

## Regional Monitoring Program for Trace Substances in the San Francisco Estuary

### 2006 Program Plan

For more information contact:

Jay Davis, RMP Manager

[Jay@sfei.org](mailto:Jay@sfei.org)

(510) 756-4562

### OVERVIEW OF THE 2006 PROGRAM

In 2006, the Regional Monitoring Program for Trace Substances (RMP) enters its fourteenth year of monitoring and research. It promises to be an exciting year in which the RMP will embark on new studies and collaborations and continue to improve existing projects. In 2005, new management questions and objectives were adopted (see the 2005 Pulse article). In an effort to efficiently and effectively address these new questions and objectives, the RMP began a process in 2005 of developing five-year workplans for each of the three workgroups: Sources, Pathways, and Loading; Exposure and Effects; and Contaminant Fate. The goal of these workplans is to develop a coherent strategy for addressing RMP management questions. As part of the process of developing workplans, new study ideas were solicited, discussed, developed, and prioritized with input from the Regional Board and RMP participants. In 2006, a comprehensive RMP five-year plan will be developed to assist in long-term planning. It is anticipated that all of these documents will be revised on an on-going basis to reflect changes in our understanding of the Bay and the priorities of the RMP.

In the process of developing workplans, several new study ideas were developed, most notably in the Exposure and Effects Pilot Study (EEPS). One of the purposes of EEPS is to answer management questions associated with Objective 4: measure pollution exposure and effects on selected parts of the Estuary ecosystem (including humans). A study of pollutant effects on fish and a study of small fish as indicators of mercury in the Estuary food web were both initiated in 2005 and will continue into 2006. RMP has begun a collaboration with a variety of researchers from University of California at Davis, Applied Marine Sciences, and California Department of Fish and Game, among others, to study the effect of contaminants on the growth, fitness, and reproduction of shiner surfperch. The RMP will also continue its collaboration with Andy Jahn (formerly of Port of Oakland) to evaluate contaminant concentrations in small benthic and pelagic fish that inhabit the margins of the Bay. This work will be integrated with small fish mercury monitoring being conducted in Suisun and San Pablo Bay as part of the CalFed Fish Mercury Project and in the South Bay as part of the South Bay Salt Pond Restoration Project. An additional EEPS project planned for 2006 is a field and laboratory study to evaluate effects thresholds for benthic organisms. The latter work will be used to verify the Sediment Quality Objectives that the State is scheduled to promulgate in 2007.

The Contaminant Fate Workgroup will continue to guide studies that address the RMP objectives, particularly Objective 2: Project future contaminant status and trends using current understanding of ecosystem processes and human activities. The fate work scheduled for 2006 is part of a multi-year effort jointly funded by RMP and Clean Estuary Partnership (CEP) to further develop the multi-box model through additional testing and review. Modeling efforts will be augmented by a sediment coring study in the Bay. The coring study will provide critical information regarding historic loads to the Bay and information on processes that affect recovery of the Bay from contamination with persistent chemicals.

The Sources, Pathways and Loading Workgroup seeks primarily to address RMP Objective 3: Describe sources, pathways, and loadings of pollutants entering the Estuary. Two special studies in 2005 will enhance our understanding of the inputs to the Bay from tributaries. First, the Mallard Island Study is a study of contaminant loads from Sacramento and San Joaquin Rivers. This Special Study enters its fifth year in 2006. Sampling in 2006 is similar to that in 2005, and will characterize the loading of pollutants during the "first flush" - the first major flows of the year that carry a large proportion of the total annual load of pollutants. A report on the five years of the study (2002-2006) will also be prepared in 2006. Plans are for the Mallard Island Study to then be dormant until another full scale sampling effort is conducted in 2009, unless we have a high flow year. Loads from the Delta (and from small tributaries) during high flows are a critical information gap. If high flows occur, the RMP will use contingency funds to sample loads at Mallard Island.

A second loading study is being conducted on the Guadalupe River to develop a better understanding of loads from small tributaries due to transport during storm events. Urban runoff is a primary source of pollutants in runoff from Bay Area small tributaries, and this study is providing critical information on the magnitude of urban runoff loads. This study began in 2003 with funding from the CEP, continued in 2004 with funding from the CEP and RMP, and continued in 2005 with funding from RMP, the US Army Corps of Engineers, and SCVURPPP. All three entities will continue their support of this study in 2006, at a funding level of approximately \$50,000.

In addition to developing long-term work plans for the workgroups, the RMP has begun a process to evaluate and prioritize elements within the annual Status and Trends Monitoring Program. This process was initiated in 2005 and will continue into 2006. The review was triggered in part by the new management questions and objectives, the lessons learned from the 10-year synthesis articles, and the recommendations made by the workgroups and committees to incorporate new elements into Status and Trends. This review presents a great opportunity to evaluate the annual program to assure that we are meeting the needs of our stakeholders. Because this is the beginning of this process, it is anticipated that the 2006 Status and Trends program will remain largely unchanged from 2005. Potential areas for refinement may include a reduction in the frequency of collection of certain organic analytes and potential inclusion of exposure and effects indicators such as pollutants in cormorant eggs and benthic community composition. These changes will be presented in the RMP Detailed Workplan that will be developed in December. One notable change in the Status and Trends Program from 2005 will be the inclusion of the triennial sportfish sampling in 2006. Popular sport fish species, including striped bass, white croaker, and halibut will be sampled for mercury, PCBs, organochlorine pesticides, and PBDEs to determine if they exceed thresholds for concern for human health.

In 2006, the RMP will continue to: optimize the Program, develop long-term strategies to address the management objectives, and provide relevant information about the Bay that can be used by regulators, RMP stakeholders, and the scientific community at large.

## **TASKS**

### **1. Program Management**

The administration and management of the RMP requires a substantial effort from SFEI staff. Costs for this component of the RMP reflect the staff time required to manage finances and contracts, plan and coordinate internal activities and external workgroup, and technical oversight of RMP products.

#### **1.1 Internal Coordination**

This category provides SFEI staff time for coordination and liaison to program participants, program collaborators, Regional Board, and Steering and Technical Review Committees. This coordination is necessary to keep everyone involved in the RMP satisfied with the organization and efficiency of the RMP, to prepare for and facilitate critical decisions, outline issues, and to ensure that RMP activities complement and enhance other scientific efforts by Program Participants and the Regional Board (e.g., Clean Estuary Partnership). This task also includes the internal coordination of RMP staff (e.g., the coordination and technical oversight of different RMP tasks).

#### **1.2 External Coordination**

External coordination promotes a comprehensive and coordinated understanding and monitoring of the Estuary through participation in work groups and committees outside of the RMP umbrella. Members of RMP staff participate in the Clean Estuary Partnership (CEP), Interagency Ecological Program (IEP), the Surface Water Ambient Monitoring Program (SWAMP), Regional Board 5 activities, Sacramento River Watershed Program, Northern California SETAC, CALFED, BASMAA, BACWA, LTMS, the Bay Delta Modeling Forum, and various TMDL work groups and committees. In addition, RMP staff is frequently asked to present guest lectures at universities and national working group meetings and to serve on advisory boards. As appropriate, RMP staff convene meetings on select topics of interest to scientists, managers, and regulators such as the annual mercury coordination conference.

#### **1.3 Contract and Financial Management**

Tasks in this category include all efforts related to tracking progress and expenditures on all budgeted items, including invoicing of Program Participants, tracking incoming and outgoing funds, accounting and working with the SFEI auditor, working with the Fiscal and Administration Subcommittee of the SFEI Board of Directors, providing financial

status updates, and communicating with the Steering Committee on financial matters as needed. It also includes preparation of contracts after scopes of work have been negotiated, scientific oversight of products, coordination of field and laboratory components, trouble-shooting, scheduling, and implementing course adjustments as necessary, cost-effectiveness/performance evaluations of existing contractors and identifying potential new subcontractors as needed.

### **1.4 Program Planning**

Program planning for the RMP involves several tasks including Program Plan and Project Plan development, updating the five-year plan, proposal writing, RFP development, and development of scopes of work, both for in-house staff and subcontractors. With procedures in place for Pilot and Special Study selection and data interpretation, we will continue to place emphasis on documenting planning steps and assisting the Steering Committee and the Regional Board in prioritizing information needs, and adapting the Program to evolving management priorities.

In 2005, we began a process of developing five-year plans for each of the work groups (i.e., Sources, Pathways, and Loading Workgroup; the Contaminant Fate Workgroup; and the Exposure and Effects Pilot Study Workgroup). The purpose of these five-year plans is to develop a coherent strategy to address the management questions and objectives that guide the RMP. The five-year plans will allow the RMP to prioritize research and monitoring needs, to coordinate with other research/monitoring activities that are being undertaken in the Estuary, to solicit input from experts on a longer term, and to enable long-term financial planning. It is anticipated that in 2006, a comprehensive program plan summarizing the five-year goals for the RMP will be developed.

## **2. Information Management and Dissemination**

To meet the RMP Objective 6: “Effectively communicate information from a range of sources to present a more complete picture of the sources, distribution, fate, and effects of contaminants in the Estuary ecosystem”, all activities related to data management, RMP web-site maintenance, development of newsletters, the RMP Annual Meeting, presentations, and information transfer to a variety of audiences, including preparation of the RMP Annual Monitoring Results and the “Pulse of the Estuary”, are included in this category.

### **2.1 Data Management**

The primary objective of this task is to manage, maintain, and improve the RMP database and to enable greater accessibility of data results. The information management and dissemination goals for 2006 are as follows (listed in order of priority):

- Upload RMP analytical results from laboratories into the new database format (the State SWAMP database format) and continue to QA/QC these data to assure they are of high caliber;

- Continue maintenance of the web-based data access tool that was developed in 2004;
- Develop tools to increase the efficiency of QA/QC review; and
- Upload select datasets from RMP Pilot & Special Studies (or other studies) into the new RMP SWAMP database.

## **2.2 RMP Web Site**

The RMP web site is assuming an ever-increasing role in making data, technical reports, newsletters, bibliographies, Powerpoint presentations, and other documents available to the public. In 2005, the website was redesigned to make it more accessible. In 2006, we will continue the process of improving the website. The tasks to be conducted include: 1) posting agendas, minutes, and attachments from all workgroups and RMP committees on the web for easy access; 2) posting the RMP Annual Monitoring Results, which is distributed solely via the RMP web site; 3) converting RMP reports into appropriate publication quality formats for quality printing and/or for distribution on the SFEI website, 4) maintaining web directories and updating the RMP publications list to allow easy access; and 5) maintaining and improving the overall design of the RMP web site.

## **2.3 Information Dissemination**

The RMP produces newsletters, inserts, and other documents for dissemination. We will continue to take advantage of existing publications for information distribution, such as newsletters of participating agencies, the NEP newsletter, ESTUARY, and the IEP newsletter. As appropriate, fact sheets, briefing papers, and formal presentations to community groups and other organizations, and scientific conferences will also provide information about the RMP and its findings. This task also includes work related to planning and executing the RMP Annual Meeting. This year the Annual Meeting will occur in the Fall of 2006 to enable the collection and dissemination of data within a one-year time period (e.g., collection of samples in the Summer, analysis of data in the Winter/Spring and reporting the following Summer).

## **2.4 Annual Reporting**

This task includes preparing the Annual Monitoring Results for distribution on the web and writing, editing, and publishing the "Pulse of the Estuary." In calendar year 2006, the Annual Monitoring Results will be released in the Fall of 2006 and will include results from 2004 and 2005. Similarly, the Pulse will be released to coincide with the Annual Meeting in September 2006.

In addition to these reports, a separate report synthesizing five years worth of atmospheric deposition data at the San Jose Mercury Deposition Network (MDN) at the NASA Ames site will be prepared. SFEI will include the results of ambient mercury concentrations obtained from the USEPA mobile laboratory. The mobile laboratory

collected ambient air data in the Fall of 2005. These data will be used to evaluate sources of mercury in the Guadalupe Watershed.

## **2.5 Quality Assurance and Quality Control**

This task includes three main elements: 1) evaluating the quality of data generated by analytical labs; 2) updating the QAPP and protocol documentation; and 3) coordinating intercomparisons and other efforts to improve the quality of RMP data. In 2005, three laboratories (e.g., EBMUD, AXYS and CDFG) participated in a National Institute of Standards and Technology (NIST) laboratory intercomparison for PCBs, pesticides, PAHs, and PBDEs. It is anticipated that these results will be available in 2006. An evaluation of the results and a short summary document will be prepared. CDFG also participated in an informal laboratory comparison of organics in bird eggs with NIST. These results will also be reviewed and summarized.

## **2.6 Data Integration**

This category provides resources for staff activities that focus on integration of data from the RMP and non-RMP studies of contaminants in the Bay, and on synthesis of all of this information in evaluations of past trends, present status, and projected future trends. Other sources of information on Bay contamination include USGS studies, SWAMP, CALFED, EMAP, NOAA's Status and Trends Program, and the Clean Estuary Partnership (CEP).

### *Multi-box Model*

In 2006, we will continue our efforts to model contaminant fate in the Estuary to better understand the potential impact of management actions on recovery. Models are valuable to summarize the existing state of knowledge, synthesize information from the RMP and other programs on contaminants in San Francisco Bay, predict the response of contaminant concentrations in the Bay to management actions and natural processes, identify and prioritize data gaps, and communicate RMP results.

A multi-year scope of work for modeling and field studies has been developed jointly by the RMP and CEP. This scope calls for close coordination between these programs. Activities that will be undertaken by SFEI staff in 2006 under this project include:

- Incorporation of additional pollutants. The multi-box model currently is being applied to the fate of PCBs in the Estuary. In 2006, the model will be expanded to two other priority contaminants. Possible contaminants include mercury, legacy pesticides, or PBDEs.

### 3. Status and Trends Monitoring

The Status and Trends (S&T) Monitoring Program is comprised of four program elements: long-term water, sediment, and bivalve monitoring; Episodic Toxicity monitoring; Sport Fish Bioaccumulation, and the USGS hydrographic and sediment transport studies.

The 2006 RMP sampling will mark the fifth year of the new sampling design. The S&T monitoring program for water and sediment was significantly revised in 2002. A long-term plan for implementing this design, including a 20-year cycle of rotating panels, has been implemented. The new design follows the EMAP example of a randomized design capable of addressing questions related to a representative characterization of contaminant concentrations in water and sediment. The bivalve bioaccumulation component of the S&T, however, will not use a randomized design but rather will continue to sample the nine historical sites.

Water, sediment, and bivalve bioaccumulation sampling for the S&T monitoring program now occurs once a year in the summer. Summer has been selected for sampling because inter-annual variation due to natural variables, primarily freshwater inflow, is minimized during this period. The number of S&T monitoring stations varies by segment for water and sediment measurements based on current Regional Board management priorities, statistical power achieved for key contaminants, and fiscal considerations. In addition, five historical water stations and seven historical sediment stations are sampled to maintain time series for long term trend analyses.

#### 3.1 Water and Sediment Chemistry and Bivalve Bioaccumulation

##### *Water Chemistry*

Conventional water quality, trace metals, and trace organics sampling in water will occur during the dry season at 31 stations throughout the Estuary. The analyte list for 2006 for trace elements and organics will remain unchanged from 2005.

##### *Sediment Chemistry*

Sediment samples will be collected during the dry season. Sediment chemistry will be analyzed at 40 random sites and seven fixed sites. The 2006 analyte list for sediment will remain unchanged from 2005.

##### *Bivalve Bioaccumulation*

The bivalve monitoring component maintains the long-term database started by the State Mussel Watch Program. Because of logistical complexities, a randomized design is not feasible. Transplanted bivalves will be deployed at nine stations, using the mussel species, *Mytilus californianus*. Pending TRC discussion and approval, one additional historical site, Horseshoe Bay, may be included because significant historical data from the State Mussel Watch program exists for this site. As has been done since 1999, resident *Corbicula* will be collected from the Sacramento and San Joaquin River stations (BG20 and BG30). Similar to sediment and water, tissue concentrations in bivalves will be analyzed once per year during the dry season when Estuary conditions are more consistent on an interannual basis, to meet the trend evaluation and guideline comparison

objectives. Bivalves are analyzed annually for organics and this list remains unchanged from 2005. Trace element analysis has been reduced to a five-year interval. This analysis was most recently completed in 2001. Trace elements may be included in 2006, pending TRC discussion and approval.

#### *Toxicity*

Because the RMP S&T aquatic toxicity monitoring in the Estuary has shown little toxicity over the past several years, aquatic toxicity sampling has been scaled back to a screening effort approximately every five years. The next sampling is set to occur at a subset of random sites in 2006. Pending approval from the TRC, details of this sampling effort will be developed in the Spring of 2006.

RMP S&T sediment toxicity monitoring will continue as in previous years. Sediment toxicity measurements will be made at 27 sites in the Estuary (20 randomly allocated sediment chemistry stations and seven historical RMP sampling sites). Toxicity tests will be conducted with *Eohaustorius* (a solid phase test with survival as the endpoint) and *Mytilus* (an elutriate test with normal larval development as the endpoint). TIEs will be conducted in samples that show significant toxicity. In 2005, TIE testing was not conducted to enable the University of California-Davis, which conducts these tests for the RMP, to spend the year refining TIE methodologies. It is hoped that the improved methodology will provide better insight into the causes of toxicity.

Because toxicity is greater in the winter, a recommendation has been made to the TRC to sample sediments in winter to evaluate toxicity. Pending TRC approval, the toxicity workgroup will convene in early January to begin scoping this work.

### **3.2 Episodic Toxicity Monitoring**

The toxicity workgroup met in the fall of 2005 to discuss a five-year strategy for monitoring episodic toxicity in the Estuary. Based on this meeting, the workgroup proposed conducting episodic toxicity monitoring in the vicinity of the tributaries of the Estuary. A meeting of the toxicity workgroup will be held in the winter of 2005 to plan this event.

### **3.3 Sport Fish Bioaccumulation Monitoring**

Sport fish sampling in the RMP began in 1997 and occurs on a triennial basis. The next sampling event is scheduled for 2006. In preparation for this event, the RMP will convene the Fish Committee in November to assist with the study design. It is anticipated that popular sport fish species, including striped bass, white croaker, and halibut will be analyzed for mercury, PCBs, organochlorine pesticides, and PBDEs. Resources for the 2006 fish tissue monitoring component were set aside in 2004 and 2005 to lessen the budgetary impact in the 2006 monitoring year.



### **3.4 U. S. Geological Survey Participation**

The United States Geological Survey (USGS) has been a collaborating agency in the RMP since the beginning of the Program and has contributed in-kind services through Department of Interior funding, IEP funding, and other sources to enhance the RMP financial contributions designed to address basic hydrographic and sediment transport processes. An understanding of these basic processes is necessary to interpret the patterns and dynamics that are emerging from the RMP database on chemical indicators of water quality condition. The funds contributed by the RMP are generally less than half of the overall USGS costs to conduct both monitoring components outlined below.

#### **3.4.1 Sediment Dynamics in San Francisco Bay**

This study will be conducted by the USGS in Sacramento. The Principal Investigator is Dr. David Schoellhamer.

From 1993 to 2005, this element of the RMP focused on monitoring and understanding suspended sediment dynamics in the Estuary. This work has yielded many insights into sediment and contaminant dynamics in the Estuary. In 2006, in part in response to funding cuts, the USGS will reduce the number of stations from ten to five. The RMP, USGS, and the US Army Corps of Engineers convened a meeting in the summer of 2005 to discuss the optimal locations of suspended sediment stations in the Estuary. It was agreed to fund four fixed stations (i.e., Mallard, Benicia, Point San Pablo, and Dumbarton) and one temporary station located at the Hamilton Army Airfield. The four fixed stations will provide suspended sediment information at four embayments. The temporary site at Hamilton will provide the US Army Corps with information needed to evaluate the impact of the aquatic transfer station. It was also decided that the USGS will develop sediment flux calculation for the Dumbarton Bridge site. This information will be useful to the USGS, the RMP, and other parties including the South Bay Salt Pond Restoration Project in understanding the sediment dynamics in the South Bay.

In addition to the suspended sediment work, the USGS will continue to assist SFEI in the further refinement of the multi-box model.

#### **3.4.2 Hydrography and Phytoplankton**

This study will be conducted by the USGS in Menlo Park. The principal investigator is Dr. Jim Cloern.

This study will continue its measurement program in support of the RMP, with monthly water sampling in 2005 to map the spatial distributions of basic water quality parameters along the entire Bay-Delta system. Measurements will include salinity, temperature and dissolved oxygen, which influence the chemical form and solubility of some trace contaminants; suspended sediments and phytoplankton biomass, which influence the partitioning of reactive contaminants between dissolved and particulate forms. This basic information is required to follow the seasonal changes in water quality and estuarine

habitat as they influence biological communities and the distribution and reactivity of trace contaminants. Highlights from this work were described by Dr. Cloern in the 2003 Pulse of the Estuary. Hydrographic and phytoplankton sampling will be coordinated with other elements of RMP sampling.

Approximately 15,000 acres of salt ponds in the South Bay will be converted into wetlands. As part of this process, salt pond levees will be breached and water from the ponds released. Information on basic water quality parameters, such as salinity and dissolved oxygen, will be very important for understanding the impact of this wetland restoration on the Estuary.

### **3.5 Status and Trends Monitoring Field Work**

This work element includes SFEI staff involvement in Status and Trends Monitoring on board ship and general sampling support. SFEI staff collect water samples for analysis of trace organics, and assist with sediment collection and bivalve retrieval operations.

## **4. Pilot Studies**

### **4.1 Exposure and Effects Pilot Study**

The RMP in 2006 will continue a Pilot Study of contaminant exposure and effects in the Bay. The 2003 RMP Program Review Panel recommended an increase in the EEPS budget and stated that biological effects research should be a priority. In response to this concern, the SC allocated \$200,000 each year for EEPS through 2008. This includes funds for SFEI labor and subcontractors (e.g., analytical laboratories).

The EEPS workgroup met several times in 2005 to develop a four-year work plan for EEPS. In 2006, EEPS is embarking on several new projects including:

- Continuation of the second year of a three-year small fish study. Small fish are sentinel indicators of contamination in the margins of the Bay. It is anticipated that this effort will be funded at approximately \$40,000 per year.
- Continuation of a second year of a two-year fish effects study on Shiner Surfperch. The second year of study will be conducted in the laboratory to determine the effects on contaminants on growth and fitness. As part of this effort, a laboratory culture of Shiner Surfperch will be developed and exposed to contaminants in the Bay to determine if effects on growth, fitness or reproduction are observed. Funding for the second year will be authorized by the Advisory Panel based on a review of the first year's results. This project will be funded at approximately \$50,000 for the second year.
- Initiation of a benthic survey of the Bay to validate effects thresholds. In 2007 the State is scheduled to promulgate Sediment Quality Objectives that are based in part on benthic community assessments. The goal of this work is two-fold.

First, the SQO effect thresholds will be investigated and validated. Second, the project will begin a process of identifying what is causing effects and toxicity in the Bay. It is anticipated that this work will be conducted in the laboratory and field. This is a three-year project that is funded at \$40,000 per year.

- A potential egg-injection study in terns using PBDEs or contaminant mixtures. The RMP is in the process of identifying potential collaborators for this study. It is hoped that this work could piggy-back on existing work by researchers such as Mary Ann Ottinger at the University of Maryland. The feasibility of this study is being evaluated. If feasible, it is anticipated that this effort will be funded at approximately \$50,000.

In addition to subcontracts, there are labor and direct costs associated with this project. Estimated funding for the next three years is \$200,000 per year (e.g., 2006, 2007, and 2008).

#### **4.2 Winter Pilot Study**

In 2005, the first year of a two-year winter pilot study was conducted. Estuarine water was sampled at three historical RMP stations (i.e., Sacramento River (BG20), Yerba Buena Island (BC10), and Dumbarton Bridge (BA30)) during the 2005 winter season (February 2005). These water samples were analyzed for contaminants on the California Toxics Rule priority pollutant list.

Wet weather S&T contaminant monitoring is potentially an important element of the RMP. At the present time, the annual S&T monitoring occurs during the dry season, and seasonal variation is not captured by this sampling plan. The results from this Pilot Study will enable SFEI to evaluate the spatial and temporal trends of pollutants in the winter. Wet season monitoring results have been an important resource provided to environmental managers of Region 2 for use in NPDES permitting and the 303(d) listing processes.

A workgroup will be convened in October 2005 to discuss the winter sampling needs for 2006 and beyond. A key discussion point for this meeting will be understanding regulatory needs and assessing whether the scope of the pilot study needs to be expanded to additional sites or matrices. Changes to the scope of the Winter Pilot study will need to be discussed and approved by the TRC and SC.

### **5. Special Studies**

#### **5.1 Contaminant Loads from the Sacramento and San Joaquin Rivers**

As outlined in the Sources, Pathways, and Loadings Workgroup Report (Davis et al. 1999), large uncertainties exist with regard to loading estimates from the Sacramento and San Joaquin rivers. Analyses from this multi-year study have suggested that our previous estimates for both suspended sediment load and Hg load were high and this has greatly

affected the implementation recommendations in the recently released Hg TMDL report (Johnson and Looker, 2003). The question remains as to how accurate are our estimates. The San Francisco Bay is listed (Clean Water Act 303(d)) as impaired for mercury, selenium, PCBs, and chlorinated pesticides. This study aims to address information gaps associated with loadings of these substances (with the exception of selenium) so that a better understanding of relative inputs from urban point and non-point sources, erosion and resuspension in the Bay, and the inputs from the Central Valley rivers can be developed. The RMP TRC endorsed the continuation of the study in future years with the following work plan:

Water Year 2006	Sample “first flush” only and use contingency funds to sampling floods larger than 150,000 cfs as necessary (\$21,000 subcontracts + \$5,000 labor) and report the results and interpretation for five years of data (\$35,000)
Water Year 2009	Sample all floods during the season and report results and interpretation (\$115,000)

Funding level: \$60,000 for 2006.

## 5.2 Small Tributary Loading Study

Small tributaries form a major pathway for loads of contaminants that enter the Bay each year. Models developed for the Bay are highly sensitive to the magnitude of loads from small tributaries but present load estimates for this pathway lack accuracy and precision. This study will accurately measure contaminant loads from a small tributary representative of one that may contribute significant loads of sediment and associated contaminants to the Bay, help evaluate the significance of this load as a means of prioritization of further loadings studies, demonstrate a new methodology, and compare these accurate loads measurements to existing simple model estimates.

During WY 2003, the study was funded by the CEP. In WY 2004, the CEP funded the labor portion of the budget (\$75K out of \$125K). The RMP funded the laboratory analysis portion of the budget (\$50K). In WY 2005, USACE has provided \$100K out of \$173K for analysis of total, dissolved Hg and total and dissolved MeHg, fieldwork and reporting. SCVURPPP has provided \$23K for bed load sampling and Hg analysis, and RMP has provided \$50K for trace organics analysis and reporting. In WY2006, the USACE will continue to support this work at a level of \$77K.

During water year 2003 and 2004, the study successfully sampled flood events during the wet seasons for trace contaminant concentrations (Hg, TMs, PCBs, and OC pesticides), made continuous measurements of turbidity (~22,000 data points per year) and suspended sediment data were collected during floods amassing >300 samples. In WY 2003, 10,800 tonnes of suspended sediment passed by our sampling location carrying with it 116 kg Hg

and 1.5 kg PCBs, In WY 2004, 8,500 tonnes of SS passed through (estimated for contaminants are not yet completed).

The estimated funding level for 2006 is \$50,000.

### **5.3 Sediment Coring Study (Joint with CEP)**

As discussed in Section 2.6 Data Integration, the RMP is working closely with the CEP to develop contaminant models of the Bay that can be used to evaluate management actions and the corresponding response of the Bay. One of the key input parameters to the model is the load of pollutants into the Bay (e.g., from tributaries and the surrounding watersheds, from Delta inflow, or from buried sediments). Pending approval by the CEP Technical Committee, SFEI will implement a plan to analyze sediment cores in the Estuary to better understand contaminant fate processes in the Bay and the potential load available from buried sediments. Seventeen cores will be collected. The cores will be segmented, radio-dated, and analyzed for PCBs, PBDEs, and mercury. This information will be extremely useful not only to the RMP/CEP multi-box model but to our understanding of Estuarine processes and the potential reservoir of legacy contaminants. At present, this project is on hold pending approval from the CEP Technical Committee.

The estimated funding level for 2006 is \$100,000.