWQCB, 2009) called for a range of actions including gaining a better understanding

of which Bay tributaries contribute the most loading to sensitive areas of biological interest on the Bay margin, better quantification of loads of sediments and trace contaminants on a watershed basis and regionally, a better understanding of how and where trends might best be measured, and an improved understanding of which management measures may be most effective in reducing impairment. These same needs were reflected in the small tributary loading strategy (STLS) priority questions (SFEI, 2009) and the annual updates of a Multi-Year-Plan (MYP) (e.g. BASMAA, 2013). On May 11, 2015, a Draft Tentative Order of the second MRP was issued and provided an updated set of management questions (provided below) (SFRWQCB, 2015).

Beginning with planning efforts in 1999 -2002 (“First report of the Sources, Pathways and Loadings Workgroup” (Davis et al., 2001) and the “Urban run-off literature review” (McKee et al., 2003)), the RMP along with other funding sources made considerable effort to measure loads at a number of strategic locations (i.e. Sacramento River at Mallard Island in Pittsburg, Guadalupe River at Hwy 101 and Almaden Expressway in San Jose, Zone 4 Line A in Hayward). These studies provided basic information to inform the PCB and Hg TMDL development as well as providing a valuable dataset for many other purposes, including reevaluating study design in relation to the issuance of the first MRP in October 2009.

During the first term of the MRP, the RMP initially funded two studies: a reconnaissance study, and a loading study. The data from the reconnaissance study, along with information from other studies and knowledge from program reps, supported the implementation of four fixed-station loading studies in WY 2012 and two more in WYs 2013 and 2014, for a total of six stations. These watersheds were deemed “no regret watersheds” in areas that had suspected elevated level of pollutant loading suitable for baseline information on which to measure future pollutant trends for priority contaminants. The RMP also funded the development of the Regional Watershed Spreadsheet Model (RWSM), a tool for estimating regional and sub-regional pollutant loads and a study component using GIS layer development to improve our understanding of source areas and event mean concentrations (EMCs).

The data obtained from the reconnaissance study and the loading studies, as well as efforts to better quantify the characteristics of PCB and Hg source areas, together constituted the entire program of investigation. This work occurred in relation to other strategies being performed to locate PCB and Hg source areas (e.g. the Bay modeling strategy, the BASMAA Source Property Identification screening). The ongoing success of the STLS program component as a whole cannot occur without sustained support from the RMP and a programmatic vision with appropriate linkages across other pollutant strategies. The individual studies described above are interrelated. For example, characterization data obtained from field studies primarily aimed at finding high leverage watersheds are also needed to provide calibration data for the RWSM modelling effort being developed to estimate regional loads. Likewise, the data gathered at the fixed monitoring stations to provide baseline loading data against which to measure future trends in relation to management actions also provide data to verify the RWSM. BASMAA utilized these data in Part C of their Integrated Monitoring Report (2013) to independently estimate regional loads, loads associated with specific land uses (i.e. for PCBs it was Old Industrial, Old urban, New Urban/Other, Open Space, and Hot spots) and to provide the basis for predicting the effects of management actions. The development of GIS data and the back-calculation of EMC

data in relation to source identification provided the necessary input data for the RWSM and also provided the starting point for source identification efforts conducted by BASMAA.

Much has been learned over the past 15 years and more recently during the first permit term (McKee et al., 2015) much of which was overseen by the Sources Pathways and Loadings Workgroup (SPLWG). The focus, in terms of RMP funding during the first permit term, was largely devoted to better understanding of loadings. Estimates for PCBs and Hg and other contaminant loads are now available for the Sacramento River at Mallard Island and 11 other local smaller tributaries locations (McKee et al., 2015). In addition, particle ratio data collected during storm events are available for 27 local smaller tributary locations (McKee et al., 2015). Despite this growing powerful data set, the remaining information include weaknesses such as learning more about which watersheds are most contaminated, source identification within contaminated watersheds, regional scale loads, where and which management actions will be most cost effective, and concentration and loadings trends in relation to management efforts (McKee et al., 2015). As such, during the next permit term (MRP 2.0), an increased focus is being placed on identifying watersheds and areas within watersheds that are producing disproportional concentration and loads in relation to impairment in Bay margin areas. There will still be some effort on the loadings question and developing and implementing a plan to determine trends. At this time, the Water Board and BASMAA are not recommending any RMP effort on true source area identification or predicting the potential effectiveness of management actions. Substantial efforts by BASMAA have been and are ongoing in relation to these management questions outside of RMP funding.

During 2015, the RMP funded the first phase of a new watershed characterization study aimed at locating more high leverage watersheds and sub-watersheds and developing a remote sampler method. This method will help to decrease costs and increase ease of data collection in locations where sampling may be logistically too challenging during storms. In addition to three locations tested with the pilot remote samplers, samples from 22 additional watershed locations were collected using manual methods. Also during 2015, funding was provided for further development and calibration of the RWSM, with progress made up to May 2015 indicating improved calibration. Funding was provided for developing the STLS trends strategy. So far, a general workplan has been developed and reviewed by the SPLWG, and a mission statement and a refined set of management questions are currently being developed. The “kickoff” meeting is planned for July 29<sup>th</sup>, 2015. Funds carried over from 2014 monitoring are being expended on field monitoring, GIS source work in relation to the RWSM, trends strategy support, remote sampler support, program management and updating the STLS in relation to MRP 2.0. These funds are expected to be sufficient to complete the first version of the calibrated RWSM for PCBs and mercury, the completion of the trends strategy, and completion of testing of up to three remote sampler options.

## **Study Objectives and Applicable RMP Management Questions**

The main study objectives are three fold:

1. Find watershed or sub-watershed locations with high concentrations of PCBs, Hg and other priority pollutants and rank these locations relative to each other and in relation to potential sources.

2. Determine regional scale loads of PCBs and Hg and determine which individual watersheds may be producing disproportionately high loads per unit watershed area.
3. Develop and implement a sampling program to provide suitable baseline data to support the identification of trends in concentrations and loads over appropriate spatial and temporal scales, connecting management effort on land with water quality improvements in the Bay.

MRP 2.0 Q1: Source Identification / Leverage: Which sources or source areas provide greatest opportunity for load reductions?

MRP 2.0 Q2: Impairment: Which source areas contribute most to impairment of Bay?

MRP 2.0 Q3: Management effectiveness: Provide support for planning future management actions or evaluate existing actions.

MRP 2.0 Q4: Loads: Assess POC loads, concentrations, or presence/absence.

MRP 2.0 Q5: Trends: What are the spatial and temporal trends in loads or concentrations?

## Approach

### **Task 1. Small Tributaries Stormwater Characterization Field Study [MQ1&2]**

The objective of this study is to characterize concentrations of key pollutants (PCBs and Hg) in watersheds suspected of having elevated concentrations. A wet weather field monitoring program will be implemented during the winter of 2015/2016 (Water Year 2016) that largely mimics, with the exception of some improvements, the program implemented during water year 2011 (McKee et al., 2012) and 2015.

- Monitoring Design:
  - 1 composite sample per site (unless unexpected low concentrations result, in which case additional samples may be considered)\_
  - Methods development for one remote sampler type at another nine locations.
- Site Selection: A balance between two overarching rationale:
  - Nested sampling design to track sources upstream in known polluted areas to help better define source areas and management options.
  - Finding new polluted watersheds or sub-watershed areas (watershed locations near the Bay margin or further downstream than the source tracking approach).
  - Other selection rationale:
    - 1 large watershed per year
    - Re-sampling potential false negatives
    - Contingency for resampling Guadalupe River for trends
    - Filling gaps along environmental gradients in relation to source areas (most specifically to support RWSM development [MQ4])
- Number of sites: Dependent on site logistics, proximity, analyte list, budget and other factors, likely in excess of 15 sites.
- Funding levels: \$150k (more than 15 sites); 200k (more than 20 sites).

### **Task 2. Regional Watershed Spreadsheet Model (RWSM) [MQ4]**

The primary objective of this study is to provide a defensible estimate of regional and sub-regional scale loads of PCBs and total mercury. During 2015, it is anticipated that a fully calibrated PCB and mercury model will be completed based on data from about 25 calibration

watersheds. Pending the outcomes of the 2015 work plan, STLS and the SPLWG will be consulted to agree upon and recommend the workplan for 2016. However, during 2016, further improvements will be made to the regional GIS component of the model along with experimentation with an increased calibration dataset (likely in excess of 45 sample locations). If budget allows, we will start the process of publishing the model software for use by STLS stakeholders. If not, publishing will be postponed until the next fiscal year.

- Funding levels: \$35k (Completion of the calibration for 45 sites, as much work as possible on model publication including a user manual); \$40k (further work on model publishing)

### **Task 3. Watershed Loadings Trends Strategy Support [MQ5]**

The objective of this task is to develop a Sampling and Analysis Plan (SAP) and Quality Assurance Project Plan (QAPP) for Task 1, carry out necessary pre-field season logistical support including site selection and reconnaissance, and then implement components of a winter season field monitoring program. The details of the workplan for this task will need to be worked out during the development of the Small Tributaries Loadings Trends Strategy that is occurring during 2015.

- Funding levels: \$100k (Completion of the SAP, QAPP, site reconnaissance, and sampling collection at an unspecified number of sites (budget dependent)); \$150k (samples at more sites).

### **Task 4. Small Tributaries Loading Strategy (STLS) coordination support**

The objective of this task is to provide support for coordination of efforts to address Small Tributary Loading Strategy management questions funded through the RMP program and those efforts funded and carried out by BASMAA. Funds will be used to prepare for and execute local STLS meetings, phone conferences and for staff to attend key meetings (i.e. BASMAA Monitoring/POCs Committee.)

## **Budget**

**Table 1. Budget summary.**

Task #	Task description	MRP 2.0 STLS Management Questions	2016 (low)	2016 (medium)
1	Small tributaries stormwater characterization field study	MQ1: Identify source areas.	150	200
		MQ2: Identify watershed areas contributing most to Bay impairment.		
2	Regional Watershed Spreadsheet Model (RWSM)	MQ4: Loads information / presence/absence.	35	40
3	Watershed loadings trends strategy support	MQ5: Evaluate POC trend.	100	150
4	Small tributaries loading strategy (STLS) coordination support	STLS communication support	26	26
			<u>311</u>	<u>416</u>

## Reporting

### Task 1. Small Tributaries Stormwater Characterization Field Study

The draft report written during 2015 will be updated to include the 2016 data. The main objectives of the report will be to document:

1. The outcomes of the remote sampler sub-study and make recommendation for situations when use is appropriate.
2. The concentrations and particle ratios observed in each watershed location, comparing these to existing data and ranking the watersheds from greatest to least pollutant concentrations.
3. Any loads estimates for watershed locations where there are flow measurements

### Task 2. Regional Watershed Spreadsheet Model (RWSM)

The short report written during 2015 will be updated and finalized.

### Task 3. Watershed Loadings Trends Strategy Support

Sampling and Analysis Plan (SAP) and Quality Assurance Project Plan (QAPP) will be written. The outcomes of the site selection and reconnaissance efforts for the 2016 wet season will be recorded in the master spreadsheet that will also compile information generated during all previous site selection exercises. This information will form a useful basin relation to site selection and reconnaissance for the trends strategy.

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