



## RMP Steering Committee Meeting

January 24, 2005

San Francisco Estuary Institute  
Second Floor Conference Room

7770 Pardee Lane, Oakland

1:00 PM - 3:30 PM

### AGENDA

1.	<b>Approval of Agenda and Minutes</b> (Attachment)	1:00 Chair
2.	<b>Information: Committee Member Updates</b>	1:05 Group
3.	<b>Information: Technical Review Committee Meeting Summary</b> (Attachment) The TRC met on December 21. Topics referred to the Steering Committee include the budget development process, the Annual Meeting, and timing of the Annual Meeting.	1:15 Jay Davis
4.	<b>Information: Budget Status</b> (Handout)	1:25 Meg Sedlak
5.	<b>Action: Program Plan Writeup and Budget for 2005</b> (Attachment, Handout) The SC approved the 2005 Program at the October meeting, but the narrative description had not yet been completed. The narrative and a budget summary page are now provided for approval. <b>Recommended Action:</b> Approve the narrative and budget summary.	1:30 Meg Sedlak
6.	<b>Discussion: Process for Determining the Budget and Program for 2007 and Beyond</b> (Attachment) <b>Desired Outcome:</b> Agree on a process or how to establish a process.	1:40 Mike Connor
7.	<b>Action: Responding to Review Panel Recommendations</b> (Handout) <b>Desired Outcome:</b> Develop a table summarizing planned approaches to responding to each recommendation designated for SC consideration.	2:10 Jay Davis

<b>8.</b>	<b>Discussion: Joint Meeting of the RMP SC and the CEP EMB</b> The Program Review Panel and the TRC have recommended that the SC consider a joint meeting with the EMB. <b>Desired Outcome:</b> Decide whether this should occur and, if so, select a date.	2:40 Jay Davis
<b>9.</b>	<b>Action: Annual Meeting Agenda</b> (Attachment) <b>Recommended Action:</b> Provide input on and approval of the Agenda.	2:45 Jay Davis
<b>10.</b>	<b>Information: Pulse Update</b> (Attachment) The latest outline for the Pulse will be briefly discussed.	3:00 Jay Davis
<b>11.</b>	<b>Information: Updating the RMP Objectives and Management Questions</b> (Attachment) A draft final document on the revised objectives and management questions has been prepared and is being distributed for a final review.	3:05 Rainer Hoenicke
<b>12.</b>	<b>Information: Report on the Winter Pilot Study</b>	3:10 Sarah Lowe
<b>13.</b>	<b>Information: Program Update</b> (Handout)	3:25 Meg Sedlak
<b>14.</b>	<b>Adjourn</b>	3:30

**REGIONAL MONITORING PROGRAM FOR TRACE SUBSTANCES  
STEERING COMMITTEE MEETING MINUTES  
October 18, 2004**

**Members Present:**

Kevin Buchan, Western States Petroleum Association  
David Dwinell, US Army Corps of Engineers  
G. Robert Hale, Alameda County Clean Water Program  
Ken Kaufman, South Bayside System Authority  
Delphine Prevost, Bay Planning Coalition  
Chuck Weir, East Bay Dischargers Authority  
Dyan Whyte, SFB RWQCB

**Others Present:**

Jay Davis, SFEI  
Rainer Hoenicke, SFEI  
Sarah Lowe, SFEI  
Meg Sedlak, SFEI

**1. Introductions and Approval of Agenda and Minutes**

After introductions, Jay Davis opened the meeting and asked for comments on the August 20, 2004 minutes (Item 1 Attachment 1). Under Item 10, 2005 Budget, Kevin Buchan asked that the minutes be revised to show that BASMAA would consider an increase, a decrease or no change in the budget for future program evaluations. Dyan Whyte and Bob Hale motioned to accept the minutes pending this revision.

**Action item: Revise August minutes to show that BASMAA agreed to consider an increase, a decrease or no change in future budgets.**

**2. Committee Member Updates**

Sarah Lowe informed the group that she would be transitioning much of her financial work (e.g., contracts and budgets) to Meg Sedlak as she will be leading a new data management group at SFEI. Kevin Buchan thanked Ms. Lowe for her many contributions to the group and noted that he particularly appreciated the easy-to-read, concise budget summaries that she had developed.

Dyan Whyte informed the SC that the Regional Water Quality Control Board and CEP will be hosting a stakeholder workshop on PCBs on October 25<sup>th</sup>, 2004. Information regarding the meeting can be obtained from the CEP web site.

### 3. Technical Review Committee (TRC) Meeting Summary

Jay Davis summarized the minutes from the most recent TRC meeting on September 21, 2004 (Item 1 Attachment 3). Jay Davis noted that the TRC has developed a table containing a list of responses to the external review panel's recommendations and that the SC will likely need to develop a similar table of responses for issues pertaining to the SC. Specific recommendations from the TRC table were then discussed (Item 3 Attachment 2). Dr. Davis noted that the TRC recommended that the SC should have a joint meeting with the EMB.

To respond to the Panel's recommendation that there be an increased emphasis on biological effects, the TRC extended the EEPS pilot study for two additional years at an annual cost of \$200,000. Dyan Whyte commented that this was a large expenditure and that the SC might benefit from a presentation on how this money would be spent. Jay Davis stated that a presentation could be made to the group and the SC agreed that this would be a useful exercise.

Dr. Davis then noted that the TRC had finalized its selection of Pilot and Special Studies for 2005. The approved plan included the following studies (Item 1 Attachment 5): a reconnaissance survey for potential locations for future local tributary load monitoring studies (McKee, \$7,500); determination of linkage between dredging and the SF Bay food web (Jahn, \$20,000); and development of a conceptual model for PBDEs (Oros, \$25,000). The TRC also approved the Winter Pilot for sampling at three historical sites for 2005 and 2006. Sarah Lowe indicated that the estimated annual winter sampling costs (\$100,000 for 2005 and 2006) were included in the budget sheets provided to SC but that the actual costs for the sampling would likely be lower. Dyan Whyte requested a brief presentation on the Winter Pilot Study.

The TRC authorized \$5,000 from the contingency fund to retrieve and catalog archived RMP samples that Bob Riseborough is currently maintaining. Chuck Weir asked how the samples would be used in future research and whether the integrity of the samples had been comprised due to the long storage time. Jay Davis indicated that it was important to know what was maintained by Dr. Riseborough before a decision could be made as to whether the samples would be of value to the RMP. In addition, Dr. Davis stated that Dr. Riseborough had already prepared a valuable summary on the long-term storage of archival materials. SC approved the use of contingency funds for this activity.

#### **Action items:**

- **SC should consider a joint meeting with EMB.**
- **EEPS work group will present an overview of the pilot study at the next SC meeting. The presentation will describe program goals and how the program will answer the RMP management questions.**
- **Sarah Lowe will prepare a similar presentation regarding the Winter Pilot Study.**
- **Execute contract with Dr. Riseborough to fund his proposal.**

#### 4. Information: Budget Status

Sarah Lowe presented an updated summary for the RMP Budget (Years 2002 – 2004) (Item 4 Attachment 1) and stated that the current budget was generally on track. Labor expenses were slightly higher than estimated (level of effort expended to date was 78 percent rather than 75 percent). Ms. Lowe noted that unpaid participant fees for 2004 totalled \$60,000 due to three participants: Caltrans, Mirant, and Loch Lomond Marina. Dyan Whyte expressed concern that Caltrans had not paid any of its fees. Sarah clarified that Caltrans initially owed approximately \$90,000 to the program, had paid approximately \$60,000, and was under a contractual obligation to pay the remaining portion. Ms. Lowe stated that in general, SFEI assumed that representatives from the delinquent industrial categories would work with the specific delinquent parties to see that the fees were paid. Kevin Buchan asked whether the Board needed to call Loch Lomond Marina to confirm that the fees would be paid. Dyan Whyte stated that she preferred that the stakeholders try to resolve the issue first. As a result of staff changes at the Bay Planning Coalition, it was not clear that Delphine Prevost had all of the information she needed to pursue the delinquent fees with Loch Lomond Marina. Sarah Lowe indicated that she would send information on the RMP and the allocation of dredger fees to Ms. Prevost. Ms. Lowe also stated that due to issues associated with the allocation of fees, the invoices for 2005 had been delayed slightly and were being sent out this month.

Dyan Whyte announced that a new discharger, Crockett Cogen, would be added to the RMP group starting 2005/2006. The individual fees in the industrial category would be reduced as a result of the addition of this new member. Ms. Whyte stated that the addition of a new discharger and subsequent reduction fees raised an interesting philosophical question – when new dischargers are added, does the overall work load for the RMP remain the same or increase? Ms. Whyte stated that she believed that Crockett Cogen had formerly been associated with C&H Sugar. This year the cogen plant obtained its own permit. Mr. Weir stated that if Crockett Cogen had been part of an existing discharge then the new permit did not really represent a new discharge and therefore, there was not substantial new work for the RMP. Mr. Weir, however, could envision a scenario in which a new discharger, such as refinery, relocated to the Bay. This new operation would represent a significantly new discharge and funding to the RMP should be increased. Kevin Buchan asked whether SFEI had a policy regarding new dischargers and the allocation of fees. Sarah Lowe reported that it did not. There was some discussion regarding if discharger fees in one sector increased then should fees be increased across all industry sectors? Kevin Buchan stated that a policy needed to be developed regarding the addition and deletion of members in sectors and the new allocation of fees. Mr. Buchan and Mr. Weir stated that they believed this was a policy issue that the Board should address.

**Action item: Sarah Lowe to send Delphine Prevost information on the RMP and allocation of dredger fees .**

## **5. 2005 Program Plan**

Jay Davis stated that the goal for this item was to approve the general elements of the 2005 budget. Dr. Davis stated that typically a general narrative on the Program Plan is made available to the SC during this meeting; however, because he has been unusually busy, he was unable to complete the Plan before the meeting. The Program Plan will be sent to the SC by electronic mail shortly.

Dr. Davis stated that the 2005 budget reflected the 1.5% inflation increase. Pursuant to BASMAA's request, the budgets for 2006 and onwards do not contain the inflationary increase (i.e., a zero percent increase). Dr. Davis indicated that the TRC would like to re-evaluate the episodic toxicity program. Ms. Lowe stated that in the past, the focus of the episodic toxicity program was on the water toxicity; however, data to date has not shown significant water toxicity. As a result, the EEPS work group is considering evaluating toxicity associated with sediment-associated chemicals in tributaries. Ms. Lowe also stated that the impetus for the winter sampling was to have wet weather data that could be used for NPDES permit evaluations. Dyan Whyte commented on the link between the RMP study and the application of the work to the development of NPDES permits.

Dr. Davis then discussed the status of specific program elements. Dr. Davis noted that the Mallard Island Special Study was carried over into 2005 due to budget constraints in 2004. Approximately \$50,000 remains in the budget for analysis of data and writing the report. The budget for 2005 allows for sampling of first flush events but does not address high flow events. Dr. Davis stated that if 2005 is a high flow year then contingency funds will be used to conduct additional sampling. Dr. Davis emphasized the importance of obtaining data on high flow events due to the nonlinear relationship between sediment loads in high flow events and sediment loads in low or medium flow events. The Mallard Island study will continue into 2006.

Dr. Davis stated that technical summaries associated with the Ten-Year Synthesis Special Study will be the subject of a special issue of Environmental Research. Russ Flegal of UC-Santa Cruz and Jay Davis have identified a tentative list of authors to write about a variety of 303 (d) list chemicals. Manuscripts should be prepared by June 2005.

Dr. Davis briefly summarized Lester McKee's Special Study on pollutant loads in the Guadalupe River. This project has been jointly funded by CEP and RMP. Dr. Davis noted that Lester McKee has been successful in obtaining additional funding sources for this project from the Santa Clara Water Valley District and the Army Corps of Engineers.

Jay Davis then outlined the remaining three new Special Studies. A project developed by Andy Jahn (\$20,000) would study bioaccumulation in the food web from dredged materials. It is anticipated that Don Yee of SFEI will lead this project. Lester McKee

(\$7,500) will conduct a reconnaissance survey for sediment studies. Daniel Oros' project will contribute to development of a conceptual model for PBDEs. Dr. Oros will work with Karen Taberski of the Board on this project. The CEP and RMP will jointly fund this project (\$25,000 from each).

Dr. Davis noted that the current budget for 2005 Pilot and Special Studies is approximately \$9,000 overbudget (i.e., project budget of \$494,400 vs allocated budget of \$503,500) but that he would work to make the program elements meet the existing budget.

Mr. Weir made the recommendation to approve the 2005 budget and plan. Kevin Buchan moved to approve the budget and plan and the SC approved the budget and plan.

**Action items: Jay Davis will prepare the Program Plan which will be sent to the SC.**

## **6. 2006 Budget and Program**

Dyan Whyte asked how BASMAA wished to approach the budget approval process. Jay Davis reminded the group that Mike Connor had offered to write a memorandum on the budget approval process and asked whether the group still thought this was a useful exercise. The consensus from the group was yes.

Jay Davis stated that the budget could be reviewed on a line item basis; however, the timing is currently off by 6 months. Increases to the budget are approved by the SC in January and the program elements of the budget are typically approved by the SC in October. Dr. Davis indicated that these two activities would need to be conducted in concert. The SC agreed that, based on this information, there was not sufficient time to conduct a line item review for the 2006 budget and that a zero percent increase should be implemented for 2006. No decision was made regarding the budget for 2007 and Jay Davis stated that if the 2007 budget is to be reviewed on a line item basis, the SC would need to make a decision by January 2005 in order for the budget and program plan to be developed and approved by October 2005.

A considerable portion of the meeting was then devoted to the discussion of future budgets. Specifically, the discussion focused on the inflationary increase to the budget (in past years this has amounted to an approximately 2 percent increase) and the merit of individual program elements. Bob Hale requested that the budgets be prepared two years in advance so that he can submit a budget request before the end of December (i.e., 13 months before the Program year). In order to meet this timing, Dr. Davis noted that the final Program Plan would need to be approved at the September and October TRC/SC meetings. Kevin Buchan noted that it was difficult to accurately project 2 years into the future for budget planning purposes and that this put unnecessary constraints on the adaptability of the program. Mr. Weir noted that the inflationary increase was relatively small (e.g., \$30,000) and that these costs paled in comparison to what the future costs for stormwater management may be in light of the new mercury TMDL.

Bob Hale suggested that each pilot and special study be evaluated to determine its validity and then a budget could be prepared based on those that merited funding. Kevin Buchan noted that the TRC currently evaluates the technical merit of the studies and that if projects were evaluated in absence of a budget, it was possible that the budget could be higher than it is presently. He noted that some projects that were eliminated this year such as Ben Greenfield's fish study could be deemed critical for the mercury TMDL and that this would result in a substantial increase in the existing budget.

Jay Davis stated that if a zero percent increase (no increase in the budget as a result of inflation) were approved, the loss of revenue would likely be distributed across all programs, not just the Pilot and Special Studies. Sarah Lowe emphasized that all of the programs are integrated (e.g., Pilot and Special Studies are coordinated with Status & Trends monitoring and the results from each of these programs is used to better all of the program elements).

**Action item: Mike Connor will develop a memorandum on the process to obtain budget approval.**

#### **7. Information: Updating the RMP Objectives and Management Questions**

It was agreed that in the interest of time this issue would be discussed at the next SC meeting. Rainer Hoenicke should inform the Committee of the input he needs.

#### **8. Approval of Outline for the 2005 Pulse**

Jay Davis presented the draft outline and schedule for the 2005 Pulse (Item 8 Attachment). Dr. Davis emphasized the need to produce the Pulse approximately one month before the Annual Meeting on May 10<sup>th</sup>. Mr. Weir and Mr. Buchan appreciated the concept of having a chance to review the draft Pulse. Dyan Whyte indicated that the Board should have interesting results on the Napa River TMDL by December and that if the SC approved, a summary of this work could appear in the Pulse.

Dr. Davis stated that the TRC had recommended a one-page summary fact sheet be written and asked the group whether they thought this would be helpful to their management staff or outreach communities. Several committee members thought it would be helpful to their boards to have a one-page summary. Dyan Whyte expressed concern that it not be too costly or too vacuous (e.g., a slick glossy summary with no scientific information).

The SC approved the draft outline and the one-page summary.

**Action item: Identify outside consultant to prepare one-page summary for the Pulse**

#### **9. Annual Meeting**



Dr. Davis indicated that SFEI was considering a new location for the Annual Meeting, the Oakland Museum. Several members appreciated the fact that the museum is close to BART and has easy freeway access. Mr. Hale noted that the size of the theater in the museum may be too small to host the Annual Meeting. Jay Davis will check on this and report back to the SC.

**Action item: Jay will determine whether the Oakland Museum theater is sufficient to house the Annual Meeting.**

#### **10. Responding to Review Panel Recommendations**

In the interest of time, this item was tabled until the next SC meeting in January 2005.

#### **11. Process for Review of RMP Reports and Manuscripts**

SC approved the review process (Item 11).

#### **12. Information: Program Update**

Jay Davis gave a brief update on the recent publication of Daniel Oros' paper in Environmental Science and Technology. He also indicated that John Oram was assisting to complete the PCB multi-box model and write the report which would be finished in November. Jay Davis noted that the model would be a central part of the PCB TMDL.

#### **13. Adjournment**

The meeting was adjourned at 4:00 pm.

#### **14. Next Meeting**

The next meeting is scheduled for January 24<sup>th</sup> at 1:00 pm.

**RMP Technical Review Committee Meeting  
December 21, 2004  
San Francisco Estuary Institute  
Meeting Minutes**

In attendance: Karen Taberski (Regional Board), Chris Sommers (EOA-BASMAA), Dave Tucker (City and County of San Jose), Bridgette Deshields (BBL/WSPA), David Dwinell (USACE), Diane Griffin (EBMUD), Kathleen Dadey (USEPA), Andy Gunther (AMS), Ray Arnold (Copper Development Association), Margaret Chang (US Army Corps of Engineers), Jessie Denver (City of San Jose), Eric Dunavey (City of San Jose), Jay Davis (SFEI), Sarah Lowe (SFEI), Don Yee (SFEI), Rainer Hoenicke (SFEI), Lester McKee (SFEI), Meg Sedlak (SFEI), Aroon Melwani (SFEI), Amy Franz (SFEI), and Jennifer Hunt (SFEI)

Participating by telephone: Trish Mulvey

**1. Introductions and Approval of Agenda and Minutes**

Dave Tucker opened the meeting by asking for comments on the September 2004 minutes. Jay Davis noted that several of the action items for the September meeting had not been addressed. These action items are included with the action items from today's meeting. A table summarizing the action items follows today's meeting minutes. In absence of any comments, Karen Taberski and Bridgette Deshields motioned for the minutes to be approved and the minutes were approved by the Committee.

**Action item: Include action items from the September 2004 meeting into the action items developed from the December 2004 meeting.**

**2. Information: Steering Committee Report**

Jay Davis provided a summary of the Steering Committee meeting on October 18, 2004. One of the major points was that the Steering Committee approved the 2005 budget. Dr. Davis noted that BASMAA had proposed that the Steering Committee approve the budget on a line-item basis with the budget potentially increasing, decreasing, or remaining the same. Most of the Steering Committee members indicated that they preferred to approve budget in its entirety rather than to delve into the budget on a line-by-line basis. Dr. Davis told the TRC that if a line-by-line budget approval process is adopted that it will require a longer planning horizon (e.g., the 2008 budget would need to be approved by October 2006). Mr. Tucker asked whether there was any discussion of looking at a multi-year budget and requested that this be brought up at the next Steering Committee meeting. Jay Davis also reminded the Committee that Mike Connor will develop a memorandum on the process to obtain budget approval.

**Action item: Dr. Davis will discuss the option of approving the budget on a multi-year basis with the Steering Committee. Dr. Connor will develop a memorandum on the process to obtain budget approval.**

**3. Information: Revision of the RMP Objective and Management Questions**

Rainer Hoenicke briefly summarized the new RMP Objective and Management questions and indicated that they would be considered for adoption at the next Steering Committee meeting. Karen Taberski stated that the new language under Objective 5 (Compare monitoring information to relevant *standards*) was unnecessarily restrictive as there may be circumstances in which there are no standards (i.e., only guidelines may exist). Dr. Hoenicke stated that it was not the committee's intent to be more restrictive and that he would revise this language.

Dr. Hoenicke stated that revised Objectives will serve as guidance for the Program for the next five years and as such, they will be issued as an RMP report. Dr. Hoenicke suggested that the revised Objectives be brought up at the next TRC meeting for approval.

**Action item: Rainer Hoenicke will revise Objective 5 to indicate that monitoring information will be compared to all relevant standards and guidelines and circulate the new objectives to committee members with a deadline for comments.**

**4. Information: Update on 2004 Pulse Outline**

Dr. Davis noted that a minor revision to the Pulse outline had been made because the PCB multi-box model will not be completed and reviewed in time to make the Pulse. Dr. Davis stated that there were sufficient articles remaining in the Pulse so it would not be necessary to identify a replacement article. Trish Mulvey expressed concern that the multi-box model would not be available for public review. Jay Davis stated that a Conceptual Model/Impairment Assessment report that includes a discussion of the model would be developed in late Spring/early Summer for review by the CEP. Andy Gunther indicated that the CEP would develop a media strategy for the release of the Basin Plan Amendment and the PCB CMIA. Dave Tucker suggested that Trish Mulvey contact Michelle Pla regarding her concerns on public outreach and review.

Dr. Davis requested that the Committee assist in the identification of important findings from 2004 on water quality in San Francisco Bay (not conducted by the RMP) that could be presented in the Status and Trends section of the Pulse (i.e., graphical highlights of non-RMP work).

**5. Discussion: 2005 RMP Annual Meeting Agenda**

Jay Davis stated that this year's Annual Meeting will be at the Oakland Museum and the theme for this year's meeting is "Answering the Important Questions." . The 2005 Annual Meeting agenda was discussed.

The Committee commented that the agenda looked ambitious and several commented that the agenda as written looked very controversial. For example, Dave Tucker noted that it is not necessarily true that a TMDL will be developed for copper and nickel. It is possible that these elements will be managed through an attainment strategy, rather than a TMDL. Similarly, Andy Gunther noted that it was not necessarily a given that the Bay would be impaired by PBDEs and that a TMDL would be needed.

Several of the Committee members suggested that the same topics as proposed could be included if the foci of the talks and the titles were changed slightly. One of the Committee members noted that one of the objectives was to synthesize data to help water quality managers. Dave Tucker suggested that the talks could be framed around the theme of science in support of regulatory issues (i.e., tying the results of the RMP to management issues). Diane Griffin suggested that the talk on PBDEs could be renamed to "A discussion of emerging contaminants - technical and regulatory perspectives." Andy Gunther suggested that each presentation could begin with the new management objectives and then delve into the science in support of the management issues. Andy Gunther thought the talk on Estimation of Contaminant Loads to the Bay (Lester McKee) was exemplary as understanding storm water loads and accurately being able to characterize them directly impacts the management and regulation of contaminants.

Several Committee members thought the talk and corresponding article in the Pulse on the Napa River TMDL should be dropped as it does not directly address issues about the Bay. Trish Mulvey suggested writing an article on sediment as a surrogate for source loads, with the focus being contaminant loads around Bay and coastal areas.

Karen Taberski suggested developing talks from the journal articles (prepared as part of the Ten Year Synthesis). Jay Davis indicated that the journal articles would not be prepared in time to be included in the Pulse but that they could be used to develop talks for the Annual Meeting.

Dave Tucker noted that the 2006 National Water Quality Monitoring Council Meeting will be held in San Jose, California. The focus of the meeting will be on developing a national strategy for monitoring. Mr. Tucker stated that this was an excellent forum for the RMP to participate in.

**Action item: Jay Davis to revise 2005 Annual Meeting Agenda to reflect Committee members' comments.**

**6. 2004 Highlights and 2005 Workplan**

Meg Sedlak presented a brief overview of the 2005 Detailed Workplan and the goals for the day (obtaining feedback on the Detailed Workplan). Ms. Sedlak indicated that the draft Workplan would be revised in January to reflect the new objectives and any comments that the TRC had.

**Action item: Meg Sedlak to revise the draft Detailed Workplan to reflect TRC comments and to incorporate new objectives and management questions. A revised Workplan will be distributed at the next TRC meeting.**

**6a. Program Management**

Meg Sedlak outlined the program management activities to be undertaken in 2005. The focus for 2005 is to better track deliverables (e.g., reports) and to improve the laboratory turn-around time. Ms. Sedlak indicated that deliverables would continue to be tracked through the Scorecard. Ms. Sedlak distributed an example of a laboratory data tracking sheet, which indicated that much of the 2002 and 2003 data would be reported in December and January, and asked the Committee if periodic reports on the progress of data analyses would be helpful to the group. Committee members stated that they found the laboratory data tracking sheet useful.

A discussion ensued regarding the importance of receiving data in a timely manner without compromising data quality. Dave Tucker stated that the public, which funds the Program, cares about cost, timeliness, and quality, and that we need all three. Kathleen Dadey also agreed that public perception of timeliness is important.

Dr. Davis stated that a goal for the Program would be to obtain and report the laboratory results within one year. Dr. Davis noted that the current schedule of the Annual Meeting (approximately nine months after sample collection) precluded the presentation of the previous year's sampling event. Dr. Davis suggested that if the Annual Meeting was convened in the Fall rather than Spring then it would be possible to have the results reported in one year, rather than 18 months as currently is the case. Kathleen Dadey suggested that the Steering Committee address this recommendation.

Meg Sedlak also queried Committee members as to whether it would be useful for the laboratories to meet with the TRC to discuss timeliness of data and issues surrounding laboratory turnaround times. Committee members were somewhat mixed about the utility of this endeavor and suggested that a laboratory summit meeting be convened independently of the TRC meetings with a subset of members.

Trish Mulvey and Dave Tucker requested that the Committee be kept informed of issues that could result in substantial delays of the reporting of laboratory results.

**Action items: Ms. Sedlak to provide regular updates of laboratory turnaround times through the laboratory data tracking sheets. The Steering Committee should address the recommendation that the annual meeting be convened in the Fall rather than the Spring. Ms. Sedlak to investigate the possibility of convening a laboratory summit meeting.**

**6b. Data Management**

Sarah Lowe presented an overview of the highlights of data management for 2004:

- Transfer of RMP data into the SWAMP format to facilitate use of data among agencies; and
- Development of the data web query tool.

The goals for data management for 2005 include the following:

- Continue to upload RMP data in SWAMP format;
- Continue to maintain web-based query tool;
- Develop a method for labs to submit data via the web;
- Develop tools for increasing the efficiency of QA/QC review; and
- Upload historic data bases into the SWAMP format.

**6c. Information Management**

Jay Davis gave a brief overview of information management for 2005. Jen Hunt will oversee the production of the two newsletters and Estuary insert. Other activities included under this task are: preparation of posters and graphics for presentations, press outreach, and logistics coordination and development of graphics for the annual meeting.

**6d. Data Integration**

Jay Davis presented several of the accomplishments under the 2004 data integration task including:

- Development of the multi-box PCB report;
- Preparation of a manuscript on the PAH budget;
- Preparation of a manuscript on sediment quality triad; and
- Preparation of a manuscript on PBDEs.

Dr. Davis briefly summarized the 2005 data integration task that consists primarily of a multi-year scope of work jointly funded by RMP and CEP for fate modeling and field studies.

Major activities to be conducted in 2005 include:

- Documentation of USGS sediment transport model;
- Review and test PCB multi-box model;
- Conduct sediment sampling; and

- Apply multi-box model to other pollutants.

He envisions that the multi-box model would be expanded to address one or two other pollutants, subject to the approval of the TRC. Total mercury is proposed as the first pollutant.

Andy Gunther wondered whether there were economies of scale in the modeling effort if pollutants with similar physical/chemical properties were selected. Dr. Davis estimated that each pollutant case study would cost approximately \$40,000. Mr. Gunther also wondered if it would be possible to archive sediment samples collected in 2005 to be analyzed later for pollutants that the TRC approved (e.g., mercury). Dr. Davis noted that this might be a reason to have the TRC approve the pollutants to be model prior to the collection of sediment samples.

Deliverables for 2005 under the data integration task include:

- Journal manuscript on organochlorines;
- Final report on the PCB multi-box model;
- Manuscript submitted on the multi-box model;
- Technical report on PCB multi-box model 2.0;
- Pulse article on the Estuary Contamination Index; and
- Report on San Francisco Bay wetland benthos.

Bridgette Deshields asked whether there would be TRC review of the multi-box report; Dr. Davis indicated that the draft report would be distributed for review in the next few weeks and the final report on the PCB multi-box model would be available for review in March.

Jay Davis queried the Committee as to whether it was useful to present a multi-year scope of work. The Committee indicated that it was; however, Mr. Tucker indicated that he would have preferred more detail in the detailed workplan.

There was discussion on the Estuary Contamination Index and how this related to other indices such as the Bay Institute Report card. Mr. Gunther requested clarification on the relationship of the Estuary Contamination Index to the work that SFEI is currently conducting for the San Francisco Estuary Project (SFEP). Mr. Gunther also wondered whether the development of an Estuary Contamination Index included the collection of data or whether it would compile indicators from existing sources. Rainer Hoenicke indicated that it would be a mixture of both and would identify data gaps.

With regard to indicators, Rainer Hoenicke stated that SFEP was hosting an Environmental Indicators Workshop on January 26, 2005 at Oakland City Hall to develop, monitor, and interpret data on indicators and to coordinate indicator monitoring efforts. Karen Taberski stated that the State Board must develop a report card and wondered if there was any overlap or participation in this endeavor by agency personnel. Rainer Hoenicke indicated that John Hall of

USEPA is actively participating in this workshop. Dr. Hoenicke stated that he will send a list of participants in the workshop to the TRC.

**Action item: Rainer Hoenicke to provide the TRC with a list of participants in the Environmental Indicators Workshop. Bruce Thompson will clarify the relationship of the Estuary Contamination Index to the work that SFEI is currently conducting for the San Francisco Estuary Project.**

6e. **QA/QC**

Don Yee summarized the highlights of 2004 which included:

- Field QA involving XAD sampler and whole water – Based on the PCB data, XAD sample results are twice the whole water grab samples. This may be because XAD samples are integrated across a longer period of time.
- Split egg samples for PBDE – good reproducibility for PBDEs, less so for PCBs;
- Method Development – difficulties with phthalates;
- New Analyses – Methyl mercury analyses are now being conducted by UCSC. Based on a conference that UCSC recently attended, it may be necessary to modify field SOP for methyl mercury to reduce loss as a result of compositing of sediment samples.

For 2005, it is envisioned that QA/QC task will include the following:

- Develop data quality objectives for new contaminants;
- Revise the QAPP to conform with the SWAMP template;
- Conduct laboratory audits; and
- Continue calibration and validation of sampling and analysis.

Ray Arnold asked why the dissolved selenium reported on the RMP web site was higher than the total selenium.

**Action item: Don Yee to provide an explanation as to why dissolved selenium concentrations frequently exceed total selenium concentrations.**

**Lunchtime Presentation – Multi-box PCB Model Version 1.0 –Sneak Preview**

John Oram gave a lunchtime presentation on the PCB multi-box model that Jon Leatherbarrow had developed and Jon Oram had recently optimized. The model incorporates the Uncles and Peterson salinity model with the UC-Davis sediment transport model developed by Lionberger and Schoellhammer. A PCB transport component was then added by SFEI. The multi-box model segments the Bay into 50 boxes with two vertical layers. Physical aspects such as tides, inflow, outflow, wind and rain force flow between the boxes. In addition, mixing between layers is based on a model by Fuller et. al. (1999) that indicates most of the mixing occurs in the top 30 cm. By using the model to hindcast PCB concentrations in



the Bay from 1940 to 2000, Oram and Leatherbarrow found surprisingly good correlation between the model and the available historical data. Andy Gunther commented that this was remarkable given that the model had not been calibrated. Forecasting by the model indicates that natural attenuation is a critical factor for achieving recovery of the Bay. A discussion of the assumptions regarding natural attenuation ensued.

Jay Davis indicated that the draft report would be released shortly. The list of reviewers will include the expert scientists that participate in the Fate workgroup (Drs. Joel Baker and Tom McCone) and an outside review coordinated by Applied Marine Sciences.

**6f. Status and Trends and Winter Pilot Study**

Sarah Lowe presented the highlights of the 2004 Status and Trends sampling and a synopsis of the 2005 Status and Trends program. Ms. Lowe indicated that the 2005 sampling program would be very similar to the 2004 sampling plan with the possible exception that the “new analytes” proposed in 2002 would be revised. Ms. Lowe provided a handout summarizing the “new analytes”, cost to analyze, and recommendations for 2004 and 2005. Ms. Lowe indicated that based on an internal staff meeting in September regarding the “new analytes,” she had notified that the laboratories to drop all of the “new analytes” for 2004 with the exception of PBDEs and polycyclic musks in bivalves.

Mr. Tucker concurred with this recommendation for 2004 and recommended dropping all of the “new analytes” in 2005 except for PBDEs. Ms. Lowe encouraged Mr. Tucker to consider retaining polycyclic musks in bivalves to ensure consistency (e.g., several years of sampling data); however, the Committee felt that, if needed, additional samples could be collected in the future and it would not impair the research if the data were not collected consecutively. Ms. Lowe indicated that the musk data would be important for Dr. Epel at Stanford University who is studying effect thresholds of polycyclic musks in bivalves.

Bridgette Deshields recommended that a study of PFOS and pharmaceuticals be developed as a special study. Andy Gunther also suggested looking at alkanes because this data could be very relevant in the event of an oil spill. There was some discussion as to whether the alkylated PAHs could be a surrogate for the alkanes. It was agreed that Daniel Oros should look at the alkylated PAH data and determine whether it could be used as a surrogate for alkanes.

Ms. Lowe recommended that the octylphenols and alkylphenol polyethoxylates be included in the 2005 water sampling program. Nonylphenols were monitored as a “new analyte” in water, sediment, and tissue but were either not detected or detected at concentrations significantly below the NTR aquatic life value. The Committee suggested reviewing octylphenols and alkylphenol polyethoxylates in March when a justification for this sampling could be provided.

Sarah Lowe then provided a brief summary of the Episodic Toxicity work. The purpose of the study is to investigate sediment toxicity to freshwater and estuarine test species in six estuary tributaries from storm events. Two sampling events, the first rains in November 2004 and after the first application of pesticides in April 2005, will be undertaken. Sediment will be analyzed for metals, organics (i.e., PAHs, PCBs, pesticides, PBDEs and pyrethroids), and sediment toxicity. One of the Committee members asked whether this work was duplicative of the work conducted by the SWAMP program. Karen Taberski indicated that, unlike the RMP research project, the SWAMP program is not storm-event driven.

Ms. Lowe indicated that approximately \$142,000 had been set aside for Episodic Toxicity research for 2005. Dave Tucker asked how this money would be spent. Ms. Lowe indicated that approximately \$100,000 would be spent on the April sampling of six tributaries. Mr. Tucker asked whether PBDEs would be analyzed as part of this research project. Ms. Lowe said yes.

Ms. Lowe also briefly discussed the wet weather sampling that would occur in February at three sites. The purpose of this work is to identify seasonal variability. Mr. Tucker then recommended that RMP develop a five-year plan for toxicity testing and linking the plan to changes in pesticide usage. He stated that it might not be necessary to analyze for all chemicals. Ms. Lowe indicated that the research was a baseline. Mr. Tucker agreed that it might be a baseline but that SFEI needs to start looking out over a five-year planning horizon. Sarah Lowe stated that during the next year SFEI needed to further develop the design of wet season sampling in the RMP. Mr. Tucker and Ms. Taberski asked that they be included in the work group that will consider the wet season sampling program.

Ms. Lowe also informed the group that she would be leading a new data management group at SFEI.

**Action Item: Meg Sedlak will look at the potential for analyzing alkanes and whether the alkylated PAHs could serve as a surrogate for alkanes. Sarah Lowe to provide justification for sampling for octylphenols and alkylphenol polyethoxylates at the next TRC meeting. A work group will be convened to determine how to redesign the status and trends sampling program to capture the impacts of seasonal effects.**

**6g. Status and Trends: Fish**

Jen Hunt gave a brief summary of the status of the Sport Fish element. Results from the laboratory are expected in early 2005 and report summarizing these results will be written in the Spring.

**6h. Special Study: Mercury Deposition Network (MDN)**

Don Yee gave a brief presentation on the results of the national Mercury Deposition Network. The San Jose site is one of two sites in California involved

in the program. The second site is located in Sequoia National Park. Dr. Yee presented a slide contrasting the mercury concentrations at each site.

The committee agreed to continue funding this project for 2005 at a cost of \$18,000 to the RMP. The City of San Jose will continue to provide in-kind contributions on the order of \$50,000 for the collection of samples. It was felt that these data are useful because it is one of the few urban measuring sites in the west and the only site in California. Don Yee noted that Calfed had requested that the RMP continue this project. Karen Taberski noted that in a recent study by the Board on reservoirs that all lakes had mercury regardless of distances from potential sources suggesting that atmospheric deposition of mercury is important. One of the Committee members asked whether any speciation data is available (it is not). Don Yee agreed to determine the cost for conducting the additional analyses for mercury speciation.

**Action item: Develop contracts for RMP's continued participation in MDN.**

**6i. Special Study: Dredged Material and the Food Web**

Dr. Yee presented a summary of the special study to investigate the effect of dredging on bioaccumulation. This \$20,000 research project will involve a literature review followed by the development of a conceptual model.

**6j. Exposure and Effects Pilot Study and Exposure Effects Work Group**

Dr. Davis presented a summary of activities that occurred in 2004 including:

- An advisory meeting in February;
- A conceptual model report completed; and
- Collection of cormorant eggs.

Ms. Lowe also indicated that the RMP had funded a study of seal fur mercury. The study will compare Bay seals to open ocean seals and determine the best matrix for sampling seals. A Committee member asked when the study results would become available. Ms. Lowe also indicated that the RMP had assisted scientists in developing a proposal to the National Science Foundation regarding the decreasing population of seals in the Bay.

Activities proposed in 2005 for EEPS include the following:

- A study of mercury, selenium, and organochlorines in diving ducks;
- A study of mercury in clapper rails;
- A proposal to fund research on the impact of contaminants on fish (to be posted in January);
- Sediment toxicity study (comparison of laboratory and resident species); and
- Report on benthic community evaluation.

Kathleen Dadey asked for clarification on the sediment toxicity study. Ms. Lowe explained that the purpose of this \$60,000 study is to evaluate mechanisms of

toxicity to two different types of amphipods (one is free burrowing; the other is a tube builder). The effect of three different chemicals, copper, chlorpyrifos, and the PAH fluoranthene will be investigated. Two different studies will be conducted one with sediment/water and the second with only water. Ms. Dadey questioned the relevance of conducting a water only experiment with a contaminant such as PAH which is hydrophobic. Ms. Lowe responded that the purpose of the experiment was to determine the mechanism of exposure and, therefore, it was important to conduct the water-only experiment.

**Action item: Sarah Lowe to find out when results of seal study will be available and to provide copies to the TRC.**

**6k. Special Study: Ten Year Synthesis**

Dr. Davis stated that the Ten Year Synthesis articles would be published in a special issue of the journal *Environmental Research*. Dr. Russ Flegal of University of California—Santa Cruz is coordinating this effort.

**6l. Special Study: PBDE Information Gaps**

Jay Davis presented Daniel Oros's special study investigation PBDE information gaps that is being jointly funded by the RMP and the CEP. The RMP will fund the analysis of samples for this project. Ms. Lowe reminded the group that this work would tie into the Episodic Toxicity project that is examining PBDEs in tributaries. Chris Sommers, Karen Taberski, and several other Committee members requested the location of sampling sites for this study. Mr. Tucker indicated that Daniel was welcome to sample the City of San Jose's wastewater treatment plant.

**Action item: Daniel Oros to provide TRC with sampling site locations.**

**6m. Special Study River Loadings, Guadalupe River Study, and Reconnaissance Study to identify loading sites**

Dr. McKee provided of the three special studies that he is directing. The river loading study (\$51,000) is a continuation of previous years' Mallard Island work to determine sediment loads from the San Joaquin and Sacramento rivers. This project is jointly funded by the US Army Corps of Engineers (\$100,000), the RMP, and the Santa Clara Valley Water District (\$23,000). The purpose of the Guadalupe river study (\$50,000) is to accurately quantify mercury and PCB loads from a known contaminated tributary. The third special study (\$7,500) is to identify potential sampling locations in representative watersheds. Karen Taberski noted that the Regional Board has conducted considerable work in this area. Ms. Taberski recommended that Lester contact her regarding this work.

With regard to the Guadalupe and Mallard Island studies, Dr. McKee explained that storm water would be analyzed for PCBs, OC pesticides, PBDEs, PAHs, Hg, TMs, organic carbon and SSC. At existing sampling locations, after satisfactory data are gathered that characterizes OC pesticides and PAHs (one to two years of

data), OC pesticides and PAHs would be dropped. The rationale for this change in sampling regime is the increasing concentration of PBDE in the Bay and food change and the expectation that a ban on OC pesticides will greatly diminish their presence in storm water. Dr. McKee stated that although the cost to analyze for PBDEs is higher than the OC pesticides, the budgets for these projects would remain unchanged and fewer samples would be analyzed to cover the increase in analytical costs. Ms. Taberski thought that the proposed sampling change was a good idea. Motions were made and the change was approved by the TRC.

Dr. McKee and the Committee discussed how the PBDE tributary work would be incorporated into Dr. Oros's work on PBDEs.

**Action item: Lester McKee to contact Ms. Taberski regarding reconnaissance work that the Regional Board has conducted on potential sampling sites.**

**6n. Work Groups**

Jay Davis indicated that the Fate work group would reconvene after reviewing the multi-box model, most likely in February. The next meeting of the Sources Pathways and Loading Work Group will be March/April and the objective would be to approve the five-year work plan. The Exposure and Effects work group will also meet in 2005; a date for this meeting has not been proposed.

The meeting was adjourned at 3:15 pm.

## ACTION ITEMS

<b>ACTION</b>	<b>WHO</b>	<b>STATUS</b>
Put the alkylated PAH data on the web.	Jennifer Hunt	Don Yee to QA/QC data and post to web
Incorporate comments received on the Dredged Material Testing study	Don Yee	Don Yee to release draft for comments in January.
Look into whether recent data on PCB congeners can be provided electronically	David Dwinell	
Talk with Dave Tucker about a joint TRC/TC meeting	Jay Davis	
Discuss with Steering Committee approval of the budget on a multi-year basis	Jay Davis	
Develop a memorandum on process to obtain budget approval	Mike Connor	
Revise Objective 5 to indicate data will be compared to all relevant guidelines and standards. Circulate revised objectives to TRC members.	Rainer Hoenicke	
Revise 2005 Annual Meeting Agenda to reflect TRC's comments	Jay Davis	
Revise Detailed Workplan to incorporate new objectives and TRC comments	Meg Sedlak	
Provide laboratory data tracking sheets at TRC and investigate possibility of convening laboratory summit	Meg Sedlak	
Discuss with Steering Committee the possibility of convening the annual meeting in the Fall, rather than the Spring	Jay Davis	
Provide TRC with list of participants for the Environmental Indicators Workshop	Rainer Hoenicke	
Clarify relationship of Estuary Contamination Index with the existing SFEI/SFEP	Bruce Thompson	

work		
Investigate why dissolved selenium concentrations frequently exceed total selenium	Don Yee	
Investigate the suitability of analyzing alkanes/alkylated PAHs	Meg Sedlak	
Provide rationale for analyzing octylphenols and alkylphenol polyethoxylates in water	Sarah Lowe	
Convene Status and Trends Redesign work group to address seasonality of sampling	Sarah Lowe	
Initiate contracts to continue MDN work	Meg Sedlak	Started.
Provide results of seal study to TRC	Sarah Lowe	
Provide TRC with a map showing PBDE sampling locations	Daniel Oros	
Contact the Regional Board to obtain previous studies on potential sampling sites	Lester McKee	

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

### 2005 Program Plan

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### OVERVIEW OF THE 2005 PROGRAM

In 2005, the Regional Monitoring Program for Trace Substances (RMP) enters its thirteenth year of monitoring and research. Each year, SFEI has adapted the RMP in response to changes in the regulatory landscape, advances in our understanding of the Estuary, and a continual drive to adjust the Program to better meet its objectives. Part of this adaptation process includes a periodic review of the RMP objectives and management questions that are the foundation for all of the Program's activities. In 2004, a review of the objectives and management questions adopted in 1998 was undertaken to evaluate whether they adequately addressed current information needs. Based on this review and input solicited from scientists, regulators, and interested stakeholders, the following revised objectives were developed:

1. Describe the distribution and trends of pollutant concentrations in the Estuary;
2. Project future pollutant status and trends using our current understanding of ecosystem processes and human activities;
3. Describe sources, pathways, and loading of pollutants entering the Estuary;
4. Measure pollution exposure and effects in the Estuary ecosystem (including humans);
5. Compare monitoring information to relevant standards and other guidelines; and
6. Effectively communicate information from a range of sources to present a more complete picture of the sources, distribution, fate, and effects of pollutants in the Estuary ecosystem.

It is anticipated that the revised RMP objectives will be formally adopted in early 2005. The 2005 RMP has been specifically designed to address these objectives. Following this overview, the remainder of this Program Plan describes the major elements of the 2005 RMP. Further details are presented in the Detailed Workplan (available upon request).

To address the new RMP objective to project future trends (Objective 2) in 2005 the RMP will continue to refine and expand the applications of the multi-box PCB model that was developed in 2004. This will be part of a multi-year effort jointly funded by RMP and CEP to further develop the multi-box model through additional testing and review, inclusion of quantitative uncertainty analyses, and improvement of graphical output. This will result in the production of version 2.0 of the Multibox PCB Model in 2005. Other parts of the joint multi-year scope address further documentation of the multi-box model by USGS, a two-phase field



study of sediment dynamics, and application of the model to three other pollutants. Work on one of the additional pollutants will occur in 2005. The pollutant to be modeled next will be determined through discussions of the TRC. The joint scope also calls for sampling to fill information gaps on the distribution of pollutants at depth in sediment and the dynamics of sediment mixing and exchange with the water column. The CEP will fund the first round of sediment sampling in 2005. If deemed necessary by the TRC, a second round of sampling funded primarily by the RMP will occur in 2006.

Three 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 fourth year in 2005. Sampling in 2005 and 2006 is being scaled back from that in previous years, 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 first three years of the study (2002-2004) will also be prepared in 2005. Plans are for the Mallard Island Study to then be dormant until another full scale sampling effort is conducted in 2009.

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 is continuing in 2005 with funding from RMP, the US Army Corps of Engineers, and SCVURPPP. The RMP has earmarked funds for this study again in 2006.

The third tributary loading study is a small effort to identify sampling locations in watersheds that might be studied in the same manner that we are currently studying the Guadalupe River watershed.

Contaminated sediments are resuspended during dredging activities. At present, little quantitative information exists regarding the contaminant load delivered to the Estuary as a result of dredging and dredged material disposal, and subsequent uptake into the food web. A special study this year will quantify the importance of dredging and dredged material disposal on contaminant bioaccumulation in the San Francisco Bay food web. The study will build a conceptual model of contaminant transfer to benthic-foraging fish species from dredging activities, including in-Bay disposal, and identify the steps necessary to estimate the contribution of dredging activities to contaminants detected in fish.

The effects of contaminants on the San Francisco Estuary is an important area that will be addressed through several RMP elements in 2005 including the Episodic Toxicity element of the Status and Trends and the Exposure and Effects Pilot Study. Supplemental funding for work on episodic toxicity was obtained from the State Water Resources Control Board’s PRISM Program to expand an evaluation of the impacts of changing pesticide usage (i.e., phasing out of chlorpyrifos and increase use of pyrethroids) in urban and rural watersheds on sediments in tributaries around the Bay. This project will specifically address sediment toxicity to freshwater

and estuarine amphipods. The first round of sampling occurred in November 2004; the second will occur in April 2005.

The Exposure and Effects Pilot Study (EEPS) represents a second area of study on the effect of contaminants on the Estuary. As an indication of the importance of this work, the Steering Committee has extended funding for EEPS for two more years to 2008. Major elements of the EEPS for 2005 will include: an analysis of diving ducks for selenium, mercury, and organochlorines; a field study of mercury risks to clapper rails; funding of research on fish effects; and an assessment of sediment toxicity, benthos, and sediment chemistry. It is anticipated that the Exposure and Effects Workgroup will meet in early 2005 to develop a new multi-year plan.

In 2005, the RMP will continue to investigate emerging contaminants and their potential impact. This year, the RMP is jointly funding with the CEP a study of polybrominated diethers (PBDEs). The project will consist of a literature review to develop a conceptual model of the sources, pathways, and loading of PBDEs. Due to a dearth of information regarding the sources of PBDEs in the environment, the RMP will fund analysis of field samples to characterize inputs to the Bay. This project will also be coordinated with existing projects to obtain samples from small tributaries (i.e., the small tributary loading project will analyze stormwater for PBDEs and the Episodic Toxicity sampling will analyze sediment for PBDEs).

Another highlight of the 2005 Program will be the completion of a special study to evaluate the first ten years of the RMP. In discussions in 2004, it was decided to publish this technical synthesis as a special issue of the journal *Environmental Research*. Dr. Russ Flegal of UC Santa Cruz has agreed to edit the issue, which will include approximately 13 articles on water quality in San Francisco Bay. These articles will address an objective of the Program that has not yet been adequately addressed: the synthesis of RMP and non-RMP data into an integrated assessment of status and trends in contamination of the Bay and the effective communication of this information. The special issue will effectively communicate RMP information to the scientific community. These articles will also provide a rich resource for development of communication material for nontechnical audiences.

A highlight of the Status and Trends element of the RMP in 2005 will be the publication of the latest round of data from sampling pollutants in Bay sport fish. This sampling is performed on a three year cycle. Data from sampling conducted in 2003 will be published in 2005, and planning will begin on the next round to be conducted in 2006. Popular sport fish species, including striped bass, white croaker, and halibut were sampled for mercury, PCBs, organochlorine pesticides, and PBDEs. Additional sampling in 2003 was performed to determine mercury and PCB concentrations in additional fish species including brown smoothhound shark, Chinook salmon, brown rockfish, anchovy, black surfperch, and walleye surfperch.

In other respects, the Program will continue on the new course (i.e., the initiation of the randomized sampling design) begun in 2002. Water and sediment will be sampled at a new set of locations as the RMP continues to fill in a picture of the spatial distribution of contamination

in the Bay. Additional elements of the on-going program are discussed in more detail in the remainder of the Program Plan.

Guided by the new objectives and management questions, the RMP in 2005 will continue to strive to provide scientists, regulators and interested stakeholders with relevant and timely information that provides a sound basis for policies to protect water quality in the Bay.

## **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, planning and coordination activities, 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 and training, as needed).

#### **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, 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.

#### **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 initiation of contracts after scopes of work have been negotiated, scientific oversight of products, coordination of field and laboratory components, troubleshooting, 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 in-house and for contracts. 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.

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

To meet the RMP Objective: “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. In 2004, the RMP Status and Trends database was converted into the Surface Water Ambient Monitoring Program (SWAMP) database format. The goal of converting the RMP database to SWAMP format is to make the data more accessible to regulators and researchers through the use of a standardized format.

The information management and dissemination goals for 2005 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 a method for Status and Trends laboratories to submit data via the web;
- Develop tools to increase the efficiency of QA/QC review;
- 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 documentation available. This task includes: 1) the publication of RMP Annual Monitoring Results, which is distributed via the RMP web site; 2) conversion of most RMP reports into appropriate publication quality formats for quality printing and/or for distribution on our website, 3) maintenance of web directories and updating the RMP publications list to allow easy access; and 4) maintenance and improving the overall design of the RMP web site.

## **2.3 Information Dissemination**

The RMP will continue to produce newsletters and other public documents. We will continue to take advantage of existing venues 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.

## **2.4 Annual Reporting**

This task involves preparation of the Annual Monitoring Results for distribution on the web and compact disk (as requested), as well as writing, editing, and publishing the "Pulse of the Estuary." In calendar year 2005, the 2003 edition of the Annual Monitoring Results will be completed, and work on the 2004 edition will begin.

## **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. A review of the data from the "new analytes" (e.g., PBDEs, nitro musks, and nonylphenols) will be conducted and recommendations regarding the continued monitoring of these substances will be made.

## **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). Prediction of future trends depends on an ability to model contaminant fate in the ecosystem. For the past several years, the RMP has been developing mass budget models of priority contaminants. Such models are valuable in summarizing the existing state of knowledge, synthesizing information from the RMP and other programs on contaminants in San Francisco Bay, predicting the response of contaminant concentrations in the Bay to management actions and natural processes, identifying and prioritizing data gaps, and communicating RMP results.

Some tasks begun in 2004 will be completed in 2005. In 2004, a significant advance was made with the development of a draft technical report on a multibox model for PCBs. A final report and a journal manuscript on this work will be produced in 2005. A journal manuscript on the one box model for legacy pesticides will also be completed.

A multi-year scope of work for fate modeling and field studies in support of fate modeling has been developed that is proposed for joint funding by the RMP and CEP. This scope calls for close coordination between these programs. Part of this scope includes further development of the multibox model for PCBs in 2005. Development of version 2.0 of the model is planned, with the key improvements being a thorough testing and review of the model, the addition of a quantitative uncertainty analysis, and continued development of graphics. The lead on this work will be Tetra Tech (funded by CEP), with support from SFEI (funded by RMP) for running the model and creation of graphics. Other parts of the joint multi-year scope address further documentation of the multibox model by USGS, a two-phase field study of sediment dynamics, and application of version 2.0 to other pollutants – modeling of two pollutants would be funded by RMP and one would be funded by CEP. Work on one of the additional pollutants (funded by RMP) would begin in 2005. Total mercury is proposed as the pollutant, subject to TRC and TC discussion and approval.

Other tasks to be completed under data integration include: developing a San Francisco Estuary Contamination Index and evaluating wetland benthic data that were collected as part of the West Coast EMAP program to determine whether new benthic assessment tools are needed.

Estimated cost of this task: \$85,000

### **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 2005 RMP sampling will mark the fourth 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. With two minor exceptions, the bivalve bioaccumulation component of the S&T, however, remains largely unchanged (i.e., the bivalve program will continue to sample the historical sites). First, as a result of sampling only in the summer, only one test species (*Mytilus*) will be used. At the two river sites, the resident clam species (*Corbicula*) will be used. Second, analyses of trace elements has been reduced.

The S&T monitoring program is supplemented by the short-term Special and Pilot Studies that are designed to answer specific management questions or to test on a small scale the efficacy of new monitoring approaches or methodologies, for possible inclusion in the S&T program.

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 33 stations throughout the Estuary. The analyte list for trace elements and organics will remain the same as in 2004 with the exception that all but one of the “new analytes” measured in 2002 and 2003 will be dropped (PBDE will be retained.) Pending approval by the TRC, polycyclic nonylphenols, octylphenols, and alkylphenol polyethoxylates may also be included.

#### *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 2005 analyte list for sediment will be similar to 2004 with the exception that all but one of the “new analytes” will be eliminated (PBDEs). Nonylphenols, octylphenol, and alkylphenol polyethoxylates may be added pending TRC approval.

#### *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, with the mussel species (*Mytilus californianus*). As has been done since 1999, resident *Corbicula* will be

collected from the Sacramento and San Joaquin River stations (BG20 and BG30). As with sediment and water, it is sufficient to analyze tissue concentrations in bivalves 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. The analyte list for organics for 2005 will be similar to 2004 with the same changes in the “new analyte” list and the possible addition of polycyclic nonylphenols, octylphenol, and alkylpolyethoxylates pending TRC 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 every four to five years. The next sampling is set to occur at a subset of random sites in 2005. Details of this sampling effort will be developed in the spring of 2005.

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.

### **3.2 Episodic Toxicity Monitoring**

In the 2004/05 wet season, the Episodic Toxicity Program of the RMP began a study to evaluate the potential toxic effects of sediments in six tributaries around the Estuary. This project is part of a combined study that is partially funded with a state PRISM grant awarded to SFEI in September of 2004. The purpose of the study is to investigate potential sediment toxicity to both freshwater and estuarine amphipods to sediments from six tributaries around the Estuary whose land uses include varying combinations of urban and agricultural practices. Bedded surface sediments will be collected targeting recently deposited sediments for toxicity and chemical analyses. A suite of California Toxics Rule priority pollutants, sediment grain-size, total organic carbon, and additional pollutants of concern (including pyrethroids and polybrominated diphenyl ethers (PBDEs)) will be characterized for each tributary.

In the Fall of 2005, the RMP toxicity workgroup will continue discussions on re-scoping the episodic toxicity component after reviewing the preliminary results from the 2004/05 sediment tributary study.

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

Sport fish sampling in the RMP began in 1997 and occurs on a three-year cycle. Sampling for 2003 was completed in August 2003. Popular sport fish species, including striped bass, white croaker, and halibut will be analyzed for mercury, PCBs, and organochlorine pesticides. Due to potential human health concerns, rising



concentrations, and their inclusion on the 303(d) watch list, PBDEs will also be analyzed in 2003 in some of the species. A special study in 2003 will also determine mercury and PCB concentrations in additional fish species that may pose hazards due to human consumption. The additional species targeted include brown smoothhound shark, Chinook salmon, brown rockfish, anchovy, black surfperch, and walleye surfperch. Resources for the 2003 fish tissue monitoring component were set aside in 2001 and 2002 to lessen the budgetary impact in the 2003 monitoring year.

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

The United States Geological Survey 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 2004, 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, as summarized in an article by Dr. Schoellhamer in the 2003 Pulse of the Estuary. In 2005, this component is being evaluated to determine whether it can be modified in response to improvements in understanding over the past 10 years and the increased emphasis in recent years on modeling the long term fate of contaminants in the Estuary. One area where better information is clearly needed is bedded sediment dynamics, include long term trends in deposition and erosion and mixing of the active sediment layer. Another aspect of this project will be continued development of a multi-box model of contaminant fate, with USGS providing the foundation of the model by describing water and sediment movement and assisting SFEI in linking this to contaminant movement.

#### **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.

### **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 Mercury Deposition Network**

The Air Deposition Pilot Study was suspended after metals and PAH/PCB data were incorporated into the mass budget models. The only remaining component is the measurement of rain samples for mercury to continue as part of the national Mercury Deposition Network through 2004, after which a decision will be made annually as to whether or not to continue data collection. For 2005, the TRC has elected to fund this project. The project includes SFEI staff time for sampling and trouble-shooting assistance, participation in site audits, and coordination with City of San Jose staff as necessary. The City of San Jose is providing in-kind sampling assistance, with samples being shipped to the MDN laboratory.

Estimated funding level: \$18,000 per year; in-kind services estimated at \$45,000.

### **4.2 Exposure and Effects Pilot Study**

The RMP in 2005 will continue a Pilot Study of contaminant exposure and effects in the Bay. The Exposure and Effects Advisory Panel assembled to guide this study has recommended a narrowed focus on the following topics: fish, birds, seals, benthos, and toxicity. The 2003 RMP Program Review Panel recommended an increase in the Exposure and Effects Pilot Study (EEPS) budget and stated that biological effects research should be a priority. In response to this concern, the SC allocated \$200,000 for the EEPS for 2005. This includes funds for SFEI labor, subcontractors (e.g., analytical laboratories), and grant proposal development. Also in response to the Review Panel recommendation, the SC and TRC extended the duration of the study for another two years (through 2008).

The Study is multifaceted, and has included a variety of different exposure and effects indicators of beneficial use impairment. In 2003 and 2004, EEPS work was scaled back.

In 2004, indicators tested included cormorant eggs (chemical trend indicators), mercury concentrations in harbor seals (exposure and effects indicators), sediment dose-response sensitivity testing comparing laboratory and resident amphipod species, and benthic community evaluations using a multi-metric approach (effects). Diving duck samples (human health indicator) were also collected in 2004. However, due to a freezer malfunction, the samples were compromised and it was decided not to analyze these samples. In 2004 the Exposure and Effects Advisory Panel met and provided input on a conceptual framework for the study that was developed at the Panel's request.

The EEPS will return to its full funding and activity level (\$200,000) in 2005. The Exposure and Effects Workgroup will meet in early 2005 to develop a new multi-year plan. Several projects discussed by the Workgroup in the past will be considered for funding in 2005:

- Diving duck analyses for Selenium (Se), Hg and organochlorines;
- A field study on mercury risks to clapper rails;
- Funding of work on fish effects (an RFP for this will be developed early 2005);
- Report on sediment toxicity, benthos, and sediment chemistry in San Francisco Bay from RMP and EMAP (possibly NOAA) data.

Estimated funding level: \$200,000 for 2005, 2006, 2007, and 2008.

#### **4.3 Winter Pilot Study**

The primary purpose of this Pilot Study in 2005 is to comply with an NPDES permit provision for ambient water monitoring for dischargers in the San Francisco Bay area. Estuarine water will be 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 will be analyzed for contaminants on the California Toxics Rule priority pollutant list.

Wet weather S&T contaminant monitoring is an important element of the RMP. At the present time, the core monitoring program, S&T, 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 importance of seasonal variation. Seasonal contaminant 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 2005 to determine additional needs for winter sampling within the RMP.

### **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. During 2004, nine years of sediment data were analyzed and sediment loads estimated. The results were written up in a revised sediment section of the “*Mallard Island Progress Report*” and also submitted to the *Journal of Hydrology* for review and publication. In addition, we completed a chapter in the progress report on Hg and a further chapter on trace organics loads. These new analyses suggest 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 2005	Sample “first flush” only and use contingency funds to sampling floods larger than 150,000 cfs as necessary (\$21,000 subcontracts + \$5,000 SFEI labor)
Calendar Year 2005	Complete “final report” on the first three years of the study (data from WY 2002, 2003, and 2004) (\$30,000 SFEI labor)
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: \$51,000 for 2005.

## 5.2 Ten Year Synthesis of Contaminant Status and Trends

In 2003, the RMP status and trends data from 2001 became available, completing the nine year period employing the original fixed station RMP design. The end of this initial era of the RMP marks an appropriate time to perform a thorough, definitive analysis of the data generated with the original Status and Trends Program design. Nine years of monitoring also represents a substantial body of work for the other aspects of the RMP, and a synthesis of these findings from these elements is also worthwhile at this time. In addition, the last synthetic overview of contamination in the Estuary was completed in 1991 (Davis et al. 1991), and Bay contamination, and understanding and regulation of Bay contamination, have changed considerably since that time.

In 2005, this special study will be completed. The final part of this study is a technical synthesis. In the 2004 workplan this was identified as a technical report: Status and Trends Report – 2001. In discussions in 2004, it was decided to publish this technical synthesis as a special issue of the journal *Environmental Research*. Dr. Russ Flegal of UC Santa Cruz has agreed to edit the issue and is performing much of the coordination.

These activities will address an objective of the Program that has not yet been adequately addressed: the synthesis of RMP and non-RMP data into an integrated assessment of status and trends in contamination of the Bay and the effective communication of this information. The special issue will effectively communicate RMP information to the scientific community. These articles will also provide a rich resource for development of communication material for nontechnical audiences.

The estimated funding level for 2005 is \$50,000.

### **5.3 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 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. The total budget is \$173,000, greater than ever before and perhaps an indication of the interest in the study.

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 2005 is \$50,000.

#### **5.4 Dredging Effects on Contaminant Bioaccumulation in the San Francisco Bay Food Web**

The question of incremental contaminant loads to the ecosystem from dredging and in-Bay disposal activities is frequently raised in discussions regarding regulatory policy development (e.g., TMDLs, etc.) suggesting that substantial effects could result. However, to date, the RMP has done little to put numeric bounds on just how much mass of a given contaminant is incorporated into the food web as a result of dredging and in-Bay disposal of dredged sediment. Impairment assessments for the Bay (e.g., mercury, PCBs, dioxins) have focused on accumulation of contaminants in sport fish, and several of the most contaminated fish are benthic foragers that frequent harbors and marinas. The proposed study will build a conceptual model of contaminant transfer to benthic-foraging fish species from dredging activities, including in-Bay disposal, and attempt to identify the steps necessary to give a first-order estimate of the incremental contribution of dredging activities to identified impairments. By focusing on pathways, the proposed work will help refine the box models that have, to now, been the main tool for understanding the fate of contaminants in the Bay. The conceptual model will incorporate the alternative to dredging, which is not dredging, to summarize what is known and needs to be known about availability to the food chain of contaminants associated with sub-surface sediments in depositional areas. The study will synthesize existing knowledge of dredged-sediment quality, suspended sediment dynamics, chemical pathways in bedded sediment, fish distribution, and food-web structures, and will include a review of available literature on these topics.

The estimated funding level for 2005 is \$20,000.

#### **5.5 Reconnaissance Work to Identify Appropriate Sediment Loading Sites**

This project will make recommendations on potential sampling locations in “representative observation watersheds” that could be used to form a “regional network” of contaminant loads monitoring stations. We will synthesize pertinent existing information on contaminant sources and pathways, hydrology, watershed physiography, and land use to prioritize potential representative watersheds for water quality and loads observations. We will then carry out a site reconnaissance in the top six prioritized watersheds to re-rank the watersheds according to on-site logistical constraints. The results will be presented in a technical memo and verbally in a SPLWG meeting.

The estimated funding level for 2005 is \$7,500.

#### **5.6 Filling PBDE Information Gaps**

This is a joint project between the Clean Estuary Partnership (CEP) and the RMP to develop a conceptual model and impairment assessment (CM/IA) for polybrominated diphenyl ethers (PBDEs) in the San Francisco Bay. The CEP has allocated \$30,000 for

SFEI labor to prepare the CM/IA, while the RMP has contributed \$25,000 to cover costs of sample analyses to fill in critical data gaps.

The work to be conducted is an impairment assessment and development of a PBDE conceptual model. Given the limited resources and time, this effort will have to be completed by SFEI staff over a 12-month period with oversight from the CEP Technical Committee. The project will include chemical analyses of various field samples to fill critical information gaps, submission of a draft CM/IA report to the CEP Technical Committee for peer-review, and the delivery of a final CM/IA report.

The estimated funding level for 2005 is \$25,000.

To: RMP Steering Committee  
From: Mike Connor, SFEI  
Subject: Budget Review Process for 2007 and Beyond  
Date: January 12, 2005

**Recommendation:**

That the Steering Committee

1. Certify that the RMP budgets established for 2005 and 2006 are appropriate to the desired program goals after a detailed inspection of any parts of those budgets about which there are questions.
2. Use the 2006 budgetary base as the benchmark for future budget modifications.
  - a. Status and Trends Monitoring will grow at the rate of the Consumer Price Index (CPI), assuming the monitoring program re-design instituted in 2002 passes a TRC evaluation in 2006 that the re-design meets the adaptive implementation needs for water quality attainment strategies.
  - b. USGS program funding will remain unchanged, assuming stable funding from the US Army Corps of Engineers and certification as above.
  - c. Pilot Studies and Special Studies will grow at the rate of the CPI, pending a determination that these studies meet the priorities set by adaptive implementation.
  - d. Program Management budget (e.g., program oversight, data base management, data integration, publications, and outreach) remain at 33% of the total RMP budget, if the elements of these programs are certified as above, with detailed review by the Technical Review Committee and Steering Committee every three years.
3. Convene a joint CEP and RMP budget meeting annually to verify the coordination between the two programs.

**Discussion:***Introduction*

At the last Steering Committee meeting, SFEI staff were asked to develop a budget review process that would address the ability of RMP participants to ensure that the program budget was appropriately matched to the available funding and expectations of the adaptive implementation process for the implementation of water quality attainment strategies. At this time, no increase in the 2006 budget will be proposed to allow for a detailed evaluation of the budget process.

*Budget Elements*

Four major elements comprise the RMP budget:

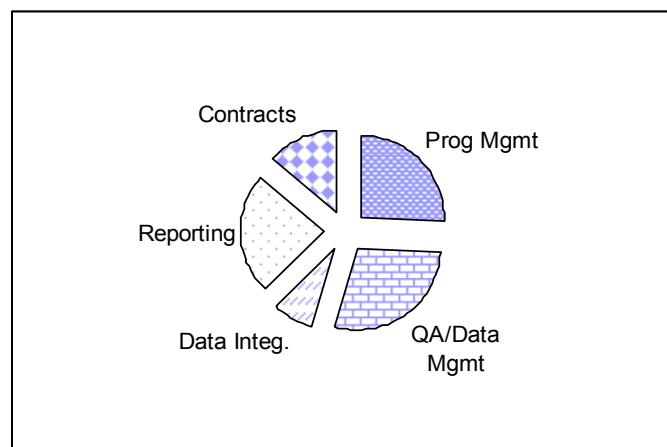
- Status and Trends Monitoring (~50% of RMP) of the water, sediments, fish, and episodic toxicity in the Bay. A major sub-element of this work has been \$360,000 annual funding of USGS for suspended sediments measurements, and matching funding for some hydrography and phytoplankton stations as part of the larger USGS sampling network in the Bay. These USGS elements have remained flat for five years, and the suspended sediment elements are funded directly by the US Army Corps of Engineers to the USGS.



Since 2002, SFEI and its sub-contractors have reduced costs of the remaining program sub-elements from \$1,140,000 in 2002 to \$1,010,000 estimated in 2005 (13% saving).

- Pilot and Special Studies are funded from a common pool that comprises 16% of the RMP, a proportion established by the Steering Committee in 2002. Pilot Studies test new monitoring tools for possible inclusion in the regular program. Special Studies (~8% of RMP) are used to help interpret monitoring data or address emerging issues raised by the different RMP participants. Lately, most of the projected budget for Special Studies is used for joint projects with the CEP (e.g., tributary studies, sediment modeling, and PBDEs). Plans for Pilot and Special Studies are evaluated each year by the Technical Review Committee (TRC), with a formal procedure established for study selection.
- Other Projects is small contingency pool that preserves money for projects with time scales beyond one year (3-year fish monitoring, flood year tributary sampling, program peer review).
- Program Oversight and Management (33% of RMP) includes Program Management, Contracts Management, Quality Assurance and Database Management, Data Integration and of data collected from other programs, and Data Reporting (Pulse, newsletters, and website) (Fig. 1). This element has decreased from \$1.118 million in 2003 to \$1.068 million in 2005, about a 5% reduction.

**Figure 1. Components of RMP Program Oversight and Management.**



Over the last five years, SFEI staff, RMP committee member and its contractors have worked hard to make the program more cost effective (Table 1) and modify the program in response to outside peer reviews received every 5 years. This management scrutiny is ongoing, but staff believe most program savings have been realized. Future program cuts or increases will be driven more by changes in the programmatic goals necessary to meet the Water Board's implementation of the TMDL program. For instance, the RMP Status and Trends monitoring design was revised in 2002 in response to Water Board needs for more fully assessing the compliance of different Bay segments with water quality goals. It would be counter-productive to modify this program until we have enough data to determine if the program is fulfilling its

goals. Similarly, the Pilot and Special studies programs are directed to specific study goals developed from the RMP Peer Review and management question revision process, and combined projects with the CEP. Modifications to those programs will depend on the Steering Committee and Technical Review Committee developing new programmatic goals. While CEP and SFEI staff and committee members are working closely to coordinate the two budgets, a joint meeting of the CEP Executive Management Board and the RMP Steering Committee could verify this coordination.

**Table 1. RMP Program Elements from 2002 to 2006.**

	<b>2002</b>	<b>2003</b>	<b>2004</b>	<b>2005</b>	<b>2006</b>
<b>Pr. Mgmt.</b>	<b>N/A</b>	<b>1118</b>	<b>1090</b>	<b>1068</b>	<b>1106</b>
<b>S&amp;T</b>	<b>1500</b>	<b>1535*</b>	<b>1362</b>	<b>1370</b>	<b>1581*</b>
<b>Pilot and Special</b>	<b>398</b>	<b>519</b>	<b>458</b>	<b>493</b>	<b>494</b>
<b>Other</b>	<b>175</b>	<b>75</b>	<b>133</b>	<b>182</b>	<b>75</b>

N/A – changed accounting classifications

\* includes 3-year fish study

# DRAFT

## 2005 ANNUAL MEETING AGENDA

THEME: Answering the Important Questions

### PRESENTATIONS

#### WATER QUALITY ATTAINMENT STRATEGY IMPLEMENTATION

Water Quality Management Questions for San Francisco Bay (Rainer Hoenicke)

Mercury and PCB TMDL Implementation (Mumley or Whyte)

Lessons from Copper and Nickel

Future Water Quality Issues: PBDEs (Daniel Oros, Tom McDonald, Karen Taberski)

Napa River Sediment TMDL (Dyan Whyte)

Estimation of Contaminant Loads to the Bay (Lester McKee): recent field studies and  
SPLWG 5 year plan

Reducing Stormwater Loads – someone from BASMAA or Levine Fricke

#### RMP HIGHLIGHTS

A Multibox Model of the Long-term Fate of PCBs in the Bay (John Oram)

#### COMPLEMENTARY STUDIES

Sediment Budget for San Francisco Bay (Dave Schoellhamer)

What We Have Found in the Bay Area SWAMP (Karen Taberski)

The South Bay Salt Pond Restoration Project and Bay Water Quality (Letitia Grenier)

LTMS: Results of Hamilton Army Airfield Studies (Herb Fredrickson?)

CEP: Results of the Food Web Modeling Project (Frank Gobas)

**2005 PULSE OUTLINE****SHORT VERSION:** One page fact sheet**FULL REPORT****About this Report****Status and Trends Update**

Summary graphics on the latest RMP results

- Water quality trends at a glance (4 pages of graphs)

Graphical highlights of non-RMP work

**Water Quality Management Update**

Something on the Mercury or PCB TMDLs (Regional Board Staff)

Water Quality Management Questions for San Francisco Bay (Rainer Hoenicke)

Napa River Sediment TMDL (Dyan Whyte)

**Feature Articles**

Article on PBDEs (Daniel Oros, Tom McDonald, Karen Taberski)

Synthesis Highlights, Conceptual Model: Legacy Pesticides (Mike Connor)

SWAMP (Karen Taberski)

Sediment Budget for San Francisco Bay (Dave Schoellhamer)

CBDA contaminant studies in the Estuary (Donna Podger)

Water Quality Issues Relating to the South Bay Salt Pond Restoration Project (Jay Davis)

Sidebar on Program Review (Mike Connor)

**Miscellaneous**

- include a reference to US EPA's website on TMDLs  
<http://www.epa.gov/owow/tmdl/intro.html>
- Include a note up front about the Primer
- Summary of year's publications and links

**SCHEDULE FOR FULL REPORT**

STEP	DUE DATE
Articles Drafted	Tuesday, February 1
Draft Out for Review	Tuesday, February 8
Review Comments Due	Tuesday, February 22
Internal Review (+ select individuals)	Tuesday, March 15
Final Review by TRC and SC	Tuesday, March 22
Sent to Printer	Tuesday, March 29
Pulses in Hand	Tuesday, April 12
Annual Meeting	Tuesday, May 10

DRAFT – January 18, 2005

## **Management Questions Guiding the Regional Monitoring Program for Trace Substances – Second Edition, 2004**

### **Introduction**

One of the key steps in any adaptive management program is to periodically and critically evaluate the extent to which monitoring and special study results, carefully interpreted, were able to answer management questions. A second step is to use the accumulated scientific information to refine current questions and develop new ones that are relevant to the goal of beneficial use protection and restoration. Following the process recommended by the National Research Council and implemented in the first RMP Review in 1997, this report begins by addressing the basic assumptions underlying the Water Board's needs to successfully manage their regulatory and incentive-based beneficial use protection and restoration programs. Second, a summary of key monitoring and special study findings linked to the management questions developed in 1998 provides the background for refining and articulating new information needs. Lastly, these new information needs then determine whether the current objectives of the RMP should be adjusted and how a refined and new set of management questions is developed together with the Program Participants.

### **The Current State of Knowledge and Working Assumptions**

Underlying all regulatory activities and incentive programs by the Water Board is the goal in the Clean Water Act to protect and restore water-dependent designated uses. For management and regulatory actions to be effective and responsive to new challenges, information about the condition of water bodies, stressors impacting them, and anticipated risks to those water bodies, has to be available.

The Clean Water Act was set up to deal with a multitude of stressors through its definition of "pollution" in Section 502(19) - "the man-made or man-induced alteration of the chemical, physical, biological, and radiological integrity of water." For the first 25 years, much regulatory emphasis was placed on protecting the "chemical integrity" of water, resulting in considerable improvements in the condition of the Estuary. More recently, in recognition of the growing relative importance of stressors in the "nonpoint source" pollution category, both the U.S. EPA and the Water Board have broadened the focus beyond "chemical integrity", as evidenced by inclusion of exotic species in the 303(d) list for the Estuary, and sediment, trash, and temperature for its tributaries. Other beneficial use impairment is caused by water diversions and hydromodification. It is now recognized that quite often limiting factors to beneficial use attainment appear to fall into non-chemical stressor categories. For adaptive management to work, evaluation of non-chemical stressors needs to be incorporated into monitoring and assessment approaches. Lastly, the regulatory framework, as it exists today in the U.S. and California, is not well suited to preventing new persistent and bioaccumulative substances from becoming the "legacy pollutants" of the future. The following updated working assumptions reflect the above perspectives:

- 1) We have an increasing understanding of the relative loadings of pollutants of concern from various sources and transport pathways and where to direct priority actions but ongoing work is still needed to extrapolate existing data and determine trends through time.

**DRAFT – January 18, 2005**

- 2) Many of the pollutants of concern found in the Estuary system are from historic inputs.
- 3) Persistent, bioaccumulative substances not yet regulated require increased attention both in terms of biological effects and loadings.
- 4) Watershed approaches to controlling ongoing inputs of pollutants of concern promise to be more effective than “program-driven” approaches (e.g., NPDES, Water Quality Certification, Nonpoint Source Program, TMDL, etc.).
- 5) Protection and restoration of beneficial uses require a different and larger set of tools than those used to deal with specific pollutants of concern.

**Summary of Findings Corresponding to 1998 Management Questions**

Since 1998, when the first edition of management questions was developed, much progress has been made in filling information gaps (see Table 1). At that time, the Program Participants began a thorough overhaul of the RMP, beginning with a revision to the original Monitoring Program Objectives of 1993. The objectives that have been guiding the RMP since 1998 are:

1. Describe patterns and trends in contaminant concentration and distribution
2. Describe general sources and loadings of contamination to the Estuary
3. Measure contaminant effects on selected parts of the Estuary ecosystem
4. Compare monitoring information to relevant water quality objectives and other guidelines
5. Synthesize and distribute 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.

The 2003 RMP Review indicated that the program has responded well to the suggestions outlined in the 1997 program review. Although the 2003 Review Panel did not explicitly suggest that program objectives be modified, the panel stated “...that the program must continue to evolve to ensure its long-term relevance.”

Table 1 summarizes how the specific management questions derived from Objectives 1-4 were addressed, and what we have learned since then. Please note that the “lessons learned” represent very simplified highlights that are not based on RMP data alone but also on numerous complementary study efforts. They represent the starting point for subsequent management question refinement.

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Table 1.

<b>Management Question</b>	<b>Monitoring and Study Approaches</b>	<b>Lessons Learned</b>
<i>Objective 1: Describe Patterns and Trends</i>		
How do contaminant levels change over the long term?	New sampling design implemented. Ten-year synthesis.	Particle-associated pollutant patterns are primarily driven by sediment resuspension and to a lesser extent by loadings from the surrounding watersheds. Few trends discernible; recovery from most legacy pollutant inputs expected to be very slow. . PCB declines of about 50% in the past 25 years. Legacy pesticide declines have been more rapid than PCBs. Little change in mercury in fish tissue over the past 30 years. PBDEs in human tissue are among the highest in the US. Little change in PAH concentrations. Too few data on dioxin. Diazinon concentrations have declined.
Can those changes be linked to changes in inputs?	RMP data complemented by large USGS database and other data sources. Ten-year synthesis	For some pollutants, yes. For others, diffuse distribution in surrounding watersheds and existing sediment reservoir will delay discernible recovery signal. Major reductions in use and discharge of some pollutants coincide with decreases in surface concentrations in cores from depositional areas of the estuary. Conclusions are limited by lack of actual data on trends in inputs. Changes in PCBs and legacy pesticides can be qualitatively linked to bans. PBDE increases qualitatively linked to increasing use. Diazinon changes qualitatively linked to declining use.
What is the relationship between pollutant trends and patterns seen in the “spine” and those in the shallower margins of the Estuary?	New sampling design implemented that includes sampling of shallows, augmented by site-specific clean-up studies.	Too early to tell by how much, but margins contain numerous spots with elevated concentrations. A few data points from the early BPTCP indicate that margins may have higher concentrations than deeper parts. Recent data, however, do not support this conclusion.
How are spatial patterns and long-term trends affected by estuarine processes?	Mass budget modeling work on PCBs, PAHs, legacy pesticides. RMP data placed in context of USGS, IEP, CBDA, and other data.	Seasonal and inter-annual variability in flow has discernible influence over contaminant distribution, concentrations, and uptake by, and effects on, biota. Dominant processes identified through modeling include sediment dynamics (mixing and erosion/deposition), outflow, degradation, and volatilization.

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<i>Objective 2: Describe General Sources and Loadings</i>		
What proportion of the contaminants in each Estuary segment are contributed by point source outfalls, storm drains, large and small tributaries, etc.?	Literature reviews on loadings in general and urban runoff in particular. Initiation of RMP field studies on loads from the Central Valley, small tributaries, atmospheric deposition, formation of CEP; development of conceptual and simple predictive mass budget models for most pollutants of concern. Non-RMP studies on loads from point sources, small tributaries, stormwater (AB 1429). TMDL reports have compiled data on major pathways.	Loads of mercury and PCBs compiled in TMDL reports. Large natural contributions of certain metals (e.g., Ni, Cr); large reservoirs of legacy pollutants in sediments and watersheds; much better understanding of relative loadings of 303(d) pollutants; insufficient knowledge about emerging 303(d) pollutants.
How do contaminants move and transform after they enter the Estuary?	Focus on Cu and Ni via impairment assessment studies; literature synthesis as part of conceptual and numeric model development for 303(d) pollutants. Movement well described for PCBs and other organics by mass budget and food web models.	Large data gaps remain for Hg, PAHs, and emerging pollutants; increased understanding about remobilization potential via erosional processes. PCBs don't transform much. Legacy pesticides and PAHs are degraded more rapidly. Mercury transformation to methylmercury is a key process driving impairment. PBDE degradation processes are a major data gap.
At what spatial and temporal resolution should loadings and changes in upstream contaminant inputs due to pollution prevention efforts be monitored?	New sampling design and special studies implemented. Further refinements necessary, especially monitoring integration with CVRWQCB. Mallard Island Study and Guadalupe River Study have established a foundation regarding temporal resolution.	Answers are pollutant-specific. For primarily water-soluble, short-lived pesticides, temporal and spatial resolution should be higher than for more persistent, particle-associated pollutants. Much transport of particle-associated pollutants occurs during a few large storms, requiring highly targeted sampling in a temporal sense. Sampling high flow years will be critically important. Spatial resolution not yet determined.
What are the background concentrations of contaminants in the Estuary from natural sources?	Data synthesis from coring data and literature; special studies in Santa Clara Basin and South Bay.	Most metals are enriched above background in Estuary sediments, with the exception of Ni and Cr.
<i>Objective 3: Compare Data to Guidelines</i>		
Which contaminants should be monitored?	Review of database, special study on previously unknown synthetic organics; CTR study	Certain metals in tissue scaled back. Screening of chromatograms and effects data expanded list of trace organics
How do RMP data compare with relevant water, sediment, and tissue quality guidelines?	Status and Trends Program modified but still suited to compare results to guidelines and recovery targets. Data reviewed annually in Annual Monitoring Results, the Pulse, reports on fish sampling	National criteria may not be appropriate for some contaminants; site specific studies have resulted in revised water column objectives for Cu and Ni. 303(d) listing is not always based on water quality measurements. 303(d) list pollutants frequently exceed their guidelines.



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How do the various Estuary reaches compare to each other, in time and space, relative to guidelines?	New sampling design implemented.	Northern and southern segments show exceedances more frequently than Central Bay. South Bay exceeds guidelines most frequently.
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<i>Objective 4: Measure Contaminant Effects</i>		
<p>Which contaminants bioaccumulate in estuarine organisms to levels of concern?</p>	<p>Review of SMW and RMP bivalve tissue data, incorporation of fish tissue analysis into status and trends monitoring; use of bird eggs to measure bioaccumulation and exposure. Analysis of duck tissue, analysis of seal blood and fur. Non-RMP work on bird eggs by USFWS, UC Davis on seals, CISNET on birds and fish, Potamocorbula by USGS, HML on humans. In 2002, the RMP began monitoring for PBDEs in water, sediments, and transplanted bivalves. PBDEs were found in all three media. Initiation of Exposure and Effects Pilot Study to develop indicators.</p>	<p>Of all the trace elements investigated, only Hg and Se bioaccumulate appreciably. Several groups of synthetic organics (both legacy pollutants and certain trace organics still in use) bioaccumulate (PBDEs, chlorpyrifos, musk ketones, nonylphenols). Mercury, PCBs, legacy pesticides, dioxins and selenium exceed screening values in sport fish. Increasing PBDEs also a concern in sport fish. Mercury a clear continuing concern in clapper rails and terns. PCBs a diminishing concern in bird eggs. Selenium, mercury, and PCBs a human health concern in duck muscle. PCBs a concern in seals. Rising PBDEs a concern in birds, seals, and humans. Selenium accumulation in <i>Potamocorbula</i> is a concern for predators. Silver appears to have affected clam reproduction in the early 1990s.</p>
<p>What is the spatial and temporal extent of toxicity in the Estuary?</p>	<p>Initiation of episodic toxicity study design for better identification of toxic events and possible causes; shift in focus to sediment toxicity as a result of changes in pesticide use to more particle-affiliated pyrethroids.</p>	<p>Estuary waters do not tend to be toxic to aquatic test organisms in the laboratory, and the RMP as seen a decrease in the incidences of aquatic toxicity observed in the tributaries during storm events between 1997 and 2001, which coincided with a shift in pesticide usage away from water soluble OP pesticides (diazinon and chlorpyrifos) towards hydrophobic pyrethroids. However, Estuary sediments continue to be toxic with no evidence of decreasing. 63% of the samples tested were toxic to at least one test organism between 1997 and 2001.</p>
<p>Which contaminants cause effects in the Estuary?</p>	<p>Initiation of expanded effects monitoring efforts. Re-design of toxicity monitoring; comparisons of new exposure data with laboratory effects threshold levels. Fish biomarker study. Non-RMP studies by USFWS on mercury in birds, UC Davis on organics in harbor seals. Development of new bioassays for estrogenic substances may benefit RMP exposure/effects monitoring. Initiation of exposure and effects indicator selection.</p>	<p>The RMP Benthic Pilot Study (and subsequent benthic studies) have begun to develop a benthic assessment tool that can identify impacted benthic community characteristics using a triad approach. Strong possibility of population-level mercury impacts on clapper rails. Indications of effects of PCBs on seals and birds. Indications of benthic community impacts of legacy pesticides. Possible PBDE effects in seals.</p>

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Since the development and application of conceptual models and simple predictive models for most of the 303(d) pollutants, general knowledge about loadings, transport processes, pathways, source categories, and pollutant fate has increased considerably in the last five years. Water quality managers now generally recognize that:

- The capacity of the Estuary to assimilate, degrade, bury, or dilute has been exceeded for a number of pollutants (e.g., Hg, PCBs).
- New inputs need to be reduced below the Estuary's assimilative capacity
- Past mistakes may take decades to rectify even after further loading reductions of controllable sources are implemented.
- The large reservoir of pollutants in sediment poses significant constraints on recovery options for some contaminants, and relatively small amounts of continuing external inputs affect recovery rates.
- Management actions throughout the watershed have effectively reduced inputs and exposure to organisms for certain pollutants, such as organophosphate pesticides.
- It appears that certain emerging pollutants may be entering the system faster than they can be degraded or removed, similar to what happened with persistent synthetic organics in the past. We don't know at this point when we will reach assimilative capacity for those pollutants, or if we have already exceeded it.

These kinds of lessons are re-shaping the questions the Water Board is asking. The information needs have also become more complex as a result of several fundamental shifts in how water quality and associated beneficial uses are managed. These include:

1. Legal requirements to systematically deal with pollutants on the 303(d) list.
2. Demand for more quantitative cost-benefit analyses in times of shrinking budgets.
3. Requirements to link expenditure of bond funds by grant recipients in the Bay Area with performance evaluations.
4. Broad information needs at landscape and river basin scales to evaluate water quality management program performance statewide.
5. The emergence of additional complementary monitoring efforts with similar assessment questions and objectives (e.g. CBDA Ecosystem Restoration and Watershed Programs, DFG Resource Assessment Program).

The parties involved in the RMP evaluated the 1998 program objectives and determined that new and emerging information needs require adjustments. Most of the RMP Objectives, revised in 1998, have been maintained with minor modifications (indicated in *italics*). An additional Objective was developed based on the advances in our understanding over that past ten years. This new Objective explicitly addresses the need to use our knowledge about ecosystem processes and human activities to forecast ecosystem recovery and pollution trends. As revised through a joint Technical Advisory and Steering Committee process, the new RMP Objectives are as follows:

1. Describe the distribution and trends of *pollutant* concentrations in the Estuary
2. *Project future pollutant status and trends using our current understanding of ecosystem processes and human activities*
3. Describe sources, *pathways*, and loading of *pollutants entering* the Estuary
4. Measure *pollution* exposure and effects in the Estuary ecosystem (including humans)
5. Compare monitoring information to relevant standards and other guidelines

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6. *Effectively communicate* information from a range of sources to present a more complete picture of the sources, distribution, fate, and effects of pollutants in the Estuary ecosystem

**Specific management questions**

Current issues of concern are grouped below in relation to each of the new 2005 RMP Objectives. In addition, program participants, stakeholders, and regulators have raised issues that are not technical or scientific in nature but related to policy. These questions will need to be informed by the types of data capable of answering the scientific questions, but they may be outside the direct scope of the RMP. Examples of these types of policy questions are listed in Appendix A.

1. **Describe *the distribution and trends of pollutant concentrations in the Estuary***
  - 1.1 Which pollutants should be monitored in the Estuary, in what media, and at what frequency?
  - 1.2 Are pollutants of concern increasing, decreasing, or remaining the same in different media?
  - 1.3 How are pollutant patterns and trends in the Estuary over time affected by remediation and source control or pollution prevention in the watersheds?
  - 1.4 Do pollutant concentration distributions indicate particular areas of origin or regions of potential ecological concern?
  - 1.5 What effects on beneficial uses or attainment of Water Quality Standards will occur due to large-scale habitat restoration in the Estuary in decades to come?
2. **Project *future contaminant status and trends using our current understanding of ecosystem processes and human activities***
  - 2.1 Can reasonably accurate recovery forecasts be developed for major segments and the Estuary as a whole under various management scenarios?
  - 2.2 Given projected changes in land and water use and management, as well as product use and disposal, can potential impairment and degradation be better anticipated?
  - 2.3 Which pollutant categories are predicted to accumulate in the Estuary faster than they can be assimilated?
  - 2.4 Do pollutant trends reflect historical changes in use patterns, transport and transformation processes, or control actions?
  - 2.5 Given various management and development scenarios, how will the importance of each pathway change through time?
  - 2.6 Given various management and development scenarios, what is the projected future loading of pollutants of concern?
  - 2.7 What are the likely consequences of various management actions or risk reduction measures?
  - 2.8 Do pollutants show existing distributions that fit our current understanding or models of their origin, loads, and transport?
  - 2.9 What changes in loadings or ecosystem characteristics (e.g., extent of restored tidal marsh, Estuary circulation and flushing, food web shifts) would reduce or increase pollutant exposures and effects?

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- 2.10 How are distributions and long-term trends in pollutants affected by current and predicted estuarine processes (e.g., sediment erosion, deposition, river inflows)?
- 3. Describe sources, pathways, and loading of pollutants entering the Estuary**
- 3.1 Where are/were the largest pollutant sources, in what context are/were these pollutants applied or used, and what are/were their ultimate points of release into the aquatic environment?
- 3.2 What are the circumstances and processes that cause the release of pollutants from both internal and external source areas?
- 3.3 Once released, how do pollutants travel from source areas to the Estuary, what are the temporal and spatial patterns of storage, and are they transformed along the way or after deposition?
- 3.4 What is the annual mass of each pollutant of concern entering the Bay from each pathway?
- 3.5 Can data with high temporal resolution from a few watersheds be projected to other watersheds and the Basin as a whole?
- 3.6 For each pollutant of concern, what forms are released from each pathway and what are the magnitude and temporal variation of concentrations and loadings?
- 3.7 How do loads change over time in relation to management activities?
- 3.8 What is the relative importance of pollutant loadings from different sources and pathways, including internal inputs, in terms of beneficial use impairment?
- 4. Measure pollution exposure and effects on selected parts of the Estuary ecosystem (including humans)**
- 4.1 How are emerging problems reflected in exposure and effects measurements?
- 4.2 Which (co-)factors (e.g., food web structure) influence exposure and effects of specific pollutants on biota?
- 4.3 What ecological risks are caused by pollutants of concern?
- 4.4 What human exposure to pollutants of concern results from consumption of fish and game?
- 4.5 To what extent does exposure to multiple pollutants lead to effects?
- 4.6 Which forms of pollutants cause impairment?
- 4.7 To what extent do factors other than specific pollutants (invasive species, flow diversions, land use changes, toxic algal blooms) contribute to beneficial use impairment?
- 5. Compare monitoring information to relevant standards and other guidelines**
- 5.1 What percentage of the Estuary is supporting beneficial uses?
- 5.2 Which segments should be considered impaired and why, and how do segments compare in terms of recovery targets?
- 5.3 How can specific source limitations, controls, and mitigation be best linked to appropriate beneficial use endpoints and recovery targets?
- 6. Effectively communicate information from a range of sources to present a more complete picture of the sources, distribution, fate, and effects of**

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**pollutants *and beneficial use attainment or impairment* in the Estuary ecosystem.**

This objective applies to all of the questions listed under objectives 1 – 5.

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**Appendix A:**

1. Once pollution 'hot-spots' are discovered, should they be cleaned up to mitigate local effects on biota and human health, to obtain a better estuary-wide understanding of hot-spot contributions to whole ecosystem recovery, or both?
2. What implementation schedules are appropriate for various pollution reduction targets?
3. What level of certainty is required in load reduction models for various pollutants to assess whether or not sources are controllable?
4. At what point do "diminishing remediation returns" require adjustments in clean-up targets?
5. Which source categories are effectively controllable?
6. What pollution prevention policies and management practices are most effective in reducing pollutant loads?
7. What additional data need to be collected to develop Sediment Quality Objectives for the Estuary?
8. What risk reduction measures are most effective?