SFEI AQUATIC SCIENCE CENTER 4911 Central Ave Richmond, CA 94804	**RMP Steering Committee** July 19, 2016 9:30 PM – 3:00 PM

Remote Access Info
Audio by Phone: +1.415.655.0381, Access Code 943-326-397#
Slides: https://join.me/sfei-conf-cw1

AGENDA

1.	**Introductions and Review Agenda**	9:30 Tom Mumley
2.	**Decision: Approve Meeting Summary from April 19, 2016 and confirm/set dates for future meetings.** Scheduled meetings: Annual Meeting: 10/7/16 SC Multi-Year Planning Workshop: 11/1/16 SC: 1/17/17 Proposed meetings: SC: 4/18/17 Materials: Steering Committee Meeting Summary (see pages 5-15) Desired outcome: Approve meeting summary, confirm existing meeting dates, and set the date for future meetings	9:35 Tom Mumley
3.	**Information: TRC Meeting Summary and Microplastics Workgroup Summary** Topics discussed at the most recent TRC meeting included: ● Recommendations for 2017 Special Studies ● Emeryville Crescent Priority Margin Unit Conceptual Model RMP Update Report ● Annual Meeting Agenda ● 2016 Status and Trends Monitoring ● PCB Lab Selection The main outcomes from the RMP Microplastics Workgroup meeting on June 29, 2016, will be summarized. Materials: Technical Review Committee Meeting Summary (see pages 16-28) Microplastic Workshop Brief Summary (see pages 29-31) Desired Outcome: Informed committee	9:45 Philip Trowbridge

4.	**Information: RMP Financial Update for 2016 Quarter 2** The RMP Financial Update report summarizes the balance of budgeted and reserved RMP funds as well as its cash position. Materials: RMP Financial Update Memo (see pages 32-57) Desired outcome: Informed committee	10:05 Lawrence Leung Philip Trowbridge
	Short Break	10:25
5.	**Discussion: Process for Supplemental Environmental Project Funding** The RMP is eligible to receive penalty funds to conduct Supplemental Environmental Projects. A draft process for allocating SEP funding in a manner that is transparent and compatible with the Water Board SEP Policy will be presented. Materials: Draft SEP allocation policy (see page 58) Desired Outcome: Guidance to RMP Manager on the process for allocating SEP funding to RMP projects.	10:35 Philip Trowbridge
6.	**Decision: Confirm RMP Fees for 2017-2018 and Discuss 2019-2021 Fees** RMP fees are set by the Steering Committee every three years. RMP target fees for 2017 and 2018 were approved in November 2014. The SC will confirm these amounts and discuss any expected revenue shortfalls. In November 2017, the Steering Committee will need to set the target fees for 2019, 2020, and 2021. Estimated RMP expenses for 2019-2021 will be presented to inform this decision and so that SC members have time to discuss fee increases with their Boards. Materials: Projected RMP Expenses and Fees for 2016-2023 Memo (see pages 59-69) Desired Outcome: Confirmation of target fees for 2017 and 2018. Feedback to RMP staff on possible fee increases for 2019-2021.	11:05 Philip Trowbridge
7.	**Science Update: 2014 Sport Fish Monitoring** Preliminary results from the 2014 Sport Fish monitoring will be presented and discussed. The findings will also be presented at the RMP Annual Meeting. Materials: None Desired outcome: Informed committee	11:35 Jennifer Sun Jay Davis
	Lunch	12:15

8.	**Decision: Approve Special Studies for 2017** Between 4/15/16 and 6/3/16, workgroups met to develop proposals for special studies in 2016. The Nutrient Management Strategy Science Advisors and Nutrient Technical Workgroup also met to develop the NMS FY17 workplan. On 6/9/16, the TRC reviewed all the proposals put forward by the workgroups and recommended a suite of studies for 2017. The TRC also prioritized unfunded studies in the event that additional monies become available. The Steering Committee will review the recommended studies, make any adjustments they deem warranted, and then approve the special studies for 2017. Materials: Special Studies Summary & Proposals (see pages 70-169) Desired outcome: Approve a suite of special studies for 2017 and identify additional studies worthy of funding in the event that additional monies become available.	12:45 Philip Trowbridge
9.	**Decision: Approve Agenda for RMP Annual Meeting** The RMP Annual Meeting will be on October 7, 2016. The purpose of this agenda item to approve the draft list of speakers and session topics. The TRC had significant comments on the draft agenda that was crafted by the SC in April. The draft agenda has been edited to reflect the TRC input. Materials: RMP Annual Meeting Draft Agenda (see page 170) Desired outcome: Approve agenda for RMP Annual Meeting	1:45 Jay Davis
10.	**Discussion: RMP Update Report, Upcoming Estuary News Articles, RMP eUpdate** Content for the RMP Update report has been drafted and will be presented briefly. The TRC has provided comments. Another draft of the formatted report will be distributed for proofing in July. Ideas for the next RMP article in Estuary News and plans for the RMP electronic newsletter will be presented. Materials: None Desired outcome: Feedback on ideas for upcoming RMP communications products	2:15 Jay Davis
11.	**Information: Status of RMP Deliverables and Action Items** Materials: Deliverables Stoplight Report (see pages 171-175) Action Items Report (see pages 176-182) See also: Bay RMP Committee Resources webpage https://sites.google.com/a/sfei.org/rmp-operations/home Desired outcome: Informed committee about the status of RMP deliverables	2:30 Philip Trowbridge Jay Davis

12.	**Discussion: Plan agenda items for future meetings** Parking Lot Items ● Approve list of projects for SEP funds ● Protocols for using RMP funds for grant match ● Cost share opportunities with Restoration Authority Desired outcome: Identify future agenda items.	2:45 Jay Davis Philip Trowbridge
13.	**Plus-Delta on meeting**	2:55
14.	**Adjourn**	3:00

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RMP Steering Committee Meeting Summary
April 19, 2016
San Francisco Estuary Institute

Attendees

SC Member	Affiliation	Representing	Present
Jim Ervin	City of San Jose	POTW-Large	Yes
Dan Tafolla	Vallejo Sanitation and Flood Control District	POTW-Small	Yes
Karin North**	City of Palo Alto	POTW-Medium	Yes
Adam Olivieri	BASMAA / EOA, Inc.	Stormwater	Yes
Peter Carroll	Tesoro Golden Eagle Refinery	Refineries	Yes
John Coleman	Bay Planning Coalition	Dredgers	Yes
Rob Lawrence	US Army Corps of Engineers	USACE	Yes
VACANT		Industry	
David Frandsen	NRG Energy	Cooling Water	Yes
Tom Mumley*	SFB Regional Water Quality Control Board	Water Board	Yes

* Chair, ** Vice Chair

Guests and Staff

- Phil Trowbridge (SFEI)
- Jay Davis (SFEI)
- Jennifer Sun (SFEI)
- Lawrence Leung (SFEI)
- Lester McKee (SFEI)
- Jing Wu (SFEI)
- Jennifer Hunt (SFEI)
- Alicia Gilbreath (SFEI)
- David Schoellhamer (USGS) - by phone
- Brenda Goeden (BCDC) - by phone

1. Introductions and Review Agenda

The group acknowledged the many contributions of Rob Lawrence, who will be retiring from USACE.

Action Item

-
- Follow up with Rob Lawrence to find a new USACE representative or, if necessary, send a formal request to the USACE senior management (Phil Trowbridge)

2. Decision: Approve Consent Calendar Items
January 19, 2016 Steering Committee Meeting Summary

There were no questions regarding the January 19, 2016 Steering Committee Meeting Summary.

Items for Approval

- Karin motioned to approve the January 19, 2016 Steering Committee Meeting Summary. Adam Olivieri seconded the motion. The motion for approval was carried by all members.

Action Items

- Post the January 19, 2016 Steering Committee Meeting Summary to the Bay RMP and SFEI websites. (Jennifer Sun)

3. Information: Technical Review Committee Meeting Summary

Tom Mumley cautioned that RMP archives should be disposed of cautiously rather than as part of a rapid effort to reduce costs. Tom also confirmed that the 6 CTR analytes with MDLs above California water quality criteria are not a priority and additional high-resolution analyses are not needed.

Phil Trowbridge reported that sediment flux monitoring at the Dumbarton Bridge and Golden Gate Bridge began, but antecedent rain conditions have been such that Guadalupe River monitoring has not yet been triggered.

4. Information & Decision: RMP Financial Update for 2016 Quarter 1

Lawrence Leung provided an update on 2016 Quarter 1 financials. Several additional items were also discussed:

<u>El Nino monitoring</u>
Luisa Valiela helped the RMP acquire $255k in unused funds from past San Francisco Bay Improvement grant funds to SFEP, in order to help fund El Nino monitoring studies. As a result, the RMP costs for this project were reduced to $43k, and $147k was returned to the Undesignated Funds**.** If Guadalupe River monitoring does not occur and additional SFEP funds remain after the wet season, it may be possible for

the funds to be used to synthesize April Robinson's work on mercury in Lower South Bay or to develop a long-term plan for Guadalupe River loads monitoring.

Dredgers Fees

The Bay Planning Coalition has held three meetings to discuss the dredger fee change, and John Coleman will bring the final option to the BPC board on May 18th. However, there will still be a deficit in 2017, because small project dredgers have already established their budgets based on the old fee system, although Rob Lawrence noted that a high volume of dredging has likely occurred over the past fiscal year due to the drought and El Nino conditions. In the future, the dredgers fee formula should be updated two years before the old formula expires so that dredgers can budget accordingly. The Steering Committee has also previously decided not to recoup the cumulative $228k deficit in dredgers fees. John Coleman also indicated that the the USACE has agreed that fees should increase from $250k, at least at levels equivalent to the consumer price index. Congress is still working on the budget for 2018, but there is a tentative expectation that the allocation for USACE fees to the RMP will increase.

Matching Funds

SFEI is requesting $93k from the RMPs 2012, 2013, & 2015 stormwater POC monitoring budgets as a retroactive match for a Flood Control 2.0 grant. These funds have already been spent, and using them as a match will not affect any RMP activities. Because this is a retroactive match and there are unlikely to be competing requests for these matching funds, the group approved this match (see vote record at the end of this section for official approval).

SFEI's Resilient Landscapes group is preparing a Water Quality Improvement Fund grant proposal related to their Resilient Silicon Valley project, and has requested a $50k match from the RMP to contribute to a sediment science synthesis task. The deadline for the proposal is May 27, 2016, and funds provided by the RMP would be leveraged 5:1. Funds would be taken from the Undesignated Funds pool.

Various committee members indicated that they preferred all funding requests to be reviewed by the workgroups, if applicable, and Technical Review Committee. Because of the imminent deadline, there will not be time for the TRC to fully review this proposal. Although this is a recurring grant opportunity, it may not be available annually. The group agreed to allow Tom Mumley to work with Phil to develop the proposal and determine how the RMP should fund such a project (i.e. Undesignated Funds, match with already allocated RMP funds, additional funds from 2017/2018 budget, etc.), but requested that Phil circulate a 1 page summary of the proposed project to the TRC and SC. The group also agreed to develop formal procedures for using RMP funds as match funds at a future meeting.

Fiscal Year transition - the group agreed that this effort is unnecessary to continue at this time

Alternative Monitoring Requirement (AMR) & Supplemental Environmental Project (SEP) Funds

Karin North requested that Lawrence invoice all wastewater participants for Alternative Monitoring Requirement funds before the end of the fiscal year, with the option to opt out. The potential total revenue from this source is $250k if all wastewater agencies opt in. Karin estimated that few if any agencies would opt out of the program altogether, with the exception of some of the smaller associate agencies.

Tom Mumley clarified that the designated use of AMR funds for CECs may be flexible, although CEC studies would remain the top priority.

Tom also estimated that about $100k in mandatory minimum penalty (MMP) funds could become available to the RMP each year. Permittees have the option of allowing half of their penalties to fund RMP studies. However, it is essential to document the use of these and other SEP funds to demonstrate that the funds are providing "added value" beyond what is required through existing permits.

Items for Approval

- Adam moved to approve the use of $93,000 of RMP past expenses from 2012-2015 as non-federal match for the Flood Control 2.0 grant proposal. Karin seconded the motion.The motion for approval was carried by all members.

Action Items

- Develop procedures for using RMP funds as grant matching funds and report back to the SC (Phil Trowbridge)
- Discuss with Tom Mumley the possibility of using RMP funds as match for a Resilient Landscapes Water Quality Improvement Fund proposal. Bring the proposal back to the SC for approval if it is justified. (Phil Trowbridge)
- Distribute more information on the Resilient Landscape's Water Quality Improvement Fund proposal to the Steering Committee, if RMP funds will be used as match. (Phil Trowbridge)
- Send invoices for the AMR supplemental RMP contribution to all wastewater participants by mid May to give agencies the option of using left-over money in their budgets for this fiscal year. (Lawrence Leung)

5. Discussion: Guidance to Workgroups on 2017 Special Studies Budgets

Emerging Contaminants

The Emerging Contaminants Workgroup meeting was held on April 15.The Emerging Contaminants Workgroup recommended developing passive sampling capabilities for emerging contaminants and legacy contaminants, and discussed holding a technical workshop (remote webinar) on passive sampling in the fall. Tom added that passive sampling could be incorporated into the RMP program beyond CECs, and that it should be used alongside modeling efforts that would optimize monitoring designs and assist with data interpretation. The inclusion of passive sampling is consistent with the Statewide CECs monitoring recommendations. Tom suggested that the RMP consider how modeling could be incorporated more comprehensively into the program, including assisting with passive sampling, in order to define funding needs and identify funding sources.Adam Olivieri emphasized the need to conduct spreadsheet analyses of chemical source and production data to predict what chemicals should be monitored. Karin also highlighted the Workgroup's intention to develop more refined methods for moving chemicals up, down, on or off the tiered ranking list based in part on this type of source analysis.

Selenium

The Selenium Workgroup has so far focused on sturgeon monitoring, but would like to consider broadening the monitoring efforts. Terry Young has requested the development of "early warning"

monitoring indicators that would highlight changes in selenium inputs from the Central Valley. Current proposals remain focused on sturgeon monitoring (muscle plug monitoring, multiple tissue monitoring at the Sturgeon Derby, telemetry data analysis) but the group will discuss additional monitoring options at the meeting. The group will also discuss beginning the South Bay Synthesis one year early. The South Bay is on the 303(d) list and experiences different sources and influences from the North Bay, for which a TMDL has recently been approved by the Water Board.

PCBs/Dioxins

The PCB Workgroup will discuss the draft Conceptual Model report on the Emeryville Crescent PMU. The 2017 proposal will will focus on developing a conceptual model for San Leandro Bay. Funding through a Supplemental Environmental Project may be available for some of the PMU work.

The dioxin synthesis report will be proposed again in 2017, and is a high priority for funding.

Exposure & Effects

The Exposure & Effects Workgroup will primarily discuss results from the second year of the bioanalytical tools study. The EEWG has previously worked with the ECWG, whose members will be participating in the discussion of this project as well.

Microplastic Strategy Meeting - will be held on June 29th at SFEI.

Additional Discussion Highlights

Tom Mumley indicated that workgroups must rank their proposed studies and prepare a list of studies that can be readily implemented if Supplemental Environmental Project funds become available. However, the availability of SEP funds should not affect the distribution of special studies funds between focus areas.

Karin and Tom highlighted that additional pre-workgroup planning would help make the workgroup decisions more fruitful. Particularly for growing focus areas like Emerging Contaminants, holding two workgroup meetings each year would be useful - one for developing concepts and one for approving proposals, although this strategy can be expensive. RMP staff should engage with Science Advisors before the workgroup meetings to get feedback and new ideas.

The available Special Studies budget will not be confirmed until the fall. The dredger fee formula is still being negotiated and the fee shortfall will not be known until September. However, any deficit is likely to be offset by new revenue from the Alternative Monitoring Requirement (intended to be used for CEC studies) and SEP mandatory minimum penalties.Tom noted that for larger SEP settlements, ultimately it is the Water Board that determines whether the nexus between a RMP project and the settlement qualifies the project for SEP funding. The group agreed that the workgroups should assume full funding levels when preparing proposals, but the TRC and SC can rank proposals and add/subtract studies in November once the true budget is known.

The next discussion of the overall RMP budget and fees will be at the July SC meeting, followed by an approval in September following stakeholder discussion. John Coleman noted that a maximum cap should be placed on the reserve funds - either a dollar amount or a percentage of the total budget. Phil also noted that it could become an issue if SEP funds start to replace participant fees in funding the program.

Action Items

- Revise guidance to workgroups to indicate that ranking of proposals is mandatory and that all workgroups should have extra projects scoped out to be ready for SEP settlements. (Phil Trowbridge)
- Add agenda item to the July 2016 SC meeting to consider a maximum undesignated reserve fund cap and plans for fee increases for the next three years (Phil Trowbridge)

6. Discussion: Potential New Focus Areas Recommended by TRC

Phil Trowbridge presented five ideas for potential new focus areas for the RMP: Tidal Wetland Regional Monitoring; Beneficial Reuse of Sediment; Trash; Sediment Fate, Transport & Effects; and Bacteria at Bay Beaches and Recreational Waters. The group strongly agreed that developing a sediment strategy is a high priority for the RMP, and it was suggested that the beneficial reuse of sediment and sediment fate, transport & effects areas be combined. The first step to developing this focus area could be the RMP's involvement in the SFEI Water Quality Improvement Fund grant proposal, which will include a sediment synthesis. Tom and Phil will work together to develop the RMP's role in this project and report back to the TRC and SC.

Tidal wetland regional monitoring was also viewed favorably, but could be a substantial effort requiring additional funding and partners. This topic will be discussed further at the Multi-Year Planning Meeting. The RMP's involvement in trash issues will be reevaluated at a later date after the BASMAA effort on trash in creeks is completed. Developing molecular methods to better monitor bacteria in Bay beaches was determined to be out of the RMP's scope and will not be further pursued.

No specific studies will be proposed for the 2017 budget cycle. Additional discussion related to key focus areas is summarized below.

<u>Sediment</u>

The group strongly agreed that the RMP should develop a new focus area on sediment fate, transport & effects. Phil Trowbridge suggested that this would initially involve developing workshops to synthesize relevant information and develop study proposals. Brenda Goeden indicated that BCDC has already begun developing a library of relevant documents and can contribute to such a synthesis. BCDC has already held a workshop on sediment research goals, which focused on sediment fate & transport relating to beneficial reuse of dredged sediments, sediment budgets, and sediment risk (shoreline erosion, sea level rise, etc.).

Tom Mumley suggested that the RMP can develop a larger strategy and identify external partners to address particular questions with expertise and funding from other agencies (ie. related to sea level rise,

wetland restoration, etc.). Tom also emphasized the need to take advantage of Dave Schoellhamer's field work capabilities, and Dave indicated that he had the capacity to expand his work for the RMP if provided additional resources.

Tidal Wetlands Regional Monitoring

Tom suggested that the RMP explore facilitating a regional wetlands monitoring program, which will have an increasing nexus with current RMP work as wetlands become receiving waters as part of horizontal levees. Jim Ervin suggested that the RMP or SFEI bid on RFPs relating to monitoring of restored wetlands that are put out by the South Bay Salt Ponds Restoration Project. The group agreed to discuss this idea in greater depth as part of the Multi-Year Planning Meeting.

Action Items

- Modify the list of "new focus areas" based on SC feedback and continue to refine the concepts for the November SC meeting. (Phil Trowbridge)

7. Science Update: Small Tributary Loading Strategy Studies

Lester McKee presented recent results from the water year 2015 stormwater monitoring program. In 2015, monitoring included reconnaissance-style monitoring in the upper watershed and an intercomparison between two passive sampling methods and composites of grab samples taken throughout the storm. Through this reconnaissance monitoring, three additional high PCB concentration sites were identified, as well as two of the highest mercury concentration sites outside of the Guadalupe River. Other key findings included: percent imperviousness was generally correlated with particle ratios; high mercury watersheds were often but not always also high PCB watersheds; climatic adjustments were used to adjust loads, but cannot fully adjust for low bias due to a lack of information about large storms; and watersheds with old industrial land use show the greatest variability in PCB concentrations and loads.

Data from 19 new sites were collected and used to calibrate the Regional Watershed Spreadsheet Model. Some data considered to be outliers were excluded from the spreadsheet model, including data points representative of base flow only and anomalous events (ie. very small storms). The group is also considering running the model in two modes, with and without the inclusion of high outliers that are representative of anomalous conditions in the watershed or particularly high source areas. The best estimate of total PCB loads (16.8 kg/yr) and mercury loads (95 kg/yr) are well within the range of what was expected and similar to the estimate in the TMDLs. The newest version of the spreadsheet model will be available in early May. With the improvements being tried presently on the model parameterization and calibration styles, it is anticipated that the loads of PCBs at the regional scale can be estimated with increased confidence.

Beginning in 2015 with the Municipal Regional Permit 2.0, efforts have shifted away from fixed loading station monitoring towards reconnaissance-style monitoring. From 2017-2020, monitoring may shift again, this time towards trend monitoring in response to the MRP 2.0 and the need to begin to assess the reduced loads caused by implementation to BMPs for PCBs and Hg.

8. Information: Annual Meeting Agenda and RMP Update Report

Annual Meeting

Speakers, sessions, and presentation topics agreed upon by the group are outlined below:

Introduction

- Tom Mumley

Nutrients

- Dave Senn: Nutrients overview summary, including what we have learned, where we are, where we're going, and guiding questions. Focus should be on phytoplankton and dissolved oxygen, with some discussion of HABs
- Phil Bresnahan: Moored Sensors
- Rusty Holleman: Modeling

Dredging, Stormwater & Sediment dynamics

- Dave Schoellhamer
- Lester McKee
- Brian Ross - management perspectives that relate to science needs on dredging
- Don Yee

CECs

  - Rebecca Sutton: CECs - if new CEC strategy is ready, potentially including microplastics strategy if RMP wants to pursue. Avoid presenting another general overview of the CEC program, which has already been done in previous years
- DPR / Jennifer Teerlink: fipronil/imidacloprid
- Anne Cooper Dougherty: Green Chemistry

Sportfish & Sturgeon studies

- Jennifer Sun

Additional suggestions included:

- Schedule the CECs and general RMP sessions in the morning and the Nutrients sessions in the afternoon
- Allow length of sessions and presentations to vary
- Increase the time allocated to Tom Mumley and Dave Senn
- Focus on an overarching theme that ties the meeting together, ie. "How the RMP is addressing science and management questions"
- Work with presenters and moderators to frame each talk in the same way, explaining the regulatory background driving the work being presented
- Tom Mumley did not feel that the nutrients presentations at this meeting would satisfy the NMS's interest in holding an annual workshop on nutrients issues. The purpose of that meeting was to create a forum that would allow for coordination between the RMP and others' work. The RMP annual meeting should focus on topics relevant to the RMP.
- Several committee members felt that HABs were not the primary concern of the Nutrients group, as the nexus with nutrients and potential management actions is unclear. The nutrients topics of interest include DO, chlorophyll, and phytoplankton (ie. ammonia and N:P ratio paradoxes)

RMP Updates

The RMP Update will not include a discuss of New Focus Areas, which will not be fully discussed by the time of report publication. The report also will not include discussion of financial issues, although it will include a summary of revenue and expenses. The report will be distributed for review following the workgroup meetings.

9. Information: Topics for Estuary News articles in 2016

The next Estuary News article will focus on bird egg sampling. The 2006-2012 bird egg report has finally been completed, and 2016 bird egg sampling is in progress. Jay proposed an annual cycle for Estuary News topics: articles on stormwater topics in March, miscellaneous RMP topics in June, Nutrients in September, and CECs in December. The December 2016 Estuary News article will focus on either the new microplastics strategy or an upcoming PFCs manuscript.

The Science Update at the July Steering Committee meeting will focus on sport fish data.

Action Items

- Give a science update on the draft sport fish data at the July SC meeting (Jennifer Sun)

10. Discussion: Staff Report on "Internal" Program Review

Phil Trowbridge reported back on the RMP's internal program review requested by the Steering Committee.

Review Workgroups and Science Advisors

The Sources, Pathways, and Loadings Workgroup and the Emerging Contaminants Workgroups have changed some of their science advisors. The PCB and Selenium Workgroups may need to incorporate more advisors; in particular, a fate and transport expert is needed for the PCB Workgroup. While workgroups are advised by a number of experts, science advisors must be explicitly external (including geographically) to the program, with no conflict of interest, and provide key peer review during the planning stages of proposals and studies. Both the PCB and Selenium Strategy Teams were transitioned into Workgroups once they acquired paid science advisors. Science Advisors are ultimately determined by the science leads, in consultation with key stakeholders.

The Mercury and Dioxin Workgroups are dormant, and the EEWG may transition into dormancy, depending on the workgroup's interest in developing new studies. The group is currently reviewing a bioanalytical tools study in coordination with the ECWG. Potential new workgroups include a Microplastics Workgroup and Sediment Fate, Transport & Effects Workgroup.

Tom Mumley warned that the RMP should be judicious about bringing in new science advisors, and careful that workgroups focus on regulatory rather than scientific research questions.Tom also requested additional explanation of the expectation for dormant groups and new groups.

Review Internal and External Partners

A summary of the group's feedback on the RMP's recommendations for external coordination is outlined below:

Maintain Strong Partnerships With:

- RMP Participants
- Nutrient Management Strategy
- SFEP

Invest in Partnerships with:

Coordination with the Delta - modeling, nutrients, and selenium are key areas of overlap. Use of RMP funds to coordinate with the Delta RMP was approved last year using Contra Costa County fees. Tom suggested regular communication to the workgroups, TRC, and SC about coordination efforts with Delta agencies.

- Delta RMP
- IEP) - attend IEP meetings for the next year to increase awareness of their monitoring efforts and evaluate the need for investing in this partnership.

Others

- South Bay Salt Ponds Restoration
- BCDC - make sure this agency is included on the new Sediment Workgroup.Bay Area universities - small effort, beginning with the advertising of archive samples

Biota - other agencies that monitor Bay biota include UC Davis, IEP, and DWR. Two issues of concern highlighted were pelagic organism decline and *Potamocorbula* clam distribution in the Bay.

Review the Need for Performance Measures

RMP staff recommended adding an annual satisfaction survey of RMP fee payers as the only additional measure of performance. Committee members felt that feedback at their stakeholder meetings was sufficient., The group agreed that mechanisms for substantial feedback already exist and are working well, and that an additional survey is not needed.

Define RMP role in New Focus Areas

This topic was discussed in Agenda Item 6.

Action Item

- Update and finalize the Internal Review report. (Phil Trowbridge)
- In the internal review document, include IEP as an external partner with whom to develop a stronger working relationship. Attend IEP meetings for the next year. (Phil Trowbridge)

11. Information: Status of RMP Deliverables and Action Items

Phil noted that the Bay Margins report will be delayed because of the delay in the sediment PCB intercomparison study and lab selection. Comments from the group included that (1) flags showing which deadlines have been extended are helpful, and (2) the font size is small.

12. Decision: Set future meeting dates and topics

The next Steering Committee meetings will be held on July 19 and November 1, 2016. The next meeting after that will be on January 17, 2016.

Action Items

- Schedule the Multi-Year Planning Meeting and fall Steering Committee meeting for January 17, 2016 (Jennifer Sun)
- Post 1/19/16 meeting summary to website (Jennifer Sun)

The meeting was adjourned at 3:15 pm.

Draft for TRC Review

SAN FRANCISCO ESTUARY INSTITUTE
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Bay RMP Technical Review Committee Meeting
June 9, 2016 San Francisco Estuary Institute

Meeting Summary

Attendees

TRC Member	Affiliation	Representing	Present
Nirmela Arsem	EBMUD	POTWs	Yes (by phone)
Rod Miller	SFPUC	POTWs	Yes
Tom Hall	EOA, Inc.	South Bay Dischargers	Yes
Amy Chastain	City and County of San Francisco	CCSF	Yes
Eric Dunlavey	City of San Jose	City of San Jose	Yes
Bridgette DeShields*	Integral Consulting	Refineries	Yes
VACANT		Industry	NA
VACANT		Cooling Water	NA
Chris Sommers	BASMAA (EOA, Inc.)	Stormwater	Yes
John Prall	Port of Oakland	Dredgers	No
Ian Wren	San Francisco Baykeeper	NGOs	Yes
VACANT	US Army Corps of Engineers	USACE	NA
Karen Taberski	SFBRWQCB	Water Board	Yes
Luisa Valiela	US EPA	US-EPA IX	Yes

*Chair

Guests and Staff

- Phil Trowbridge (SFEI)
- Jay Davis (SFEI)
- Jennifer Sun (SFEI)
- Rebecca Sutton (SFEI)
- Lester McKee (SFEI)
- David Senn (SFEI)
- Don Yee (SFEI)
- Alicia Gilbreath (SFEI)
- Naomi Feger (SFBRWQCB) (by phone)
- Richard Looker (SFBRWQCB)
- Mike Connor (EBDA)
- Samantha Engelage (City of Palo Alto)

1. Introductions and Review Agenda

Agenda item 9 was moved between agenda items 5 and 6 to allow members who needed to leave early to participate in the discussion regarding the PCB laboratory intercomparison study.

2. Decision: Approve Meeting Summary from March 29, 2016 and confirm/set date for future meetings

On page 5 of the March 29, 2016 TRC Meeting Summary, in the second sentence under the "Suspended Sediment" subheading, Karen Taberski noted that "modeling" should be revised to "monitoring."

The TRC meeting will take place on Wednesday, September 21, 2016. The following meeting was scheduled for Thursday, December 8, 2016.

Items for Approval

- Chris Sommers motioned to approve the meeting summary from March 29, 2016. Karen Taberski seconded the motion. The motion for approval was carried by all present members.

Action Items

- Revise March 29, 2016 TRC meeting summary and post it on the Bay RMP website. (Jennifer Sun)
- Schedule the fourth quarter TRC meeting for December 8, 2016. (Jennifer Sun)

3. Information: Steering Committee meeting from April 19, 2016

Phil Trowbridge gave an overview of major topics discussed during the April 19, 2016 Steering Committee Meeting.

<u>New Focus Areas</u>
The Steering Committee felt that RMP involvement in the wetlands monitoring and trash focus areas was premature. These focus areas will be discussed further during the November Multi-Year Planning meeting. Developing a strategy for a sediment focus area was identified as a priority. The first step in developing the strategy was to approve $50k in RMP matching funds for an EPA Water Quality Improvement Fund grant proposal that includes a sediment strategy task. These funds have been taken from the Undesignated Funds and placed in a set-aside, and will be returned to the Undesignated Fund if the proposal is not funded. The $50k would be leveraged 5:1 if the proposal is funded. The group requested that Phil send the full proposal to the group to review.

<u>Internal Review</u>
Phil presented the results of the RMP internal review. The Steering Committee agreed that no major

changes to the current workgroup structure were necessary. The Interagency Ecological Program, Department of Water Resources, and South Bay Salt Ponds Restoration Project were identified as groups with whom the RMP should invest in building better relationships. The Steering Committee also indicated that an annual survey of participants was unnecessary as a performance measure.

Fiscal Year - The Steering Committee agreed that transitioning the RMP from a calendar year to a fiscal year was not a high priority and could be tabled. Rod Miller suggested that major documents be labeled with "Calendar Year" to avoid confusion.

Archives
Phil reported that the whole bivalve archive samples were discarded, and the remaining samples were consolidated, reducing the sample storage volume by about 25%. This should be reflected in a similar reduction in short-term sample archive storage costs.

SEP funding -
$82k from a Supplemental Environmental Project as well as $50k in mandatory minimum penalty funds have been approved for use on PCB studies. $30k will be used to complete the San Leandro Bay PMU Conceptual model, and $100k will be used to conduct field studies.

Action Items

- Send full Water Quality Improvement Fund proposal to the Technical Review Committee (Phil Trowbridge)

4. Discussion: Presentation of Special Studies Proposals Recommended by Workgroups

Phil Trowbridge presented an overview of key outcomes from workgroup meetings apart from special studies:

- Sources, Pathways and Loading Workgroup: Lori Sprague and Bob Hirsch will be joining SPLWG as two new science advisors to help with the Trends Strategy. There will be a follow-up meeting about the trends strategy with Bob and Lori on June 22, 2016.
- Selenium Workgroup: a Selenium Monitoring Workshop focusing on leading indicators will be held during the week of July 25, 2016.
- Emerging Contaminants Workgroup: The workgroup recommended a passive sampling webinar to take place during the fall. This type of monitoring may be applicable to other types of RMP monitoring beyond ECWG.
- Microplastic Workgroup: This workgroup meeting will be held at SFEI on June 29, 2016.

Phil presented an outline of current and potential future funding sources for 2017 Special Studies. The planning budget for this project was about $1,073k. The RMP is expecting a dredger fee shortfall of approximately $234k, resulting in an approximate core budget of $839k. An additional $100k in Alternative Monitoring Requirement fees have already been collected. Phil recommended adding another

$61k from the Undesignated Funds to help make up the fee shortfall, adding up to a planning budget for special studies of approximately $1,000k. Phil noted that over $150k of unused program management funds have been released to the Undesignated Funds over the past year with the intended purpose of supplementing the Special Studies budget, and that the Undesignated Funds pool is currently at a historically high level (approximately $800k). Phil felt confident that the Steering Committee would approve using at least $61k from Undesignated Funds to fund additional Special Studies.

Chris cautioned that the TRC should not be making recommendations for use of the Undesignated Funds, but should simply be ranking proposals in separate groups based on those recommended for funding within the core budget, those recommended for funding outside the core budget (ie. with SEP, AMR, or additional Undesignated Funds monies), and those not recommended for funding. However, for this year the group agreed to include the additional $61k in the core planning budget.

Several additional funding sources have become available over the past year, and could lead to additional funding before the end of the calendar year to fund 2017 Special Studies. Up to an additional $150k in Alternative Monitoring Requirement funds may become available, and both Phil and Mike Connor expressed high confidence that almost this full amount would received. Up to an additional $200k in Supplemental Environmental Project settlement funds are estimated, although the receipt of these funds requires that a nexus exists between the violation and an RMP project, and that the violator chooses to fund an RMP project. Up to an additional $50k are expected in mandatory minimum penalty funds, the use of which is more flexible.

The group agreed to allow the pool of current and expected AMR funds to support Emerging Contaminants studies exclusively, as was originally intended. There was agreement that AMR funds are not meant to fund only wastewater-relevant Emerging Contaminant studies, but can be distributed among projects that benefit all stakeholders (e.g., stormwater). Other types of studies were prioritized within the estimated core budget of $900k ($839k + $61k Undesignated Funds). Any studies not prioritized for the $900k planning budget were ranked in case additional funding was found.

Discussion highlights are summarized below.

<u>General Comments or Funding Issues</u>
Several group members requested that the Nutrients and STLS groups provide more information about how lower funding allocations will impact their program, either through lower-cost alternative options or a more detailed breakdown of proposal costs. Additionally, TRC members requested more long-term planning from the Workgroups, including an explanation of what projects are time-sensitive and options for phasing projects over time.

<u>PCBs</u>
Jay Davis and other PCB and STLS workgroup members provided an explanation of the PCB strategy timeline and potential influence on management decisions. The purpose of the current PCB strategy is to inform and focus management actions in watersheds to reduce PCB loads. The Emeryville Crescent conceptual model report indicated that changes in watershed loads can be expected to lead to reduced

concentrations in biota in the Crescent. Monitoring in margin units may be a cost-effective way to measure the impact of watershed load reductions (e.g., monitoring small fish in the margins instead of monitoring trends in stormwater loads).

Ian Wren and Amy Chastain asked Jay to more clearly show the linkage between the PCB margins work and the STLS Trend Strategy work and how the combined studies will inform changes to the PCB TMDL in 2020. Chris Sommers asked if conceptual models are needed for multiple margin units. Jay responded that the different margin units cover a spectrum of habitats and margin types. It is important to know if the different types of margin units will respond differently.

The proposed $60k project would support the Steinberger Slough PMU Conceptual Model report, and is needed to keep the strategy on schedule to complete 4 PMU evaluations before the 2020 PCB TMDL and MRP updates.

STLS

Chris Sommers indicated that if the STLS budget needed to be cut, he recommended that the cut be made to the Trends Strategy project. Detecting stormwater trends is a technically difficult and intensive project, so fully funded reconnaissance monitoring would more reliably return useful and actionable results. The current iteration of the Regional Watershed Spreadsheet Model is scheduled to be completed within the next year, and is needed to help determine how much management activity is needed to achieve desired load reductions.

Similar to last year, the group generally agreed that the Nutrients program should be cut by approximately the same amount as the STLS program. Both programs were scaled back by approximately $100k.

Chris also highlighted that similar to the Nutrients program, the STLS is only part of a larger stormwater strategy. BASMAA is spending an additional $1-$1.5 on stormwater monitoring, primarily on PCBs and Hg. Cuts to these programs would also affect their ability to inform the upcoming 2020 PCB TMDL and MRP revisions.

Nutrients

Dave Senn explained that the Nutrients Science budget, or the amount needed to address the Water Board's priority questions on its desired regulatory timeline, is about $3 million. Current funding is about $1.1-1.4 million. The two projects proposed for RMP funding are the highest Nutrients priorities, and if RMP funding were cut, other funds would be used to support these projects. Instead, a funding cut of about $100k from the RMP would result in cuts to two lower priority projects: (1) a workshop and literature review of the impacts of HAB toxins in biota, and (2) continued monitoring of algal toxins in bivalves. Alternatively, smaller reductions may be made throughout the Nutrients budget in order to at least partially fund these smaller projects.

Dave suggested that any cuts to the Nutrients budgets be made to the moored sensor proposal. It is better for the RMP to maintain full funding of the ship-based monitoring in order to maintain the ongoing collaboration between RMP and USGS.

ECWG

Becky Sutton explained that while a number of the proposed projects did not address current regulatory priorities, these prioritization decisions may be based on incomplete science. These issues will not rise in management priority unless the RMP conducts studies that indicate whether or not they should be higher priorities. For example, bisphenol A was previously monitored using a method with a high MDL (above a new PNEC) and bioaccumulation of triclosan was not previously considered or known to be an issue. Additionally, much of the RMP's work on pesticides such as imidacloprid is part of a long term effort to include marine toxicity concerns in regulatory decision-making, which currently focuses only on freshwater toxicity.

Many of the studies proposed for 2017 are tied to water sampling, in order to take advantage of the 2017 Status and Trends Water Cruise. Eric Dunlavey asked if any of the studies could be phased over time. Becky explained that bisphenols are composed of a broad range of chemicals that could be detected in either water or sediment, so it is desirable to sample these compounds during the 2017 Water Cruise rather than just the 2018 Sediment Cruise. Additionally, a strong toxicity threshold exists only for BPA in water, not sediment. Becky also found that AXYS can analyze fish tissues for methyl-triclosan, so a time lag due to method development is not necessary for the triclosan in small fish study. However, it could be possible for the fish to be collected in 2017 and analyzed in a future year.

Mike Connor suggested funding pesticides work only if DPR would provide a match; however group members felt that this would be unlikely in the near-term and that the RMP should continue to study pesticides in the interim.

Dioxins

The committee agreed that this synthesis was a funding priority, after having been delayed for several years. Tom Hall suggested that although dioxins would be unlikely to be delisted, it could be moved down to a 303(d) category 4b designation. Mike Connor suggested that the proposal explicitly indicate that the deliverable may contribute to a draft 4b justification document. Naomi indicated that whether or not that 303(d) designation for dioxins changed, this synthesis was necessary to lay out a justification for reducing emphasis on dioxin management by the Water Board.

Exposure and Effects

Karen and Naomi supported funding the completion of the bioanalytical tools project. Mike Connor expressed doubt that this tool would be utilized, and felt it should receive funding from a broader range of sources nationally. The group explained that the initial portion of this study was indeed heavily leveraged with external funding, and Water Board staff felt this was a small amount of funding to complete this portion of the project. Jay explained that the proposal could not be easily reduced, and separating the work to finalize the tool and pilot test it on wastewater effluent would not significantly reduce costs. Criteria for considering additional funding for this work, including a study based on glucocorticoid response, will be further discussed at the Multi-Year Planning meeting.

Phil and Karen noted that $15k of the $30k climate change and ocean acidification monitoring workshop proposal was needed in the next year to fund honoraria for external science advisors to participate in an Ocean Acidification workshop that has already been funded by EPA. However, the group felt that this area was not a priority for the RMP and funding from other sources should be used to find external science advisors if essential for this workshop.

Selenium

The Selenium Workgroup members explained that a third year of Sturgeon Derby data would help to clarify the relationship between selenium in various sturgeon tissues. Recent data have shown exceedances of the new North Bay TMDL and appear to be somewhat higher than in the past, so additional data would help to identify the sources of these high concentrations. Sturgeon muscle tissue monitoring is expected to continue long-term as the North Bay TMDL established it as an impairment indicator.

The Selenium Monitoring Workshop is being developed in part by the direction of Terry Young, and as such is a high regulatory priority. Bridgette indicated that the workshop will likely recommend more than $20k in funding, but recommended studies will be reviewed and approved by the TRC and SC at a later date as well.

5. Decision: Recommendations for Special Studies for 2017

The committee recommended that the following studies be funded using the core budget ($839k) and an estimated $61k from the Undesignated Funds (total $900k). The studies are listed in no particular order:

- Estrogen receptor *in vitro* assay linkage studies: $45k
- Strategy for Benthos and Toxicity Monitoring: $10k
- Nutrients (Ship-based sampling and sample analysis): $153k
- Nutrients (Open-Bay and slough moored sensors work): partially funded at $220k
- Dioxin Synthesis: $40k
- PCB Strategy Coordination and Technical Support: $10k
- Selenium Strategy Support: $10k
- 2017 Sturgeon Derby Monitoring: $42k
- STLS Program Management: $30k
- STLS Watershed Characterization Reconnaissance Monitoring: $200k
- STLS Regional Watershed Spreadsheet Model: $40k
- STLS POC Trends Strategy and Monitoring: partially funded at $100k

All Emerging Contaminants studies were set aside for funding by Alternative Monitoring Requirements funds, and will be funded in the order of priority listed below

Funding available ($100k)

1. Emerging Contaminants Strategy: $50k
2. Imidacloprid in Ambient Bay Water: $40k

Funding likely to be available ($150k additional)

3. Perfluorinated and Polyfluorinated Compounds in San Francisco Bay: Synthesis and Strategy $56.3k
4. Phosphate Flame Retardants in Ambient Bay Water: $47k
5. Bisphenol Compounds in Ambient Bay Water: $50k

Initial funding unlikely through AMR participants

6. Triclosan in Small Fish $41.3k

The committee also recommended that the Steering Committee use an additional $202k from the Undesignated Funds pool (or other funding sources) to fund the following studies, listed in no particular order:

- Nutrients (Open-Bay and slough moored sensors work): additional $122k of funding to continue the program at the full multi-year planning level
- PCB Priority Margin Unit Conceptual Development (Steinberger Slough): $60k
- Selenium Monitoring Workshop follow-up funding: $20k
  This is a high Water Board priority for TMDL implementation. Bridgette and Naomi noted that it was likely that additional funding would be needed to fund projects recommended through this workshop, so any additional funding could be considered separately by the Steering Committee.

The following studies were considered a lower priority for funding. These projects may be funded with minimum mandatory penalty or SEP funds.

- Strategy for Monitoring Climate Change: $30k
- STLS POC Trends Strategy and Monitoring: additional $100k in funding

These recommendations and additional key notes about the projects or funding decisions are summarized in the attached 2017 TRC Special Studies Recommendations table.

For next year, the TRC recommended that projects be prioritized for the known special studies budget without assuming that any Undesignated Funds might be available.

6. Information: Emeryville Crescent Priority Margin Unit Conceptual Model

Jay, Alicia and Don presented an overview of the Emeryville Crescent PMU Conceptual Model, including discussions of indicator selection, loadings, and fate and transport. A brief summary is included below; for additional detail please refer to the draft Conceptual Model Report. Comments on the draft report are due June 24, 2016.

Biotic indicators of PCB impairment were assessed based on species' integration of concentrations across the food web, space, compartments, and time; signal strength (maximum concentrations); and logistics (ie. the ability to find and collect samples). Silversides, where they are present, were identified to be the best indicators of PCB impairment in margin areas. These small fish prefer freshwater environments, and

thus are found closer to the sources of freshwater tributary inputs to margins areas. Topsmelt are distributed more widely and not as closely linked to the freshwater inputs of margins areas. Both species are specialized feeders of epibenthic invertebrates (indicative of surface rather than subsurface PCB concentrations), are annual species, and exhibit high concentrations of PCBs (strong signal strength). Shiner surfperch are considered the best indicators for the Bay over all, but are not abundant in certain margins areas like the Emeryville Crescent.

The Emeryville Crescent PMU is composed of three watersheds that are largely urban and industrial. Limited PCB and flow data were available. The Regional Watershed Spreadsheet Model was used to estimate loads and concentrations in watersheds where empirical data were not available. The best estimate of annual loads into the PMU is 214 g, 94% of which occurs during storms. During storm periods, an estimated 85% of PCBs are carried on particles. The majority of PCB loads are delivered to the PMU during storms smaller than the 1 year recurrence interval event, and during these smaller storms, a greater proportion of PCB loads are likely to settle in the PMU. During the larger but less frequent storms, a larger proportion of the PCB load is likely to be carried out of the PMU area and into the Bay. During non-storm periods only about 19% of the PCB load is carried on particles while an estimated 81% is in the dissolved phase.

The Emeryville Crescent is a shallow region in which about two-thirds of the volume moves in and out of the Crescent during each tide. As a result, this area experiences relatively quick turnover of PCB loads. Based on estimates of solids settling times and storm flow rates, larger particles delivered during smaller than 1 year average return interval storms (with about half of stormwater PCBs) do not exit the Crescent, although dissolved pollutants and unsettled particles are flushed out within a few tidal cycles. A larger proportion of the settled material would be expected near the entry points the the PMU, at least for areas with reduced resuspension and mixing.

Long term fate was modeled by modifying the one-box Bay model with additional localized parameters (sediment PCB concentrations, upland PCB loads, tidal exchange volume, and Bay PCB concentrations). Hydrodynamic modeling (SUNTANS, without considering wind) showed that about 30% of water that exits the Crescent re-enters on the next tide, reducing total net efflux to about 42% of that calculated for the whole tidal prism. The one-box model for the Crescent was adjusted to account for this factor. Factors affecting water column PCBs (watershed loads, suspended sediment concentration, congener, and tidal adjustment parameters) were found to be important factors governing the long-term steady-state PCB concentration. Assumptions about sediment parameters, such as burial, degradation, and mixed layer depth were less influential.

Jay then presented a summary of responses to the PCB management questions:

1. **Can we expect a decline in any compartment of the PMU in response to projected load reductions in the PMU watershed?** Yes, over about a 10-year time period for the food web, and faster for the surface deposit-feeder food web.
2. **How should we monitor to detect the expected reduction?** Preliminary field studies should include biota surveys, surface sediment (0.5 and 5 cm) surveys, and load or concentration data from the Temescal Creek and Emeryville Crescent North watersheds (currently estimated).

Long-term monitoring should include annual monitoring of prey fish (trend indicator), periodic monitoring of shiner surfperch (impairment indicator), annual near-field monitoring of surface sediment, and tributary monitoring (coordinated through STLS).

3. **How should we manage loads to maximize PMU recovery?** Loads should be reduced in all watersheds, but earlier efforts should focus on the Ettie St. watershed. Management should focus on storms smaller than the 1 year average return interna.

The development of the San Leandro Bay PMU study using SEP funds will be discussed at a meeting on July 7, 2016.

Action Items

- Add an agenda item to a future TRC meeting to discuss how PCB margins studies and STLS trends strategy will inform changes to the PCB TMDL (Phil Trowbridge)

7. Discussion: Update on 2016 Status and Trends Monitoring, PCB Lab Selection, and Planning for 2017-2018

PCB Laboratory Selection

Don Yee presented an overview of the new sediment PCB lab and method selection process that was recently completed. Following an interlaboratory comparison study, AXYS was chosen to be the new sediment PCB laboratory, but measured values were generally lower than those measured by EBMUD. Moisture was determined to be a confounding issue during the extraction process. Two methods - Dean Stark (toluene extraction) and Soxhlet DCM (standard extraction method) - were evaluated against the EBMUD method (high pressure/temperature extraction) for a composite of past samples and a NIST SRM. Double extractions showed less complete extraction using the Soxhlet DCM method than either the EBMUD or single or double extracted Dean Stark results.

Don presented several recommendations for ongoing sediment PCB studies. These recommendations were endorsed by the TRC.

- Samples should be analyzed at AXYS using a Dean Stark extraction method. This method could cause interference with some secondary ions for mono-, di- and tri- PCB congeners, but these congeners make up a low percentage of total PCBs in Bay sediments. The method would produce more accurate results, but around 25% higher values compared to comparable measurements made historically by EBMUD.
- A second back-up lab should be identified and given a subset of samples to analyze from studies over time, to build a relationship between results analyzed by each lab. This will provide a check on the accuracy of measurements made by the main lab, and will help preserve the long-term time history if labs must be changed again in the future. The PCB analysis subcommittee recommended that about 10% of samples also be analyzed be a secondary lab.
  Don is currently working to identify a second lab from recent InterCinD participants. Mike suggested finding out the lab used by the NOAA Status & Trends program.

- Archive samples should be periodically sent to the main lab along with new field samples for analysis as a measure of internal consistency in the lab method over time, or among labs if the lab is switched again. Enough samples should be analyzed to enable potential correction of current or historical results due to method "drift," again about 10% may be needed.

2016 Status and Trends Sampling

2016 Status and Trends monitoring includes only bivalve monitoring. Core analytes that will be measured include PAHs, PBDEs, and selenium. Additional samples will be collected for analysis of algal toxins by the Nutrients group and emerging contaminants by Da Chen, an RMP collaborator at the Southern Illinois University.

2017-2018 Status and Trends Sampling

This discussion item was postponed to a future meeting. Key decisions include the inclusion of additional margins sediment sampling in 2017 and the inclusion of benthos monitoring during the sediment cruise in 2018.

Action Item

- Add the discussion of 2017-2018 Status and Trends sampling to the September 2016 TRC meeting agenda (Phil Trowbridge)
- Find out what laboratory the NOAA Status & Trends program uses to analyze sediment PCB (Don Yee)

8. Discussion: Update on the RMP Update Report

The 2016 RMP Update will have a strong focus on the management and regulatory impact of the RMP. Jay reviewed the outline of the draft RMP Update that was distributed to the TRC for review.

Mike Connor suggested printing each section of the report as separate fact sheets that could be easily accessed separately for briefings.

TRC review and comments on the draft RMP Update report text are due on June 24, 2016.

9. Discussion: Update on the RMP Annual Meeting Agenda

The RMP Annual Meeting agenda was updated based on Steering Committee recommendations. Jay noted that Phil's RMP impacts talk would instead be scheduled before the CECs session. Additional suggestions from TRC members are listed below:

- Almost all group members voiced their disagreement with the Steering Committee recommendation not to include a talk on harmful algal blooms. Ian again suggested that Raph

Kudela give a talk. Jay relayed that Tom Mumley and Jim Ervin thought that HABs constitute a controversial issue that is not ready for discussion. Further discussion between TRC and SC members is needed to resolve this issue. Eric Dunlavey volunteered to discuss this issue with Jim Ervin and Tom. The group felt that one of the CECs talks could be replaced with a HABs talk.

- The group agreed that the Nutrients session should be scheduled last in the day, but suggested that the modeling talk not be placed last.
- Luisa suggested reversing the order of the sediment and CECs session, such that the sediment session would be first in the day
- Mike Connor cautioned that Anna-Marie Cook's message on microplastic should be discussed with Nirmela and EBMUD, who are developing their own monitoring method. Luisa noted that Anna-Marie and BACWA were developing different but complementary methods, which will be discussed at the June 29 Microplastic Workshop.
- Mike Connor suggested that each session include a short guiding talk including a regulatory and management overview of the topic. Although the CECs strategy will not be fully updated by this meeting, Mike felt that an overview of the current strategy would be needed.

Jay indicated that TRC and SC members would again be called on to serve as session and discussion moderators. RMP staff will serve as timers.

10. Discussion: Status of Deliverable and Action Items

Phil Trowbridge gave a brief overview of late deliverables:

- Coring manuscript - this product is expected to be completed by the July 19, 2016 Steering Committee meeting
- RMP e-Newsletter - delayed due to other priorities
- Stormwater reports - final reports will be uploaded to the RMP website within the next week

No additional comments or questions were brought up.

11. Discussion: Plan agenda items for future meetings

Multiple group members continued to express interest in involving the RMP in a bacteria focus area related to the Beaches TMDL, despite a lack of interest from the Steering Committee. Amy Chastain explained that the implementation plan for the TMDL has not been fully developed, and expressed continued interest in exploring a potential role for the RMP, ranging from data interpretation to stakeholder communication and facilitation. Amy suggested that she and Rod Miller present more information about the TMDL and Rod's qPCR data showing high levels of non-human bacterial sources in environmental samples. This talk could potentially lead to further RMP involvement, such as through the hosting of a workshop on this issue.

Action Item

- Add an agenda item to the September TRC meeting for a bacteria in Bay beaches talk from Amy Chastain and Rod Miller (Phil Trowbridge).

12. Discussion: Plus/Delta

The committee provided several suggestions for improving the Special Studies approval process next year:

- Communicate more clearly information about (1) the management and regulatory relevance and (2) the timeliness of projects. These information can be added to the Special Studies summary table.
- The multiple summary "views" of the proposals were helpful.
- More time was needed to discuss the proposals. Almost the entire meeting should be dedicated to the Special Studies funding discussion.
- The summary graph of proposals provided in 2016 should continue to be used to summarize the proposed studies. Studies were plotted along two axes: Legacy Problems vs. Potential Future Problems and Planning vs. Monitoring, and were proportionally sized based on the proposed budget.
- A straw vote of initial recommendations should be taken before the full discussion to identify key points of agreement and disagreement, and help to focus further discussion.

The meeting was adjourned at 3:30 pm.

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RMP Microplastic Strategy Workshop
June 29, 2016
San Francisco Estuary Institute

Brief Meeting Summary

Microplastic is defined as particles of plastic smaller than 5 mm. Microplastic is a complex form of contamination, with a variety of chemical compositions and sources, pathways for pollution, particle types, and size ranges. Methods for assessing microplastic contamination are evolving rapidly.

Following detection of microparticles in Bay surface water and treated wastewater in 2015, the RMP is developing a multi-year strategy for microplastic monitoring and science in the Bay. This strategy is intended to be useful to the RMP and any other entities conducting further research on microplastic in the region. The RMP hosted a one-day workshop with stakeholders and experts to create the framework for this strategy.

Draft management questions reviewed at the workshop include:

MQ1) How much microplastic pollution is there in the Bay?
- Includes selection or development of analytical methods as well as characterization of multiple matrices

MQ2) What are the health risks?
- Includes risks to wildlife and human health

MQ3) What are the sources, pathways, loadings, and processes leading to microplastic pollution in the Bay?
- In response to workgroup comments, scope will be clarified to include evaluation of fate

MQ4) Have the concentrations of microplastic in the Bay increased or decreased?

MQ5) Which management actions may be effective in reducing microplastic pollution?
- Focuses on source reduction

Nirmela Arsem (EBMUD) provided an update on the BACWA effort to develop a method for assessing microplastic pollution in wastewater treatment plant final effluent. The BACWA microplastic laboratory workgroup found the NOAA method to be insufficient to remove cellulose fibers and grease residue, which interfere with identifying and isolating microplastic particles. Even hexane rise was insufficient to dissolve grease particles completely. They also determined that microplastic cannot be visually identified and spectroscopic analysis is essential for determining whether particles are plastic. Formal method development is recommended.

Anna-Marie Cook (USEPA Region 9) provided an overview of USEPA work to assess and address marine debris and relevant plastic pollution pathways, as well as ongoing efforts to

develop standardized methods for characterizing microplastic contamination in multiple matrices. Notable details of the method for fish tissue, developed in collaboration with the California Department of Public Health, include pulsed ultrasonic extraction of particles from the gut, and the need for spectroscopic verification that particles are indeed plastic polymers. USEPA is committed to releasing these methods as quickly as possible, likely in fall of 2017.

Chelsea Rochman (UC Davis) provided a thorough overview of potential concerns relating to microplastic exposure, framed as issues of food safety (human health impacts) and food security (ecological health impacts that could lead to declines in availability of seafood). She noted concerns relating to physical impacts caused by particles, such as blockages, and recent evidence indicating particles can move outside the gut and into other tissues. Studies suggest potential concerns relating to exposure to plastic monomers or additives. In contrast, evidence is mixed when it comes to exposures based on plastic particle sorption of legacy pollutants from the environment. An earlier review of the state of the science, combined with a few notable recent studies, suggests the potential for population-level impacts, and highlights a number of data gaps.

Sherri "Sam" Mason (SUNY Fredonia) provided an overview of sources, pathways, processes and loadings of microplastic, including considerable novel data. Primary microplastic particles are those manufactured with a size less than 5 mm, such as microbeads in personal care products, while secondary microplastics are those that have broken down into less than 5 mm pieces in the environment. Secondary microplastic is likely to be the biggest contributor to pollution globally. A review of data from wastewater treatment plant effluent samples taken across the United States indicates considerable within-facility variation, suggesting multiple samples are needed to characterize discharge. Combined sewer systems showed greater levels of foam particles during storm events. New data on microplastic in Great Lakes tributaries found higher levels of fibers in the tributaries relative to previous investigations in the Great Lakes. Fibers often have negative buoyancy, and are likely to settle in calmer waters. Greater levels of fragments were correlated with more urbanized tributaries; no statistically significant correlations were found for fibers.

Stephanie Karba (UC Santa Barbara) provided an overview of a recent study focused on one particular source of microplastic, synthetic garments, which shed small plastic fibers during washing. The study, sponsored by outdoor clothing manufacturer Patagonia, involved characterizing the levels of plastic shed from various Patagonia jackets (along with a budget version) during washing. Notable findings include 5x greater shedding for top load versus side load washing machines, 1.8x more shedding for aged jackets relative to new ones, and 1.5x more shedding for the budget jacket relative to the branded version. A calculation suggests that synthetic jackets are responsible for only 4% of the fibers in wastewater, pointing to the need to evaluate other sources.

The afternoon closed with a wide-ranging discussion designed to identify stakeholder priorities essential to developing an overall multi-year monitoring strategy and next steps. Themes included: a) caveats regarding research using evolving methods; b) the complexity of developing a strategy that serves both the RMP and other entities, particularly as it relates to how to fund different potential projects; c) the relative prioritization of monitoring Bay matrices versus pathways, particularly for decisionmaking; d) identification of additional sources of pollution, such as plastic embedded in asphalt and brake pads; e) positioning Bay monitoring work within

the larger context of marine debris and plastic pollution prevention efforts. The consensus that emerged is as follows:

1) Top priority was given to selection of robust methods designed for the matrix under study. When methods are not yet available, for some matrices it may be possible to collect samples and archive them for future analysis.
2) Ambient Bay data is essential for local decision-making. Therefore, next steps include gathering more data in under-researched matrices (sediment, water column, fish, etc).
3) A subsequent goal is to use these data to guide further work on pathways, loadings, and source identification, providing data essential to informing pollution prevention policies.

A draft strategy document including a multi-year plan will be available for review in the fall.

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DATE: July 11, 2016

TO: RMP Steering Committee

FROM: Philip Trowbridge and Lawrence Leung

RE: RMP Financial Update – period ending 6/30/16

The purpose of this memorandum is to provide an update of budgets and expenses for all open RMP budget years and the balances of reserve and designated funds. All of the values presented are current as of 6/30/16.

RMP 2016 BUDGET

Revenue

$3,196,578 of the $3,298,889 in fees have been collected. A few pending invoices totaling $19,576 are waiting to be resolved. The CalTrans ($82,733) invoice will be paid out upon submittal of the 2016 RMP Update Report.

Expenses

44% of the funds have been spent. The current balance of funds is $1,639,315. Figure 1b shows a comparison of expenses to budget by category. For more detailed information on budgets and expenses by line item, please refer to Table 1b. Most tasks are less than 50% expended, which is consistent with the mid-year timeframe. The two tasks that are over budget are being actively managed to complete the deliverables and the cost over-runs will be offset by savings in other tasks. The expenses by labor, subcontractors, and direct costs are:

- Labor: Expended 41% of the labor budget (i.e., $758,313 of $1,843,003)
- Subcontractors: Expended 55% of the subcontractor budget (i.e., $478,879 out of $863,881)
- Direct Costs: Expended 22% of the direct cost budget (i.e., $49,443 out of $219,902)

Unencumbrances this Quarter

None

RMP 2015 BUDGET

Revenue

All of the fees for the 2015 RMP budget have been collected.

Expenses

84% of the funds have been spent. The budget for remaining work to be completed is $437,080. Most of the tasks for this budget have been completed. The tasks that remain active are S&T monitoring for bird eggs (which was delayed from last year), CTR reporting, some multi-year special studies, and a few tasks with outstanding subcontractor billing. A total of $13,853 in left-over science advisor honoraria also remains in Task 2D.

Figure 1a shows a comparison of expenses to budget by category. For more detailed information on budgets and expenses by line item, please refer to Table 1a. The expenses by labor, subcontractors, and direct costs are:

- Labor: Expended 91% of the labor budget (i.e., $2,011,744 of $2,205,533)
- Subcontractors: Expended 73% of the subcontractor budget (i.e., $949,334 out of $1,291,985)
- Direct Costs: Expended 76% of the direct cost budget (i.e., $167,078 out of $220,002)

Unencumbrances this Quarter

None

RMP 2014 BUDGET

Budget lines continue to be open for some tasks from the 2014 RMP budget. The tables in Attachment 1 show the balances and status for labor and subcontractor budgets that have been carried over from prior years. $53,800 of labor, $77,919 of subcontracts, and $18,546 of direct costs remain to be spent from the 2014 budget.

Unencumbrances this Quarter

For the 2014 budget year, only a few tasks remain open. Any remaining surplus funds in this budget will be transferred to the Undesignated Funds Reserve when all the tasks are completely closed (estimated to be December 2016).

RESERVE FUNDS

Dedicated Set-Aside Funds

The RMP has several dedicated set-aside funds. The purpose of these funds is to spread out the cost of large projects across multiple budget years. The current balance of all Set-Aside funds is **$645,164**. The current balance of each set-aside fund is shown on Table 2.

On May 18, 2016, the SC approved a request by email (8 in favor, none opposed) to withdraw $50,000 from Undesignated Funds and to add these funds to a new set-aside fund for a 2016 Water Quality Improvement Fund (WQIF) proposal. The specific request that was approved is:

"Set aside $50,000 of RMP Undesignated Funds for a sediment strategy for the San Francisco Bay-Watershed System and, if EPA decides to fund this task through a WQIF grant, authorize the use of the RMP funds to co-fund the strategy. If the task is not funded by EPA, the $50,000 set-aside will be returned to Undesignated Funds." See Attachment 2 for the approved request and background information.

Dedicated Dredger Reserve Fund

The Dredger Reserve balance through 6/30/16 is **-$228,195 (a deficit)**. Table 3 and Figure 2 show the dredger surplus (deficit) by year.

RMP staff and the Bay Planning Coalition (BPC) have been working together to develop a revised fee schedule for dredgers for 2017-2019 which will avoid revenue shortfalls from this sector. A new fee proposal was presented to the BPC Executive Board on May 18 but no decision was taken. This issue will be discussed in more detail for the decision regarding RMP fees for 2017-2021 (Agenda Item #6).

Undesignated Funds

The RMP has a policy to maintain a reserve of Undesignated Funds of at least $200,000 to allow for response to unanticipated funding needs or revenue shortfalls. Any remaining Undesignated Funds are available for spending at the discretion of the Steering Committee. Figure 3 shows how the balance of Undesignated Funds has changed over time. The current balance of Undesignated Funds through 6/30/16 is **$802,358**. The balance decreased by $50,000 from last quarter due to the decision to set-aside funds for the 2016 WQIF proposal previously mentioned. Table 4 shows the withdrawals and deposits in the Undesignated Funds during the last two budget years.

An action item from the April 19, 2016 SC meeting was to research whether the RMP should have a policy on the *maximum* balance of Undesignated Funds. There is no fiscal precedent for limiting the amount of savings that a Program can have. A potential unintended consequence of such a policy would be to force the Program to spend money on lower priority projects in order for the Undesignated Funds balance to remain under the cap. Therefore, we do not recommend setting a numeric cap on the amount of Undesignated Funds that the Program can have. Instead, we recommend that the SC:

- Transfer Undesignated Funds to Designated Set-Asides when there are specific projects that are known priorities in future years. This practice will to make it easier to know how much of the Reserve is already obligated to known priorities.
- Consider the balance of Undesignated Funds when setting fees for future years.

Supplemental Environmental Project Funds

The Water Board and SFEI entered into an agreement that made the RMP an authorized Supplemental Environmental Project (SEP) funds administrator in October 2015. Therefore, for enforcement actions, parties have the option to direct up to half of the penalty to the RMP as a SEP. The State Water Resources Control Board SEP Policy requires a nexus between the violation and the SEP. There is nexus between the RMP and violations in general because the RMP studies water

bodies that are potentially affected by violations in the San Francisco Bay region. For smaller violations with Mandatory Minimum Penalties (MMP), this general nexus is sufficient and the funds may be assigned to any study. For larger settlements, specific studies with nexus to the violation will need to be identified through the RMP planning process.

The current balance of RMP SEP funds is **$45,000** (see Table 5a).

Descriptions of proposed or approved projects are shown in Table 5b. One project has been proposed as part of a settlement. The project will study PCBs in the San Leandro Bay Priority Margin Unit. The total budget for this project is $132,100. Most of the funding ($82,600) will come from a settlement that is out for public comment until July 15, 2016. The remaining funds will be from MMP funds already received plus $4,500 in MMP funds expected in July 2016.

Alternative Monitoring Requirement Funds

The Water Board adopted Order R2-2016-0018 on March 9, 2016, establishing an alternative monitoring requirement (AMR) for municipal wastewater discharges to San Francisco Bay and its tributaries in exchange for a set schedule of increased payments to the RMP. Participating wastewater treatment facilities who opt-in to this alternative will be able to reduce their effluent monitoring costs for most organic priority pollutants and chronic toxicity sensitive species re-screening. Facilities will also realize cost savings from reduced sampling labor and data management. In exchange for the reduced monitoring requirements, facilities will make supplemental payments to the RMP for regional studies to inform management decisions about water quality in the Bay. The intended use of these funds is for RMP monitoring and special studies for contaminants of emerging concern.

Municipal wastewater agencies will have the option to join this program by September 2016. Rather than include the optional fee with the 2017 normal yearly fees in a joint invoice, AMR invoices were emailed in late May 2016 to give participants the option to pay before the end of the State fiscal year (i.e., 6/30/16). The current balance of RMP AMR funds is **$112,790** (see Table 6). It is expected that at least $200,000 will be received by the end of September.

OVERALL BUDGET SUMMARY

Table 7 provides a summary of RMP budgets, expenses, and reserve funds across all years.

FOR STEERING COMMITTEE APPROVAL

- None this period

Figures

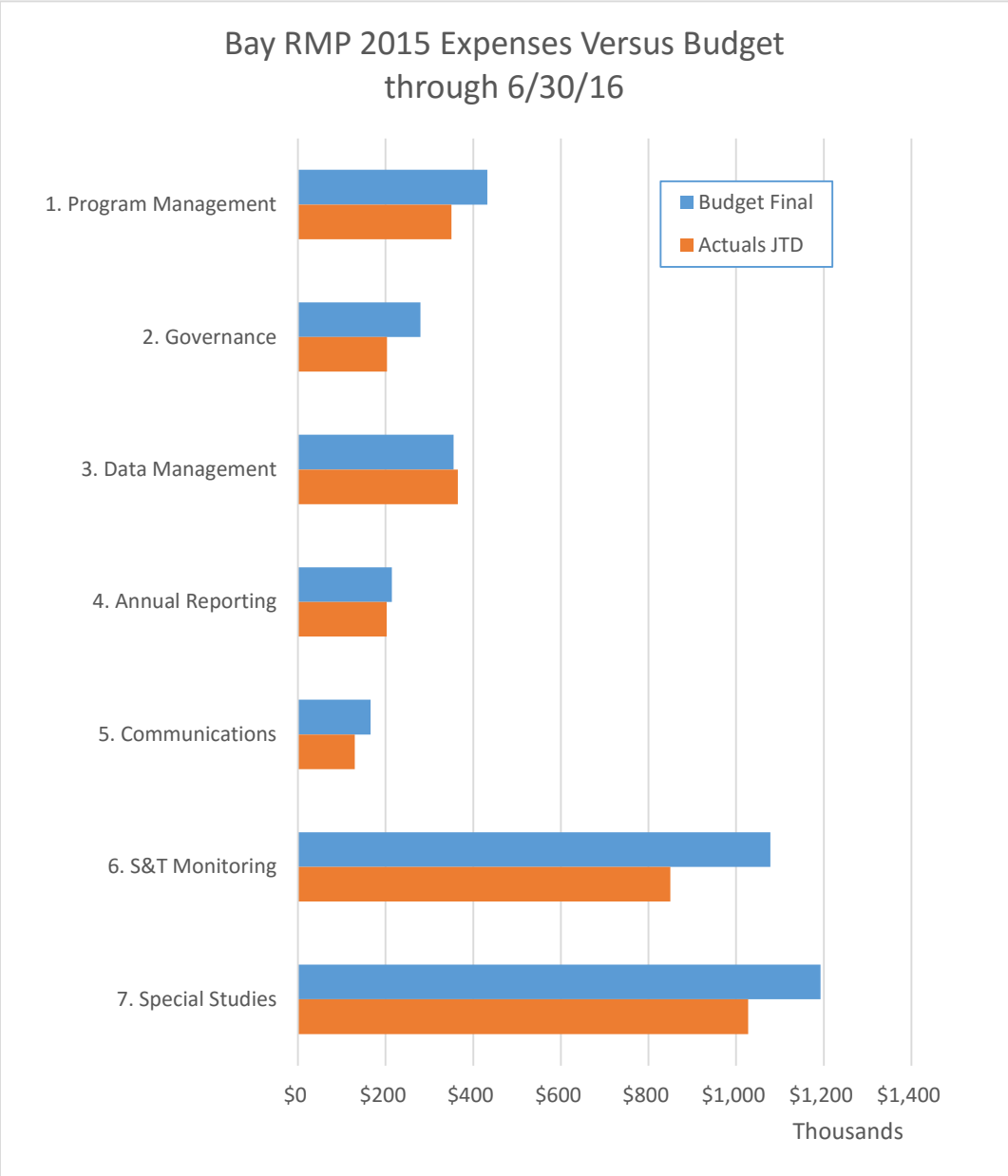

Figure 1a: Bay RMP 2015 Budget. Budget and expenses through 6/30/16 by category.

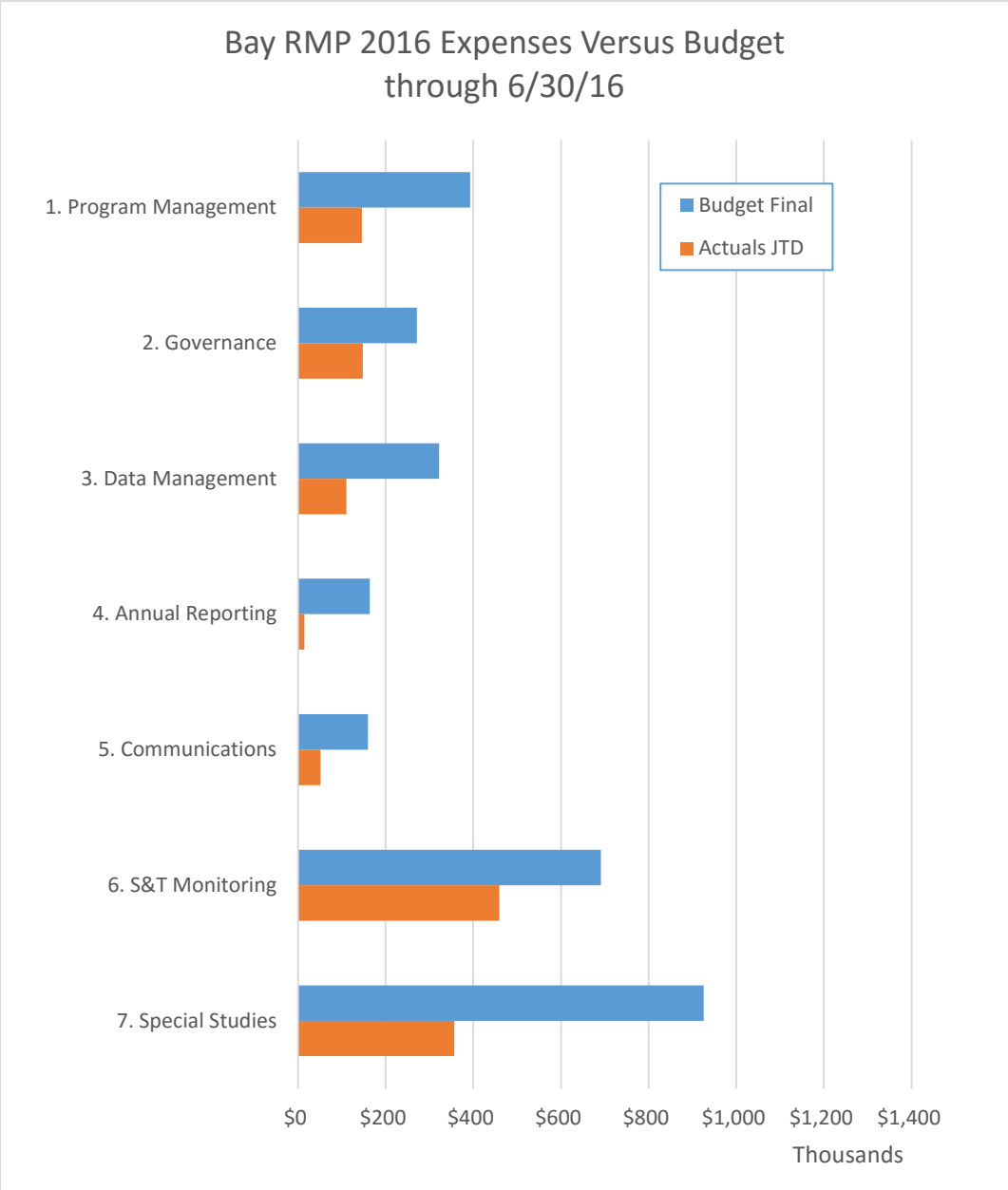

Figure 1b: Bay RMP 2016 Budget. Budget and expenses through 6/30/16 by category.

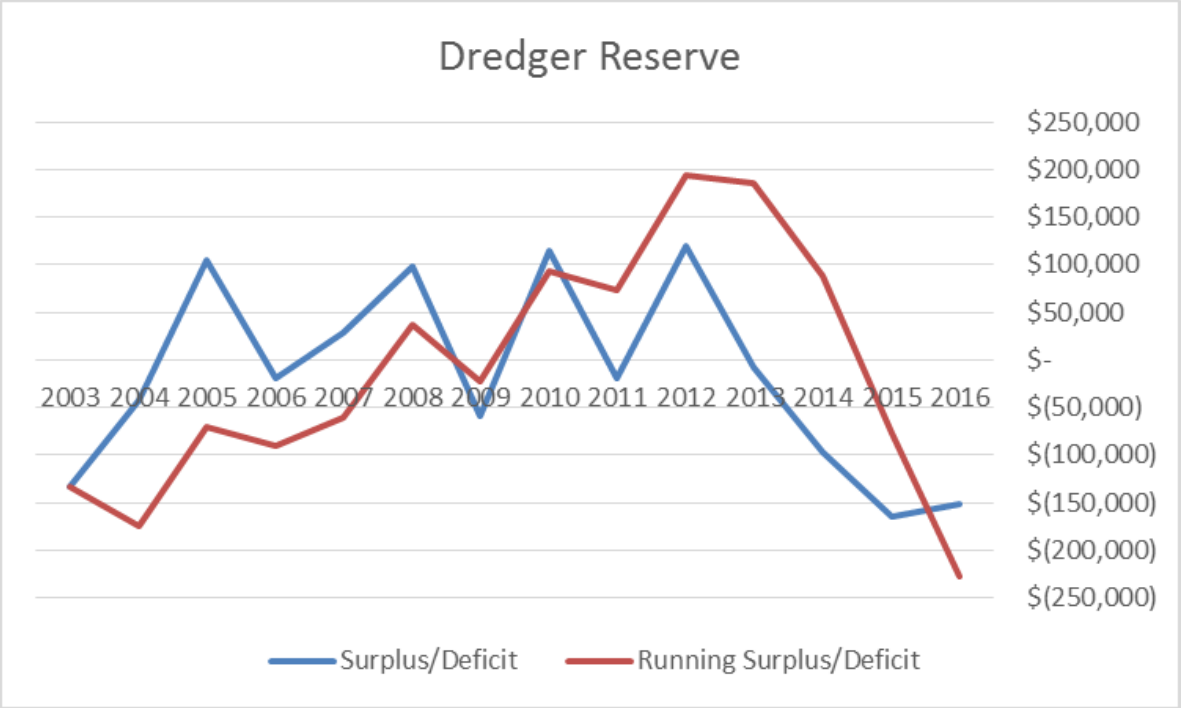

Figure 2: Bay RMP Dedicated Dredger Reserve Fund. Yearly and running surplus (deficit) from 2003 through 6/30/16.

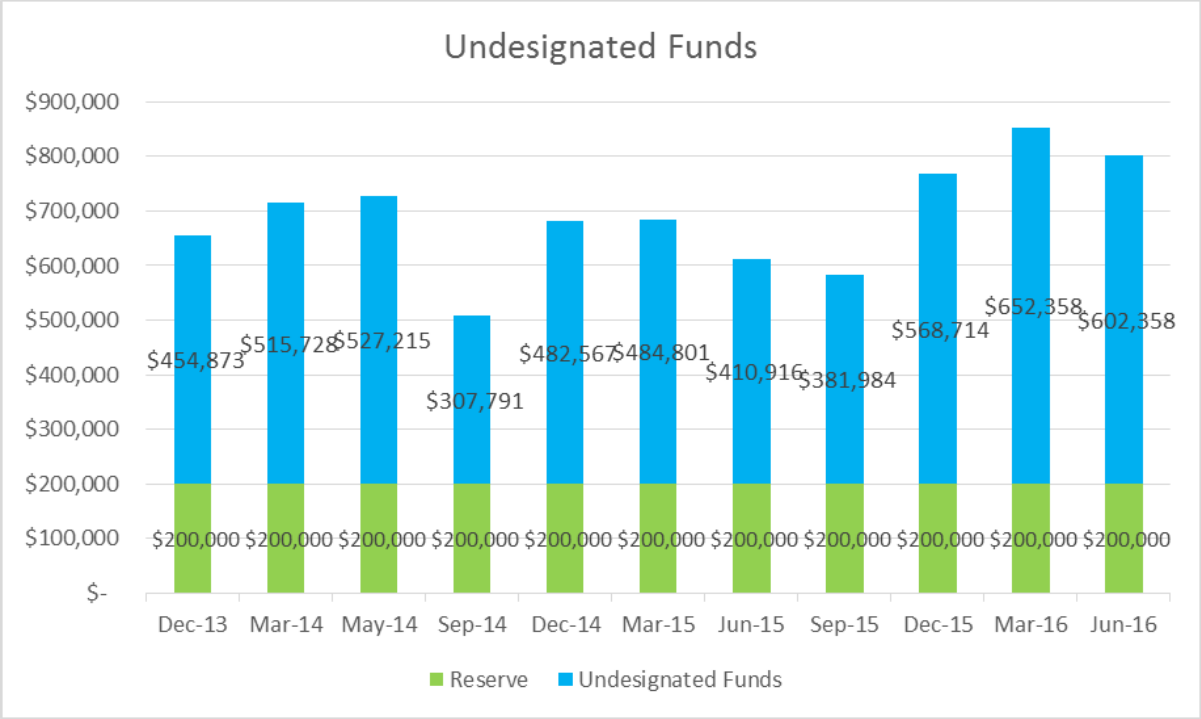

Figure 3: Bay RMP Undesignated Funds. Balance over the past two budget years. The height of the bar shows the total balance of the Undesignated Funds. However, the bar is color coded to indicate the RMP policy that $200,000 of the Undesignated Funds should not be spent.

Tables

Table 1a: Bay RMP 2015 Budget. Budget and expenses through 6/30/16 by line item

Task	Subtask	Budget Approved	Budget Adjustment	Budget Final	Expenses JTD	Percent Spent	Status	Surplus or Deficit
1. Program Management	A. Program Planning	$50,000	$0	$50,000	$24,416	49%		
2. Governance	D. External Science Advisors	$50,000	$0	$50,000	$36,147	72%		
3. Data Management	C. Quality Assurance System	$25,000	$0	$25,000	$26,316	105%	Closed	-$1,316
5. Communications	A. Communications Plan Implementation	$22,000	$0	$22,000	$17,255	78%	Closed	$4,745
6. S&T Monitoring	A. Field Work and Logistics	$175,000	$0	$175,000	$141,285	81%		
	D. Water Chemistry Monitoring	$45,000	$0	$45,000	$32,572	72%		
	F. Bird Egg Monitoring	$150,000	$0	$150,000	$18,939	13%		
	G. Sample Archive	$18,000	$0	$18,000	$13,855	77%	Closed	$4,145
	I. Bay Margins Sediment Study	$120,000	$86,370	$206,370	$159,822	77%		
	J. Analysis of S&T Impacts, Changes, and Data	$15,000	$0	$15,000	$14,010	93%	Closed	$990
	K. California Toxics Rule Monitoring	$0	$26,000	$26,000	$25,285	97%		
7. Special Studies	Nutrient Modeling Program Development	$165,000	$0	$165,000	$125,402	76%		
	Nutrient Moored Sensor Program Development	$190,000	$0	$190,000	$190,200	100%	Closed	-$200
	Nutrients High-Frequency Mapping Study	$115,000	$0	$115,000	$43,355	38%		
	PCB: PMU Conceptual Model	$85,000	$0	$85,000	$84,041	99%		
	Selenium Delta Fish Derby Monitoring	$20,000	$8,950	$28,950	$26,119	90%		
	Selenium Sturgeon Tissue Plug Monitoring	$23,000	$12,000	$35,000	$13,854	40%		
	STLS Regional Watershed Model	$35,000	$0	$35,000	$34,927	100%	Closed	$73
	STLS Strategy Coordination	$26,000	$0	$26,000	$26,326	101%	Closed	-$326
	STLS Trends Strategy	$35,000	$0	$35,000	$32,411	93%		
	STLS Wet Weather Characterization	$374,000	$0	$374,000	$347,727	93%		
Total for Remaining Tasks		$1,738,000	$133,320	$1,871,320	$1,434,264	77%		$8,111
Total for Previously Unencumbered Tasks		$1,886,700	-$40,500	$1,846,200	$1,693,894			$152,306
GRAND TOTAL		$3,624,700	$92,820	$3,717,520	$3,128,158			$160,417

Table 1b: Bay RMP 2016 Budget. Budget and expenses through 6/30/16 by line item

Task	Subtask	Budget Approved	Budget Adjustment	Budget Final	Expenses JTD	Percent Spent
1. Program Management	A. Program Planning	$40,000	$0	$40,000	$9,683	24%
	B. Contract and Financial Management	$164,000	$0	$164,000	$68,476	42%
	C. Technical Oversight	$50,000	$0	$50,000	$20,009	40%
	D. Internal Coordination	$75,000	$0	$75,000	$32,414	43%
	E. External Coordination	$50,000	$0	$50,000	$12,672	25%
	F. Administration	$14,000	$0	$14,000	$2,704	19%
1. Program Management Total		$393,000	$0	$393,000	$145,958	37%
2. Governance	A. SC meetings	$57,000	$0	$57,000	$21,216	37%
	B. TRC meetings	$60,000	$0	$60,000	$23,078	38%
	C. WG meetings	$94,500	$0	$94,500	$93,885	99%
	D. External Science Advisors	$60,000	$0	$60,000	$9,931	17%
2. Governance Total		$271,500	$0	$271,500	$148,110	55%
3. Data Management	A. Data Mgmt for 2015 S&T Water Samples	$25,000	$0	$25,000	$26,181	105%
	B. Data Mgmt for 2016 S&T Bird Egg Samples	$60,000	$0	$60,000	$7,067	12%
	C. Data Mgmt for 2016 S&T Bivalve Samples	$30,000	$0	$30,000	$205	1%
	D. Database Maintenance	$50,000	$0	$50,000	$19,285	39%
	E. Online Data Access: CD3	$65,000	$0	$65,000	$19,153	29%
	F. Online Data Access: Archive Sample Tool	$11,000	$0	$11,000	$3,831	35%
	G. Quality Assurance System	$40,000	$10,990	$50,990	$22,868	45%
	H. Updates to SOPs and Templates	$30,000	$0	$30,000	$11,547	38%
3. Data Management Total		$311,000	$10,990	$321,990	$110,137	34%
4. Annual Reporting	A. RMP Update Report	$85,000	$0	$85,000	$11,769	14%
	B. Annual Meeting	$69,000	$0	$69,000	$2,768	4%
	C. Annual Monitoring Report	$10,000	$0	$10,000	$225	2%
4. Annual Reporting Total		$164,000	$0	$164,000	$14,762	9%
5. Communications	A. Communications Plan Implementation	$35,000	$0	$35,000	$15,045	43%
	B. Stakeholder Engagement	$25,000	$0	$25,000	$11,313	45%
	C. Responses to Information Requests	$20,000	$0	$20,000	$5,355	27%
	D. Fact Sheets and Outreach Products	$14,500	$0	$14,500	$1,058	7%
	E. Presentations at Conferences and Meetings	$50,000	$0	$50,000	$11,132	22%
	G. RMP Website Maintenance	$15,000	$0	$15,000	$7,578	51%
5. Communications Total		$159,500	$0	$159,500	$51,482	32%

Table 1b (cont.)

Task	Subtask	Budget Approved	Budget Adjustment	Budget Final	Expenses JTD	Percent Spent
6. S&T Monitoring	A. Field Work and Logistics	$132,000	$0	$132,000	$1,791	1%
	B. USGS Sacramento Support	$250,000	$0	$250,000	$250,000	100%
	C. USGS Menlo Park Support	$192,000	$0	$192,000	$192,000	100%
	D. El Nino Nutrient Monitoring	$31,000	$0	$31,000	$0	0%
	E. Bivalve Monitoring	$14,000	$0	$14,000	$0	0%
	G. Sample Archive	$25,000	$0	$25,000	$12,263	49%
	I. Bay Margins Sediment Study	$31,100	$0	$31,100	$91	0%
	J. Analysis of S&T Data	$16,000	$0	$16,000	$3,083	19%
6. S&T Monitoring Total		$691,100	$0	$691,100	$459,228	66%
7. Special Studies	EC Fipronil Data Management	$6,000	$0	$6,000	$5,282	88%
	EC Fipronil Report	$24,000	$0	$24,000	$22,849	95%
	EC Microplastics Strategy	$0	$25,000	$25,000	$13,007	52%
	EC Non-Targeted Analysis	$52,000	$0	$52,000	$13,425	26%
	EC Strategy Support	$33,000	$0	$33,000	$11,914	36%
	EC Strategy Update	$15,000	$0	$15,000	$667	4%
	EE Sediment Toxicity Study	$30,000	$0	$30,000	$0	0%
	El Nino Monitoring: Golden Gate Sediment Flux Field Work	$0	$32,696	$32,696	$0	0%
	El Nino Monitoring: QAPP development	$0	$10,000	$10,000	$7,141	71%
	Nutrient Monitoring Program Development	$0	$20,000	$20,000	$324	2%
	Nutrient Moored Sensor Monitoring	$150,000	($120,000)	$30,000	$30,341	101%
	Nutrient Program Unallocated	$0	$50,000	$50,000	($115)	0%
	Nutrients Margins DO Monitoring	$150,000	$50,000	$200,000	$144,127	72%
	PCB: PMU Conceptual Model	$40,000	$0	$40,000	$9,369	23%
	Selenium 2016 Derby Monitoring - Data Management	$9,600	$0	$9,600	$658	7%
	Selenium 2016 Derby Monitoring - Field Work	$18,425	$0	$18,425	$15,689	85%
	Selenium 2016 Derby Monitoring - Planning	$2,500	$0	$2,500	$2,126	85%
	Selenium 2016 Derby Monitoring - Reporting	$6,475	$0	$6,475	$197	3%
	Selenium Strategy Support	$10,000	$0	$10,000	$5,245	52%
	STLS Regional Watershed Model	$35,000	$0	$35,000	$17,758	51%
	STLS Strategy Coordination	$26,000	$0	$26,000	$8,154	31%
	STLS Trends Strategy	$99,565	$0	$99,565	$34,125	34%
	STLS Wet Weather Characterization: Data Management	$42,400	$0	$42,400	$12,348	29%
	STLS Wet Weather Characterization: Field Work	$15,000	$0	$15,000	$216	1%
	STLS Wet Weather Characterization: Labs and Subs	$28,620	$0	$28,620	$0	0%
	STLS Wet Weather Characterization: Project Management	$24,415	$0	$24,415	$2,112	9%
	STLS Wet Weather Characterization: Reporting	$40,000	$0	$40,000	$0	0%
7. Special Studies Total		$858,000	$67,696	$925,696	$356,959	39%
Grand Total		$2,848,100	$78,686	$2,926,786	$1,286,635	44%

Table 2: Bay RMP Dedicated Set-Aside Funds. Balances as of 6/30/16.

Reserve Type	Purpose	Balance
Dedicated Set-Aside Fund	Program Review	$88,179
Dedicated Set-Aside Fund	S&T Monitoring	$467,975
Dedicated Set-Aside Fund	Monitoring Contingency	$39,010
Dedicated Set-Aside Fund	2016 WQIF Proposal	$50,000
	TOTAL	**$645,164**

Table 3: Bay RMP Dedicated Dredger Reserve Fund. Yearly surplus (deficit) and total surplus (deficit) as of 6/30/16.

Dredger Reserve	
Year	Surplus/Deficit
2016	$ (151,252)
2015	$ (164,777)
2014	$ (97,614)
2013	$ (8,359)
2012	$ 120,214
2011	$ (19,480)
2010	$ 115,342
2009	$ (59,576)
2008	$ 97,815
2007	$ 29,542
2006	$ (19,324)
2005	$ 104,520
2004	$ (42,352)
2003	$ (132,894)
TOTAL	**$ (228,195)**

Table 4: Bay RMP Undesignated Funds. Withdrawals and Deposits during the last two budget years and total balance as of 6/30/16.

Budget Year	Deposit or Withdrawal	Authorization	Date of Authorization	Amount	Comment
2012	Deposit			$289,073	End of year close-out balance
2013	Withdrawal			-$1,086	End of year close-out balance
2015	Withdrawal	Steering Committee	7/15/2014	-$134,000	Funding for 2015 Special Studies. Approved to put this amount into the 2015 budget from Reserve.
2015	Withdrawal	Steering Committee	11/13/2014	-$76,941	Funds to cover shortfall in Dredger revenue
2015	Withdrawal	Steering Committee	1/15/2015	-$8,950	Funds for sturgeon fin ray analyses for selenium. Approved by email. Partially offset by $6000 of unused 2014 funds for the sturgeon plug sampling returned to Undesignated Funds on 12/31/14.
2015	Withdrawal	Steering Committee	4/21/2015	-$86,370	Funds for 2015 Bay Margins Sediment Study. This amount will be returned to Undesignated Funds from the 2016 budget for the Bay Margins Sediment Study.
2015	Withdrawal	Steering Committee	7/21/2015	-$26,000	Funds for 2015 California Toxics Rule (CTR) Monitoring
2015	Withdrawal	Steering Committee	7/21/2015	-$12,000	Funds for 2015 Sturgeon Muscle Plug Study
2015	Deposit			$11,309	Treasure Island funds (WY2010 & 2011)
2015	Deposit			$152,307	Released funds from the 2015 budget per 4/19/16 Budget Memo to the SC.
2016	Deposit	Steering Committee	11/10/2015	$100,000	From 2016 RMP Workplan and Budget approved on 11/10/15. Additional funds from program management cost savings. Put aside for future special studies.
2016	Deposit	Steering Committee	11/10/2015	$86,730	From 2016 RMP Workplan and Budget approved on 11/10/15. Repayment for Undesignated Reserve Funds used for the Bay Margins Sediment Study in 2015.

2016	Withdrawal	Steering Committee	1/19/2016	-$39,330	Funds for Guadalupe River Mercury Study. Approved by SC on 1/19/16.
2016	Withdrawal	Steering Committee	1/19/2016	-$88,000	Funds for USGS Golden Gate Sediment Flux Study. Approved by SC on 1/19/16.
2016	Withdrawal	Steering Committee	1/19/2016	-$62,000	Funds for USGS Lower South Bay Sediment Flux Study. Approved by SC on 1/19/16.
2016	Withdrawal	Steering Committee	1/19/2016	-$25,000	Funds for Microplastics Strategy. Approved by SC on 1/19/16.
2016	Deposit			$146,634	From 2016 El Nino Monitoring Projects. Fund unencumbered due to receiving SFEP funds. Described in 4/19/16 Budget Memo to SC.
2016	Withdrawal	Steering Committee	5/13/2016	-$50,000	Transfer of funds from Undesignated Funds to Set-Aside for 2016 WQIF proposal for a sediment strategy. Approved by SC by email.
TOTAL				**$802,358**	**Total UF Balance**

Table 5a: Bay RMP Supplemental Environmental Project (SEP) Funds. Penalty funds received since RMP was authorized as a SEP on 10/27/15.

Complaint Order Number	Complaint Regulatory Measure Number	Amount Received	Date Received	Type	Project Assignment	Amount Spent
R2-2015-1027	403112	$21,000	2/9/2016	MMP	San Leandro Bay PCB, Phase I	$0
R2-2016-1002	403128	$4,500	3/11/2016	MMP	San Leandro Bay PCB, Phase I	$0
R2-2016-1004	403976	$1,500	4/18/2016	MMP	San Leandro Bay PCB, Phase I	$0
R2-2016-0007	404910	$1,500	5/11/2016	MMP	San Leandro Bay PCB, Phase I	$0
R2-2016-0005	404694	$7,500	5/20/2016	MMP	San Leandro Bay PCB, Phase I	$0
R2-2016-1009	404575	$1,500	6/6/2016	MMP	San Leandro Bay PCB, Phase I	$0
R2-2016-1010	404730	$7,500	6/17/2016	MMP	San Leandro Bay PCB, Phase I	$0
Total Received		**$45,000**				**$0**
Expected		$4,500		MMP	San Leandro Bay PCB, Phase I	
Expected		$82,600		Settlement	San Leandro Bay PCB, Phase I	
Total Received and Expected		**$132,100**				

Table 5b: Bay RMP Supplemental Environmental Project Descriptions

Study Name	Budget	Description	Status
San Leandro Bay Priority Margin Unit Study, Phase 1	$132,100[1]	The goal of the study is to assemble and collect PCB related information on water quality in San Leandro Bay, which has been identified as an area on the Bay margin that is a high priority for water quality management. The study will assemble existing information into a conceptual model of PCB dynamics in San Leandro Bay, and conduct field studies as allowed by the study budget to address critical information needs related to conceptual model development.	Pending approved settlement by Water Board

1 - Most of the funding ($82,600) will come from a settlement that is out for public comment until 7/15/16. The remaining funds will be from MMP funds already received plus $4,500 in MMP funds expected in July 2016

Table 6: Bay RMP Alternative Monitoring Requirement Funds. Balance as of 6/30/16.

RMP Budget Year	Fund	Amount Received	Project Assignments	Amount Spent
2017	AMR	$112,790	TBD	$0

Table 7: Steering Committee RMP Budget Summary
as of 6/30/16

Budget and Current Expenses

Year	Budget Item	Budget $	Expended $	Work to be Completed $	Expended %	Funds to be Expended by
2016	Labor	1,843,003	758,313	1,084,690	41%	6/30/2017
	Subcontracts	863,881	478,879	385,002	55%	6/30/2017
	Direct Costs	219,902	49,443	170,459	22%	6/30/2017
	Total	**2,926,786**	**1,286,635**	**1,640,151**	**44%**	**6/30/2017**
2015	Labor	2,205,533	2,011,744	64,900	91%	12/31/2016
	Subcontracts	1,291,985	949,334	309,229	73%	12/31/2016
	Direct Costs	220,002	167,078	62,951	76%	12/31/2016
	Total	**3,717,520**	**3,128,156**	**437,080**	**84%**	**12/31/2016**
2014	Labor	2,093,743	2,012,690	53,800	96%	9/30/2016
	Subcontracts	1,856,397	1,645,697	77,919	89%	3/15/2017
	Direct Costs	310,806	234,497	18,546	75%	12/31/2016
	Total	**4,260,946**	**3,892,885**	**150,265**	**91%**	**3/15/2017**
	2014-2016 Grand Total	**10,905,252**	**8,307,675**	**2,227,496**	**76%**	**6/30/2017**

Cash, Set-Asides, and Undesignated Funds as of reporting date

	Item	$	Notes
	Cash on Hand	5,208,375	
	A/R & Interest (see below)	106,795	
	Total Assets	**5,315,170**	
	Total Current Liabilities (figures above)	(3,867,648)	
Set- Asides	'16 Status & Trends	(250,000)	
	'13-'14 Water Chemistry	(110,700)	
	2005-2009 Program Review	(88,179)	TBD; previously $125K, $37K approved withdrawal 5/6/14
	'13-14 Tern Monitoring	(50,625)	TBD
	2016 WQIF Proposal	(50,000)	TBD
	Monitoring Contingency	(39,010)	TBD
	2013 Sediment Benthos	(30,900)	TBD
	2013 Sediment Toxicity	(25,750)	TBD
	Total Liabilities	**(4,512,812)**	
	Undesignated Funds	**802,358**	RMP SC has set a policy to maintain a minimum balance of $200K of Undesignated Funds

Year	Accounts Receivables & Interest:	Amount	Anticipated Collections by	Notes
2016	Caltrans	82,733	12/31/2016	Ok; upon submittal of Pulse
	Rhodia	16,742		Check issued to WB, refunded, no followup check nor response
	BP West Coast Products	2,834		No response
	Interest	4,486	12/31/2016	

Attachment 1 **Carryover Labor from Prior Year RMP Budgets: Budgets, Balances, and Expected Completion Date**

2014 RMP

Task	Budget	Remaining	Work to be Completed	Date to be Completed	Unencu-mbered	Rationale
2. INFORMATION MANAGEMENT & SYNTHESIS						
3. STATUS & TRENDS MONITORING						
3.3 Sportfish	$43,400	$15,227	$15,227	9/30/16	$0	This is a multi-year study so the task must be kept open until complete.
4. SPECIAL STUDIES						
4.1 EC: Alternative Flame Retardants	$39,437	$4,739	$4,739	9/30/16	$0	This is a multi-year study so the task must be kept open until complete.
4.12 Nutrients: Monitoring Program Development	$41,200	$30,067	$30,067	9/30/16	$0	Deadline extended to 9/30/16.
4.15 Nutrients: Modeling	$146,804	-$260	$0	6/30/16	$0	This task is closed for labor. The funds will be unencumbered when the other remaining tasks are closed.
4.17 Dioxin: Sportfish Monitoring	$4,000	$3,767	$3,767	9/30/16	$0	This is a multi-year study so the task must be kept open until complete Dioxin results will be reported with the sportfish report.
TOTAL	**$274,841**	**$53,540**	**$53,800**	**9/30/16**	**$0**	

Attachment 1

Carryover Subcontracts from Prior Year RMP Budgets: Budgets, Balances, and Status

Project Year	Cont #	Contractor	Project Title	Amount	Billed	Work to be Completed	Unencu-mbered	Project Mgr	Start Date	Expire Date	Type of Agency	Contract Status
2014	1073	USGS	PSSS Benthic Recovery Study	$ 150,000.00	$ 115,122.46	$ 34,877.54		Phil Trowbridge	3/31/2014	3/15/2017	Federal	Signed
2014	1086	SJSURF	S&T Sport Fish	$ 92,062.00	$ 87,996.00	$ -		Phil Trowbridge	4/1/2014	2/28/2016	University	Closed
2014	1091	Deltares	PSSS Modeling	$ 100,000.00	$ 78,454.08	$ 21,545.92		Phil Trowbridge	10/1/2014	12/31/2016	Private	Signed
2014	1099	AXYS	S&T Sport Fish	$ 10,630.15	$ 8,716.44	$ -		Phil Trowbridge	8/1/2014	2/28/2016	Private	Closed
2014	1100	UF	PSSS Bioanalytical Tools	$ 26,000.00	$ 25,960.28	$ 39.72		Phil Trowbridge	7/1/2014	6/30/2016	University	Signed
2014	1101	SCCWRP	PSSS Bioanalytical Tools	$ 30,000.00	$ 30,000.00	$ -		Phil Trowbridge	7/1/2014	6/30/2016	JPA	Closed
2014	1195	UCSD	PSSS Modeling	$ 50,000.00	$ 28,544.20	$ 21,455.80		Phil Trowbridge	2/1/2015	8/30/2016	University	Signed
			TOTAL	**$ 458,692**	**$ 374,793**	**$ 77,918.98**	**$ -**			**3/15/2017**		

Attachment 2

SFEI AQUATIC SCIENCE CENTER
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DATE: May 13, 2016

TO: RMP Steering Committee

FROM: Philip Trowbridge, RMP Manager

RE: Request to Set-Aside RMP Funds for a WQIF Proposal to Develop a Sediment Monitoring Strategy

REQUESTED ACTION

Set aside $50,000 of RMP Undesignated Funds for a sediment strategy for the San Francisco Bay-Watershed System and, if EPA decides to fund this task through a WQIF grant, authorize the use of the RMP funds to co-fund the strategy. If the task is not funded by EPA, the $50,000 set-aside will be returned to Undesignated Funds.

FISCAL SITUATION

Undesignated Funds Balance: $852,358 (as of 5/9/16)

EXPLANATION

SFEP, SFEI, and other partners are submitting a proposal to EPA for a Water Quality Improvement Fund (WQIF) grant. In broad terms, the proposed project would fill in critical data gaps needed to improve sediment management that supports baylands resilience. One critical task of the project is developing a sediment strategy for the San Francisco Bay-watershed system (see attached task description).

Over the past six months, the Steering Committee and TRC have discussed the need to reconsider the RMP strategy for sediment monitoring. The SFEP-SFEI proposal is a good opportunity to achieve this goal with significant leveraging of federal funds. The total budget for the task is $300,000. The proposal requests $250,000 from the EPA. RMP would contribute $50,000 for a 5:1 leveraging of federal dollars for the task (there will be overmatch from other implementation tasks to make up the difference). With RMP funds, the scope of strategy will be expanded from sediment management to also include development of a sediment monitoring strategy.

The Water Board, BCDC, and San Francisco Bay Joint Venture have already signed on as partners for the SFEP-SFEI proposal. If funded, the work will be an important regional effort. Providing funds will give the RMP some control over the process and ensure that the final deliverables meet the needs of the RMP. Moreover, a vetted sediment monitoring strategy would be an important product for the dredging community and may be useful for attracting additional participants to the RMP.

If funded, the TRC will be engaged to provide guidance on the details of the scope of work.

The proposal must be submitted by May 27, 2016. Therefore, I am requesting Steering Committee members reply by email with their vote on this request by May 18, 2016.

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Task Description

Sediment strategy to inform decision-making for the resilience of San Francisco Bay wetlands and water quality

Draft text for EPA WQIF 2016 Proposal task 4 (will be summarized for actual proposal)

Sections relevant to the RMP shown in yellow

Proposed project team and partners: SFEP, SFEI, BCDC, SFBJV, RB2

The recently completed Science Update to the Baylands Ecosystem Habitat Goals emphasizes the importance of sufficient sediment supply to ensure the resilience of tidal marshes and other baylands (or tidal wetland) in the face of sea level rise. In addition, the Nutrient Management Strategy for San Francisco Bay highlights the importance of suspended sediment in the Bay for controlling algal blooms. Currently, sediment from many Bay Area watersheds is prevented from reaching the Bay due to accumulation in water supply reservoirs and flood control channels. With the rate of sea level rise predicted to increase over the coming 30 years and sediment supply to the Bay from the Central Valley on the decline, sediment is now a precious resource that needs to be understood and managed to achieve the most positive outcomes for beneficial uses. To achieve such a goal, sediment science needs to be integrated for the first time across the watershed, baylands, and bay components of the system, taking into account particular scenarios of sea level rise, baylands restoration, and management choices in the baylands and watersheds.

Much of the science foundation for this synthesis comes from the work of USGS, BCDC, USACE, RMP, and others. In particular, recent efforts by the USACE to determine sediment placement strategies that support tidal marsh resilience (the USACE Strategic Placement Project) will help determine the best restoration uses for available sediment. However, there is no synthetic understanding of current and potential future sediment supply and demand across all the elements of this system that can help prioritize and guide management of sediment for resilience of beneficial uses, including wetlands restoration and Bay water quality. Under historical rates of sea level rise, the strategy of restoring available lands as quickly as possible was appropriate, no matter the amount of sediment required and absent consideration of the long-term sustainability of the restored baylands. This approach will likely no longer be ideal as sea level rise accelerates and existing baylands are jeopardized. More work is needed to bring in an understanding of landscape context and long-term sediment supply when developing bayland restoration priorities.

A science-based strategy to inform decision-making for the long-term management of sediment in watersheds, the baylands, and the Bay is lacking. We don't know how much sediment it will take to maintain current tidal marshes or restore and maintain areas slated to become tidal marsh. We also don't know how changes related to sea level rise, restoration and watershed management will affect water clarity and the physical Bay system in general. We do not yet have the science to integrate sediment demand, given sea level rise, for the subtidal bay, tidal

marshes, mudflats, and areas to be restored to tidal action. In addition, we are lacking an understanding of current and projected future sediment supply that includes the in-bay and watershed sediment sources laid out in the Science Update to the Baylands Ecosystem Habitat Goals. Addressing these unknowns is already a high priority for Bay sediment managers. BCDC recently convened a 2-day workshop for scientists and managers to create a prioritized list of the main Bay sediment management questions and begin development of a regional research strategy that would lay out a process for the studies and actions necessary to address these questions.

To fill critical information gaps and begin addressing key management questions, we propose to develop a strategy that will inform decision-makers about options and tradeoffs for managing and monitoring sediment to increase the resilience of tidal wetlands and bay water quality (or *Sediment Strategy*). The *Sediment Strategy* will start with a sediment supply and demand assessment for the baylands and Bay under different scenarios of climate change (i.e., sea level rise and increased storm magnitude), marsh restoration, and watershed management (see below for details). To develop the sediment supply assessment, we will convene an initial workshop of sediment experts to synthesize the best available science and provide "bounded estimates" for key sediment supply and demand values. The sediment science will come from many recent efforts, including the 2013 special issue of the scientific journal *Marine Geology* (a compilation of 21 manuscripts on many aspects of Bay sediment science) and the outcomes of the 2015 BCDC Sediment Science Workshop. The workshop proposed here will address sediment sources, transport, and fate, and approaches to watershed management that could increase sediment transport to the baylands while protecting other beneficial uses, particularly the health of stream habitats for aquatic organisms that might be affected by increased fluxes of fine sediment and any attached chemical contaminants (e.g., nutrients and pesticides). The workshop will also address the state-of-the-science regarding projected sea level rise rates in the Bay over the next century, anticipated changes in storm magnitude, and associated changes in projected sediment supply from the Delta and local watersheds.

Once these science products are complete, they will be used to create:

- a resilience map of the 20 baylands segments, indicating the relative sustainability of marshes and mudflats over the next 50-100 years.
- options and trade-offs related to management and use of sediment for the long term sustainability of existing and restored baylands.
- guidance on regional monitoring strategies for sediment in watersheds, baylands and Bay, including related to inundation regimes and accretion rates in tidal marshes and mudflats.
- a prioritized list of information gaps and required research, associated with a monitoring approach (as appropriate), for the highest priority items.

These products would be vetted with the expert group in a second workshop and revised based on that input.

Overall, the *Sediment Strategy* will help guide regional thinking on where, when and how to improve management techniques and use natural processes ("work with nature") to use the finite supply of sediment for maximum benefits. This means having more sediment end up where it is needed and having less sediment causing problems by getting stuck in the wrong places. This

strategy will help us understand how certain types of sediment supply can be used, such as sediment trapped in reservoirs and flood control channels, excavated upland sediments, and dredged material. This understanding will help guide investment in monitoring, assessing, and managing these resources. There will probably be tradeoffs between using sediment for restoration versus using it to maintain the elevation of existing broad marsh plains. We will gain an understanding of possible risk associated with stretching our sediment resources too thinly across too many activities such that there is not enough material to maintain tidal marshes of significant size over the long term. The integrated approach will also help inform trade-off decisions regarding the costs and benefits of mobilizing fine sediment and any associated chemical contaminants for transport to the baylands. Decisions associated with such trade-offs need to be made thoughtfully, using science, and well ahead of time, given the time it takes these ecosystems to evolve. Creating a *Sediment Strategy* now is critical to increase the long-term sustainability of bay wetlands and water quality by thoughtfully changing sediment source and demand management in particular places, at particular times, for particular types of projects and having a robust monitoring program for adaptive management.

Elements of the *Sediment Strategy* task:

1. Develop a sediment supply and demand, fate and transport, and management synthesis vetted by Bay and watershed sediment experts, which would include:
    a. Building upon previous work, a regional sediment supply analysis will be completed that includes all significant actual and potential sources of coarse and fine sediment supply, including from dredging, excavation, Delta inputs, local watersheds, and sediment that exits via the Golden Gate that could be trapped in the Bay. An estimate will be made of the "erodible pool" of sediment held in mudflats and shallows. Local watershed sources will be estimated, including sediment sources trapped behind reservoirs, in flood-control channels, and in other engineered waterways. Changes in both Delta and local watershed sediment supply due to climate change impacts on precipitation patterns will be incorporated into the analysis.
    b. An estimate of sediment demand by shoreline segment based on sea level rise and restoration scenarios that includes best available science on demand created by mudflats, managed ponds, and the subtidal bay as well as by tidal marshes.
    c. A brief science summary of the transport and fate of each sediment source to understand the location, volume and timing of sediment delivery to the Bay and baylands.
    d. A brief science summary of how management of sediment sources and pathways could be altered to increase sediment supply to the baylands without harming stream health or other beneficial uses (this addresses a priority research question identified during the BCDC Sediment Science Workshop: How can we design channels to help convey sediment from the watersheds to floodplains, marshes and mudflats rather than directly into the Bay?).
    e. A brief summary of ongoing sediment monitoring in Bay Area watersheds, baylands, and the Bay and identification of information gaps and opportunities for better coordination. This synthesis will be guided by a broad set of management questions including:

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i. What are the regional budgets for sediment in watersheds, baylands segments, and sub-embayments and how have they changed over time?
ii. What are the fluxes of chemical contaminants due to the movement of fine sediment?
iii. How is suspended sediment concentration expected to change in the future?

2. Using the sediment analyses (supply, demand, fate and transport) and management synthesis above:
    a. Identify how to manage particular sediment sources in order to keep particular baylands segments resilient over time.
    b. Identify shoreline segments that are unlikely to maintain current or future restored marshes and mudflats under any feasible sediment management strategy.
    c. Create a prioritization map that identifies relative resilience of baylands in the different Baylands Goals segments. Information developed in Task 1a –b and Task 2 a-b will be visualized on the map to help guide restoration. This map will help bring together regional thinking on what to restore where and in what order. (This addresses a priority research question identified during the BCDC Sediment Science Workshop: Are there particular types of shoreline and parts of the Bay that are most at risk from erosion and sea level rise?). The map will be vetted by the science experts in the second workshop.
    d. Create a *Sediment Strategy* that will inform decision-making around how to maximize the long-term resilience of tidal marshes, mudflats, and managed ponds. The strategy will also consider how future change will affect Bay suspended sediment concentrations. The strategy will include guidelines and best practices stemming from the science products above and will identify key information that should be collected to develop site-specific strategies and monitor long-term strategy effectiveness (e.g., marsh accretion rates). To the extent possible, the strategy will also include a discussion of the other factors that need to be considered when developing site-specific sediment strategies (e.g., institutional constraints). The strategy will be vetted by the science experts in the second workshop.
    e. Create a sediment monitoring strategy that can be implemented to inform management decisions about sediment supply to the baylands (including which areas may need supplemental sediment placement), fluxes of chemical contaminants attached to fine sediments, and water clarity in the Bay.

Supplemental Environmental Projects Through the RMP

Introduction

In October 2015, the Water Board and SFEI entered into an agreement that made the RMP an authorized Supplemental Environmental Project (SEP) funds administrator. Therefore, for an enforcement action against a discharger, the discharger has the option to direct up to half of the penalty to the RMP as a SEP. The State Water Resources Control Board SEP Policy requires a nexus between the violation and the SEP. There is nexus between the RMP and violations in general because the RMP studies a water body that is potentially affected by violations in the San Francisco Bay region. For smaller violations with Mandatory Minimum Penalties (MMP), this general nexus is sufficient and the funds may be assigned to any study (subject to the "above and beyond" requirement described below). For larger Settlements that are negotiated between the Water Board and the discharger, studies with a more specific nexus to the violation (e.g., geographical) need to be identified through the RMP planning process.

SEP Budgeting Process

For MMP payments, SFEI will receive the funds and save them separately from the base RMP fees. The Steering Committee will allocate the accumulated funds to a project of its choosing through its normal budgeting process. Separate MMP payments may be combined to jointly fund a larger project. MMP payments may also be combined with Settlements (described below) to jointly fund a larger project.

For Settlements, the Water Board will request a list of eligible projects that have been vetted by the RMP to present as options during the negotiations. If the Water Board and the discharger agree to implement one of the RMP projects, the project will be incorporated into the Settlement Agreement. Funds for the project will be sent to the RMP after the Settlement Agreement is fully executed. These funds cannot then be allocated by the Steering Committee to any other project. The RMP Manager will communicate with the SC members about upcoming settlements as much as possible without compromising the negotiations.

Requirements for RMP Projects to be Eligible for SEP Funding

- The SEP Policy requires that the SEP must "go above and beyond" other applicable obligations of the discharger that proposes to satisfy a part of its monetary penalty with a SEP.
- SEP funds must be used to implement only those elements of the Program that would not otherwise be implemented through the base funding for the Program.
- Eligible RMP projects are monitoring or special studies that have been reviewed and recommended by a RMP workgroup but not funded.
- SEP funds may not be used to satisfy any permit requirements for any permittees but may augment a basic permit compliance study to make it more rigorous and comprehensive than it otherwise would have been.
- For Settlements, the project must be acceptable to both the Water Board and the discharger and must have a nexus to the violation.

The Steering Committee will maintain a list of eligible projects that can be used during settlement negotiations. The list will reflect the priority science needs of the RMP at that time.

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DATE: July 11, 2016
TO: RMP Steering Committee
FROM: Philip Trowbridge, RMP Manager
RE: Projected RMP Expenses and Fees for 2016-2023

Introduction

RMP fees are set by the Steering Committee (SC) every three years. In November 2017, the Steering Committee will need to set the target fees for 2019, 2020, and 2021. The purpose of this memo is to estimate the RMP expenses for 2019-2021 so that the SC can make an informed decision about what the total fees should be in these years. This information is being presented more than a year in advance so that SC members have time to discuss fee increases with their Boards. Also, direction from the SC on 2019-2021 fees is needed to set preliminary budgets for the Multi-Year Planning workshop on November 1, 2016.

Executive Summary

1. For 2016-2018, the Steering Committee approved fee increases of 3% per year but also phased out Cooling Water discharger fees. The result was an increase in RMP fees at an annualized rate of 1.8% per year.
2. The current balance of Undesignated Funds ("the Reserve") is $802k.
3. For 2019-2021, calculations show that the current level of expenditures with fee increases of 2% per year would use up $596k of the Reserve by the end of 2021 and all of it by 2022 or 2023. Fee increases of 3% per year and utilization of $373k of the Reserve would cover the current level of expenses through 2021. Finally, fee increases of 4% per year would generate revenue greater than expenses.
4. New funding for Supplemental Environmental Projects and supplemental wastewater agency contributions for emerging contaminants studies are intended to increase RMP budgets, not to replace core funding. Regardless, these new funding sources are already mostly offset by the loss of Cooling Water fees and expected shortfalls in Dredger fees.
5. The loss of the entire Cooling Water Participant Group means that the cost allocation percentages need to be changed for the first time since the Program started in 1992.

Approved Fees for 2016-2018

On November 13, 2014, the SC approved fee increases of 3% per year for 2016-2018. The total fees for these years were set at $3,521k, $3,626k, and $3,735k. However, these fee increases were promptly offset by another SC decision to reduce the fees paid by Cooling Water dischargers. Cooling Water dischargers have been responsible for a cost allocation of 4% of the total fees. The last remaining Cooling Water discharger will cease operations in 2018 and, therefore, will no longer have RMP participation as a permit condition. The SC decided that it was better to gradually phase out the Cooling Water fees over several years than to have an abrupt loss of $149k in revenue after 2018. Therefore, the cost allocation for Cooling Water was reduced to 2% in 2016, 1.5% in 2017, and 0.5% in 2018. The lost revenue was not made up by the other Participants. The net effect was that fees over this 3-year period will rise at an annualized rate of 1.8% instead of 3.0% as planned. In absolute terms, $292k of Cooling Water fees will be lost over the three-year period, followed by a permanent loss of $149k per year.

Table 1: Approved RMP Fees for Participant Groups for 2015-2018

Participant Group	2015	2016	2017	2018
Municipal Wastewater	$1,503,925	$1,549,043	$1,595,514	$1,643,379
Stormwater	$803,233	$827,330	$852,149	$877,714
Dredgers	$598,152	$616,096	$634,579	$653,617
Industrial Discharges	$375,981	$387,261	$398,878	$410,845
Cooling Water	$136,720	$140,822	$145,047	$149,398
Reduced CW Fees	$0	-$70,411	-$90,654	-$130,723
Total	$3,418,011	$3,450,140	$3,535,514	$3,604,230

Estimated RMP Expenses and Fees for in 2019-2023

In order to inform the decision about fees for 2019-2021, RMP expenses in each year between 2019 and 2023 were estimated following the steps and assumptions outlined below. Rather than limit the analysis to 2019-2021, the expense projections were extended to 2023 in order to span the full range of RMP monitoring activities. The RMP's most expensive monitoring program, sport fish tissue monitoring, now occurs every five years. Sport fish were monitored in 2014 and will next be monitored in 2019. Given this schedule, it made sense to estimate expenses for 2016-2023, which spans the five year interval starting in 2019.

Methods and Assumptions

- Estimate the 2017-2023 budgets for yearly RMP activities. The yearly RMP activities consist of program management, governance, data management, annual reporting (including the Pulse Report), and communications. The budgets for these activities were inflated by 2.7% per year using the approved 2016 budgets as the basis. The budgets for the Pulse and RMP Update reports were also inflated at 2.7% per year using the cost of the 2015 Pulse and the 2016 RMP Update reports as the basis. The rationale for the 2.7% inflation rate is provided below.
- Estimate the variable costs for RMP Status and Trends (S&T) monitoring in each year based on what it cost to do the work in previous years after adjusting for inflation (2.7%). This information came from the estimated costs of S&T activities in the Multi-Year Plan.
- Assume that $1,200k of funding per year (in 2016 dollars) is needed for RMP special studies. The Steering Committee has allocated $1,020k, $1,228k, $1,682k, $1,193k, and $926k for special studies in 2012, 2013, 2014, 2015, and 2016, respectively. The funding level for 2016 is an outlier and represents a reaction to reduced revenue from Cooling Water participants and a shortfall in Dredger fees. The average budget for special studies for 2012-2015 was $1,280k. In 2017, the RMP workgroups proposed $1,517k worth of proposals for special studies.
- Convert all costs to real dollars in each year by adjusting for inflation. The future cost estimates are sensitive to the inflation rate but, of course, the inflation rate in the future is unknown. In the past, the Bay Area Consumer Price Index (CPI)[1] increased an average of 2.7% per year over the 19-year period of 1997-2015. Most recently, the five-year average from 2010 to 2015 and the year-over-year CPI increase between April 2016 and April 2015 were also both 2.7%/year[1]. Therefore, CPI increases of 2.7% per year occur consistently in the Bay Area and this inflation rate was assumed for estimates of future purchasing power.

[1] http://www.abag.ca.gov/planning/research/cpi.html

- Calculate the net RMP expenses in real dollars in each year after accounting for set-asides and interest income. Set-asides are funds that the Steering Committee "saves" in years with low S&T monitoring costs to be used in later years with high S&T monitoring costs. Therefore, the net expense for S&T in a year will be the actual expense plus any funds set-aside for future years and minus any previously set-aside funds that will be used in that year. A nominal amount of interest income ($10k in 2015 dollars) was also assumed to offset a small portion of the expenses.

The second step of the study was to match up the estimated expenses with the total fees for 2014-2023 that have been or would be collected. Fees between 2014 and 2018 are known. Fees from 2019-2023 were estimated for different scenarios.

- The first scenario was that fees for 2019-2021 would increase at 2%, which is less than inflation but equal to what the SC approved for 2014 and 2015.
- The second scenario was that fees for 2019-2021 would increase at 3%, which is approximately the current rate of inflation and equal to what the SC approved for 2016-2018.
- The last scenario was that fees for 2021 would increase at 4%, which is faster than inflation in order to make up for past years when RMP fees increased slower than inflation. Cumulatively, between 1997 and 2016, RMP fees have grown 20% slower than the actual rate of inflation. For 2016-2018, RMP fees will increase by 1.8% per year, which is 30% lower than inflation.

The phase out of Cooling Water fees between 2016 and 2018 was accounted for in this analysis. Specifically, the 2016-2018 fees reflect the reduced Cooling Water contribution. For 2019-2021, zero contribution is assumed for Cooling Water Participants and the projected increase in total fees was calculated for the remaining Participant Groups only[2].

The third step of the study was to compare the estimated fee revenue and net expense for each year between 2016 and 2023 for each of the three fee scenarios. If expenses were higher than revenue in a year, the deficit was calculated and was assumed to be made up by funds from the RMP reserve funds until the $802k current balance of those funds was exhausted. This comparison was used to show which fee scenarios would require the RMP to draw upon reserve funds and how long the reserve funds would last.

[2] For example, assuming a 2% fee increase from 2018 to 2019, the Cooling Water fees paid in 2018 were first subtracted from the 2018 total, then the adjusted 2018 total was increased by 2% to calculate the 2019 fees.

Results

Table 2 shows the RMP approved budgets for 2014-2016 along with the projected expenses for 2017-2023. In 2016, the gross expenses are budgeted to be $2,927k; and, after adjusting for set-asides and interest revenue, the net expenses will be $3,167k. The total net expenses for the RMP are expected to increase to $3,778k by 2019 and $3,952k by 2021 in order to keep up with inflation.

Table 3 shows the three different scenarios for fee increases and how the fee revenue would compare to net expenses. Each of the scenarios is explained below.

- For the first scenario, 2% increase in fees per year, the total fees would be less than expenses in every year. Unless expenses were cut by an average of $120k each year, all RMP reserve funds ($802k) would be needed to fill the funding gap and would be exhausted by 2023.
- For the second scenario, 3% increase in fees per year, the total fees would initially be less than expenses but would catch up by 2022. A total of $373k would need to be taken from reserves during 2017-2021.
- For the third scenario, 4% increase in fees per year, the total fees would initially be less than expenses but would catch up by 2020. A total of $245k would need to be taken from reserves during 2017-2019, after which the reserve would begin to accumulate funds. At the end of 2023, the reserve balance would be $325k higher than it was in 2016.

The projected expenses in Tables 2 and 3 are sensitive to the assumed rate of inflation. An average rate of 2.7% was assumed for this analysis. If the rate were to actually be 3%, the results would be different. In particular, the first scenario (2% increase in fees per year) would fully deplete the reserve funds balance by 2022. What actually happens in future years depends on the actual rate of inflation that occurs in each year. Inflation rates as high as 5.4% have occurred in the Bay Area (2001).

Table 2: RMP Budgets in 2014-2015 and Projected Expenses in 2016-2013 ($'000)

	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Line Item	Budget	Budget	Budget	Forecast	Forecast	Forecast	Forecast	Forecast	Forecast	Forecast
1. Program Management	$666	$432	$393	$404	$415	$426	$437	$449	$461	$474
2. Governance		$280	$272	$279	$286	$294	$302	$310	$319	$327
3. Data Management	$318	$355	$322	$331	$340	$349	$358	$368	$378	$388
4. Annual Reports and Conferences	$348	$89	$79	$81	$83	$86	$88	$90	$93	$95
Pulse or RMP Update Report*		$125	$85	$132	$90	$139	$95	$147	$100	$155
5. Communications		$166	$160	$164	$168	$173	$177	$182	$187	$192
6. S&T Monitoring**	$993	$1,078	$691	$875	$1,312	$1,173	$856	$1,122	$1,236	$1,146
7. Special Studies***	$1,682	$1,193	$926	$1,232	$1,266	$1,300	$1,335	$1,371	$1,408	$1,446
Subtotal	**$4,007**	**$3,718**	**$2,927**	**$3,498**	**$3,960**	**$3,939**	**$3,649**	**$4,039**	**$4,181**	**$4,223**
S&T Set-Aside Revenue	-$417	-$79			-$225	-$150		-$75	-$175	-$120
S&T Set-Aside Expense	$161		$250	$125			$225			
Interest Revenue	-$7	-$10	-$10	-$11	-$11	-$11	-$11	-$12	-$12	-$12
Total Net Expenses	**$3,744**	**$3,629**	**$3,167**	**$3,612**	**$3,724**	**$3,778**	**$3,862**	**$3,952**	**$3,994**	**$4,090**

Inflation rate for 2017-2023 was assumed to be: 2.7% http://www.abag.ca.gov/planning/research/cpi.html

* Cost for Pulse and RMP Update reports are based on budgets for 2015 Pulse and 2016 RMP Update.

** For S&T costs in 2014, the value shown is the actual cost, which was $157k less than budget ($1,150k).

*** For Special Studies, 2014 values are actuals, 2015-2106 values are budgeted, and 2017-2023 are forecast assuming a need for $1,200k in 2016 $.

Table 3: Comparison of Projected RMP Fee Revenue and Expense in 2016-2013 For Different Scenarios ($'000)

A. Fees Increase Slower than CPI (2% per year)

Year	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Total Fees	$3,351	$3,418	$3,450	$3,536	$3,604	$3,657	$3,730	$3,805	$3,881	$3,959
Total Net Expenses	$3,744	$3,629	$3,167	$3,612	$3,724	$3,778	$3,862	$3,952	$3,994	$4,090
Funding Gap	-$393	-$211	$283	-$77	-$120	-$120	-$132	-$147	-$113	-$132
RMP Reserve Balance			$802	$725	$606	$485	$354	$206	$93	$0

B. Fees Increase at CPI (3%)

Year	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Total Fees	$3,351	$3,418	$3,450	$3,536	$3,604	$3,693	$3,804	$3,918	$4,036	$4,157
Total Net Expenses	$3,744	$3,629	$3,167	$3,612	$3,724	$3,778	$3,862	$3,952	$3,994	$4,090
Funding Gap	-$393	-$211	$283	-$77	-$120	-$85	-$58	-$34	$41	$66
RMP Reserve Balance			$802	$725	$606	$521	$463	$429	$470	$536

C. Fees Increase Faster than CPI (4%)

Year	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Total Fees	$3,351	$3,418	$3,450	$3,536	$3,604	$3,729	$3,878	$4,033	$4,195	$4,362
Total Net Expenses	$3,744	$3,629	$3,167	$3,612	$3,724	$3,778	$3,862	$3,952	$3,994	$4,090
Funding Gap	-$393	-$211	$283	-$77	-$120	-$49	$16	$81	$200	$272
RMP Reserve Balance			$802	$725	$606	$557	$573	$654	$854	$1,127

Red text indicates that total fees are less than RMP net expenses.

Other Financial Windfalls and Deficits

Other factors in the decision about future fees are any new revenue that the Program is scheduled to receive and any expected funding shortfalls.

New Funding Sources

One new funding source is money for Supplemental Environmental Projects (SEP). Starting in 2015, for enforcement actions, parties have the option to direct up to half of the penalty to the RMP as a SEP. Total SEP revenue is expected to be between $100k and $200k per year. However, the funds must be used for studies that are "above and beyond" what the RMP would normally do and cannot replace core RMP fees.

Another new funding source are extra payments from wastewater agencies in exchange for reduced monitoring for certain priority pollutants in compliance with an alternative monitoring requirement (AMR) permit condition. This program could provide between $200k and $300k annually. The intended use of these funds is to increase monitoring and special studies for contaminants of emerging concern.

Therefore, both of the new sources of revenue are intended to increase the RMP budget, not to replace core fees.

Known Deficits

Cooling Water contributions to the Program will be phased out between 2016 and 2018. The Cooling Water Participants have been responsible for 4% of the budget, which will be $149k in 2018. The SC has decided that the lost Cooling Water fees will not be made up by the other Participant Groups. This decision was tantamount to a Program budget cut of 4% or approximately $150k per year. The loss of these fees is already accounted for in the calculations.

The RMP is unlikely to receive the full amount of expected fees from Dredgers in 2017. Dredger fees are calculated from in-Bay disposal volumes, which have been declining over time. The process for changing the fee schedule to address this issue has been delayed. Also, contributions for dredging from the U.S. Army Corps of Engineers have not changed since 1992 and now are $150k below the equivalent value after accounting for inflation. Overall, the expected shortfall in Dredger fees will be $150k and $250k per year until a new fee schedule is approved. If RMP reserves ($802k) are used to cover this shortfall, all of the reserves would be exhausted in 3-5 years.

Changes in Cost Allocation Percentages

One effect of the phase out of Cooling Water fees is that the cost allocation percentages for the Program, which have been in place since 1992, need to be updated. The cost allocation percentages are important because these numbers are used to calculate the fees for each Participant Group. The process for setting RMP fees is for the SC to set the total budget for the Program. Then, the total budget is divided up between the different Participant Groups based on cost allocation percentages. Finally, each Participant Group has a formula for dividing up the total fees between individual agencies or organizations. The cost allocation percentages for each group have not been changed since the Program began.

Table 2 shows the proposed new cost allocation percentages. The new numbers divide up the 4% of the budget that was formerly assigned to Cooling Water to the other Participant Groups in proportion to the amount that each group contributes to the Program. The increased percentages do not mean that the remaining Participant Groups will be responsible for covering the lost Cooling Water fees. The new numbers just reflect the fact that the contributions from the remaining groups will make up the total budget and, therefore, their percentages need to sum to 100%, not 96%.

Table 4: Cost Allocation Percentages Before and After the Cooling Water Fee Phase-Out

Participant Group	Cost Allocation Percentages	
	Before CW Phase Out (2015)	After CW Phase Out (2019)
Municipal Wastewater	44.0%	45.8%
Stormwater	23.5%	24.5%
Dredgers	17.5%	18.2%
Industrial Discharges	11.0%	11.5%
Cooling Water	4.0%	0.0%

Note: These cost allocation percentages have been rounded to one decimal place. The round off will cause slight deviations between the fees calculated by multiplying the total fees by these percentages versus the fees that would be calculated by increasing the fee for each Participant Group separately. For example, the largest deviation is for Industrial Discharges, where calculating the 2019 fee by increasing the 2018 fee by 3% would be $423,170 versus $424,709 calculated by multiplying the total 2019 fees ($3,693,121) by 11.5% ($424,709). This discrepancy is a one-time issue associated with changing to the new cost allocation percentages.

Recommendations

1. The Steering Committee should confirm the approved fees for 2017 and 2018.

Participant Group	2017	2018
Municipal Wastewater	$1,595,514	$1,643,379
Stormwater	$852,149	$877,714
Dredgers	$634,579	$653,617
Industrial Discharges	$398,878	$410,845
Cooling Water	$54,393	$18,675
Total	$3,535,514	$3,604,230

2. RMP fees for 2019-2021 should increase at 3% per year to maintain the current pace of work. The proposed fees for each Participant Group are shown below. The Steering Committee will need to make this decision in November 2017. The remaining Participant Groups will not cover the loss the Cooling Water fees.

Participant Group	2019	2020	2021
Municipal Wastewater	$1,691,450	$1,742,193	$1,794,459
Stormwater	$904,815	$931,959	$959,918
Dredgers	$672,148	$692,313	$713,082
Industrial Discharges	$424,709	$437,450	$450,574
Cooling Water	$0	$0	$0
Total	$3,693,121	$3,803,915	$3,918,033
Percent Increase	3%	3%	3%

3. New cost allocation percentages for the Participant Groups should be adopted starting in 2019.

Participant Group	Cost Allocation Percentages	
	Before Cooling Water Phase Out (2015)	After Cooling Water Phase Out (2019)
Municipal Wastewater	44.0%	45.8%
Stormwater	23.5%	24.5%
Dredgers	17.5%	18.2%
Industrial Discharges	11.0%	11.5%
Cooling Water	4.0%	0.0%

2017 Special Studies Proposals - TRC Recommendations

Workgroup	Proposal Name	Funding Request	AMR [1]	Approximately Within Budget[2]	Use of Reserve[3]	Comments/Rank
Emerging Contaminants	Emerging Contaminants Strategy	$50,000	$50,000			#1 priority
Emerging Contaminants	Imidacloprid in Ambient Bay Water	$40,110	$40,110			#2 priority
Emerging Contaminants	Perfluorinated and Polyfluorinated Compounds in San Francisco Bay: Synthesis and Strategy	$56,300	$56,300			#3 priority
Emerging Contaminants	Phosphate Flame Retardants in Ambient Bay Water	$47,125	$47,125			#4 priority
Emerging Contaminants	Bisphenol Compounds in Ambient Bay Water	$50,000	$50,000			#5 priority
Emerging Contaminants	Triclosan in Small Fish	$41,300	$41,300			Potentially defer to later year
Exposure and Effects	Estrogen receptor *in vitro* assay linkage studies	$45,000		$45,000		Decide on criteria for continuing after 2017 at MYP meeting
Exposure and Effects	Strategy for Benthos and Sediment Toxicity Monitoring by the RMP	$10,000		$10,000		
Exposure & Effects	Strategy for Monitoring Water Temperature, Salinity, and Acidification due to Climate Change in SFB	$30,000			$30,000	Could be split between workgroup honoraria ($15k) and strategy development ($15k)
Nutrients	Ship-based sampling and sample analysis	$153,000		$153,000		
Nutrients	Open-Bay and slough moored sensors: data analysis, interpretation and maintenance	$342,000		$220,000	$122,000	High priority.
Dioxin	Dioxin Synthesis Report	$40,000		$40,000		Funding has been delayed for several years and is determined a priority for 2017
PCBs	PCB Strategy Coordination and Technical Support	$10,000		$10,000		Also receiving $132K in SEP funds
PCBs	Priority Margin Unit Conceptual Model Development	$60,000			$60,000	High priority.
Selenium	Selenium Strategy Support	$10,000		$10,000		
Selenium	2017 Sturgeon Derby Monitoring	$42,000		$42,000		If Derby does not take place, get approval to change scope
Selenium	2016-2017 Selenium Monitoring Workshop	$20,000			$20,000	High priority. True funding needs will become clear after the workshop is held in late July.
STLS	Small Tributaries POC Loading Program Management	$30,000		$30,000		
STLS	Small Tributaries Loading POC Watershed Characterization Reconnaissance Monitoring	$200,000		$200,000		
STLS	Small Tributaries Loading Regional Watershed Spreadsheet Model	$40,000		$40,000		
STLS	Small Tributaries Loading POC Trends Strategy and Trends Monitoring	$200,000		$100,000	$100,000	
Total		**$1,516,835**	**$284,835**	**$900,000**	**$332,000**	
Available Funding			**$100-250K**	**$900K**		

[1] Fund in order of work group priority with available AMR funds

[2] Includes anticipated available budget ($839K) plus additional funds from the reserves ($61K); if dredger fee shortfall is less than anticipated, less reserve funds may be needed. The TRC strongly recommend the use of reserve funds for these studies, deemed of high priority for 2017.

[3] The Steeering Committee should consider the use of additional reserve funds (or other funding sources) for the remaining studies; three studies were considered high priority:

- Additional funding for nutrients to continue program at the level in the multi-year plan
- Continued work on PMUs (to avoid losing momentum and project continuity)
- Work identified by the selenium workshop scheduled for 2016; high priority for TMDL implementation

2017 Special Studies Proposal Abstracts

Workgroup	Proposal Name	Principal Investigator	Funding Need / Decisions Impacted	Abstract	Funding Request	Notes	Page Number in Agenda Package
Emerging Contaminants	Emerging Contaminants Strategy	Rebecca Sutton (SFEI)	Inform Water Board CEC Action Plans; update tiered risk framework; support pollution prevention	Increasing interest in emerging contaminants issues by the San Francisco Bay Regional Water Board, RMP stakeholders, and the general public is reflected in headline news as well as policy actions at local, state, and federal levels. The amount of effort needed to manage the RMP Emerging Contaminants Strategy has increased significantly in recent years. Core deliverables have been tracking new information regarding contaminant occurrence and toxicity and updating the RMP's Tiered Risk and Management Action Framework. New requests for information include assisting the Water Board with emerging contaminants action plans. Coordination of pro bono analyses by partners, such as BACWA and universities, is another rapidly expanding component of strategy implementation. A Bay-specific contaminant transport model will also be revised to incorporate better information on pathways, in response to a need for improved modeling capabilities identified by stakeholders and experts. Finally, an exploration of passive sampling capabilities has been identified as another near-term strategic goal. For these reasons, this proposal requests an increase in funding for managing the RMP Emerging Contaminants Strategy.	$50,000	Ranked #1 priority by the ECWG	78-83
Emerging Contaminants	Imidacloprid in Ambient Bay Water	Rebecca Sutton (SFEI)	Inform federal pesticide reregistration efforts; complements DPR's monitoring efforts, which does not include marine environments; support inclusion of marine toxicity concerns in DPR regulatory decision-making	Imidacloprid is a widely used neonicotinoid insecticide. Recent RMP-funded monitoring of 24-hour composite samples of influent and effluent from eight Bay wastewater treatment plants (WWTPs) found levels in discharged effluent that exceed an established aquatic toxicity threshold. Imidacloprid has been intermittently detected in Bay Area creeks at levels above this threshold. The proposed study would screen ambient water samples from San Francisco Bay to determine whether levels of imidacloprid, common imidacloprid degradates, and other neonicotinoid pesticides approved for use in California exceed aquatic toxicity thresholds. Findings are essential to appropriate classification of imidacloprid and other neonicotinoids within the RMP's tiered risk framework for contaminants of emerging concern (CECs), and may influence ongoing efforts within the California Department of Pesticide Regulation aimed at reducing environmental contamination and ecological impacts of current use pesticides.	$40,110	Ranked #2 priority by the ECWG	84-90

2017 Special Studies Proposal Abstracts

Workgroup	Proposal Name	Principal Investigator	Funding Need / Decisions Impacted	Abstract	Funding Request	Notes	Page Number in Agenda Package
Emerging Contaminants	Perfluorinated and Polyfluorinated Compounds in San Francisco Bay: Synthesis and Strategy	Meg Sedlak and Adam Wong (SFEI)	Identify data gaps and develop strategy for ongoing monitoring; update tiered risk framework; inform DTSC's effort to select prioritized products suitable for examination via Safer Consumer Products regulations	A comprehensive review of PFAS monitoring and toxicity data is needed to determine whether PFOS is the only member of the family to merit regular surveillance. The RMP currently monitors for 13 perfluorinated chemicals including perfluorooctanoic acid (PFOA) and perfluorooctane sulfonamide (PFOSA). The purpose of this study is to synthesize the PFAS monitoring to date, to evaluate the classification of these compounds according to the RMP CEC tiers, and to develop a strategy for monitoring PFASs.	$56,300	Ranked #3 priority by the ECWG	91-99
Emerging Contaminants	Phosphate Flame Retardants in Ambient Bay Water	Rebecca Sutton (SFEI)	Update tiered risk ranking based on more complete Bay monitoring and inclusion of new compounds; potential impacts to state flammability standards and DTSC green chemistry (Safer Consumer Products) regulations	California's past implementation of unique flammability standards has resulted in decades of flame retardant additives in consumer goods. RMP-funded monitoring of ambient Bay water in 2013 revealed the presence of numerous phosphate flame retardants. Some South Bay samples exhibited levels of one particular flame retardant, triphenyl phosphate (TPhP), which approached an established marine aquatic toxicity threshold. New furniture testing data also reveal key flame retardants in current use that have yet to be monitored. The proposed study would screen ambient water samples from San Francisco Bay to determine whether levels of TPhP or other widely used phosphate flame retardants commonly exceed aquatic toxicity thresholds. Findings are necessary to determine whether these chemicals have been appropriately classified as "possible concerns" (Tier I) within the RMP's Tiered Risk Framework for contaminants of emerging concern (CECs), and may influence ongoing efforts within state agencies aimed at reducing environmental contamination and ecological impacts of flame retardants.	$47,125	Ranked #4 priority by the ECWG	100-107
Emerging Contaminants	Bisphenol Compounds in Ambient Bay Water	Jennifer Sun and Rebecca Sutton (SFEI)	Update risk prioritization ranking based on new PNEC and new analytical methods with lower MDLs and ability to detect newer bisphenol compounds; inform DTSC's effort to select prioritized products suitable for examination via Safer Consumer Products regulations	Bisphenols are a class of widely used endocrine-disrupting compounds, commonly found in polycarbonate plastics and epoxy resins and frequently detected in many environmental matrices. Bisphenol A (BPA) is a high-production volume compound, and use volumes of several BPA alternatives have increased in recent years. This study would screen ambient water samples from San Francisco Bay for 16 bisphenol compounds. The results of this initial screening will inform the classification of bisphenols within the RMP's tiered risk framework for contaminants of emerging concern (CECs).	$50,000	Ranked #5 priority by the ECWG	108-116

2017 Special Studies Proposal Abstracts

Workgroup	Proposal Name	Principal Investigator	Funding Need / Decisions Impacted	Abstract	Funding Request	Notes	Page Number in Agenda Package
Emerging Contaminants	Triclosan in Small Fish	Rebecca Sutton (SFEI)	Update risk prioritization ranking based on new knowledge of triclosan bioaccumulation; support for pollution preventions; inform DTSC's effort to select prioritized products suitable for examination via Safer Consumer Products regulations; inform federal reregistration decision for use of triclosan as a pesticide	The RMP classification of the widely used antibacterial ingredient triclosan as an emerging contaminant of low concern (Tier II) for San Francisco Bay is based on a relatively small amount of data. A recent study of a West Coast estuary suggests monitoring in small fish may be a more sensitive indicator of impact; these data are lacking for San Francisco Bay. Characterization of triclosan in whole fish composites of juvenile salmon from the Puget Sound indicates levels of potential concern, despite low concentrations in estuary waters. Food web transfer is suspected of leading to the higher concentrations observed in small fish. The proposed study would screen Bay prey fish for triclosan and its metabolite, methyl triclosan, to determine whether levels may pose concerns. These data are essential to appropriately classifying triclosan within the RMP's tiered risk framework for contaminants of emerging concern (CECs), and may influence ongoing efforts among stakeholders and local and state agencies aimed at reducing environmental contamination and ecological impacts of this antibacterial agent.	$41,300	Ranked #6 priority by the ECWG - may be deferred in whole or part to a subsequent year	117-123
Exposure and Effects	Estrogen receptor *in vitro* assay linkage studies	Nancy Denslow (University of Florida)	Supports completion of a tool for monitoring and management of estrogenic contaminants	The RMP has funded a study to develop quantitative linkages between *in vitro* bioanalytical assays an higher order *in vivo* endpoints that point to population level effects in estuarine fish. The objective of this effort is to develop a cost-effective, high throughput tool that will assist in the identification of chemicals of emerging concern that are adversely affecting biota. The current proposal would support addressing two objectives: (1) repeating the *in vivo* portion of the previous linkage study with tigether concentrations around the likely EC-50 for *in vivo* responses, which will help narrow the comparison between *in vitro* and *in vivo* endpoints, and (2) testing water and sediment from six locations in San Francisco Bay for estrogenic equivalencies as a pilot test for this bioanalytical tool.	$45,000	Decide on criteria for continuing after 2017 at MYP meeting	124-129
Exposure and Effects	Strategy for Benthos and Sediment Toxicity Monitoring by the RMP	Philip Trowbridge (SFEI)	Develop strategy for ongoing RMP long-term monitoring to inform implementation of Sediment Quality Objectives	Monitoring for benthic invertebrates and sediment toxicity has been part of the RMP Status & Trends Program for decades. From 2009-2016, a number of special studies have been completed on benthic assessment tools and the causes of moderate sediment toxicity in the Bay. No additional studies are planned. In 2018, the RMP is scheduled to collect the next round of benthic invertebrate and sediment toxicity data. This study will support the development of a short strategy document outlining what has been learned over the past 7 years of special studies and how the RMP should proceed in the future with benthic monitoring.	$10,000		130

2017 Special Studies Proposal Abstracts

Workgroup	Proposal Name	Principal Investigator	Funding Need / Decisions Impacted	Abstract	Funding Request	Notes	Page Number in Agenda Package
Exposure & Effects	Strategy for Monitoring Water Temperature, Salinity, and Acidification due to Climate Change in San Francisco Bay	Philip Trowbridge (SFEI)	Development of monitoring strategy for ocean acidification and climate change.	Due to climate change, the temperature, salinity, and acidity in San Francisco Bay is changing. Although these changes are largely out of control of local managers, it is important to anticipate the changes, document changes that occur, and understand the effect that changes could have on habitat quantity and quality for species of management interest. This study would support the development of a strategy for monitoring and assessment of climate change stressors in the Bay, including holding a workshop on ocean acidification and the developing a long-term monitoring design for water temperature, salinity, and acidification due to climate change in the Bay.	$30,000	Could be split between workgroup honoraria ($15k) and strategy development ($15k)	131-132
Nutrients	Ship-based sampling and sample analysis	David Senn (SFEI)	Water Boards's Nutrient Management Strategy timeline for developing nutrient WQO. Leverages $1 - $1.4 million in total NMS funding, out of a planned $3 million project budget. Reduced funding could result in cuts to other NMS projects (ie. HABs strategy and monitoring).	Ship-based samples will be collected and analyzed for a range of nutrient-related parameters. This data is essential for basic condition assessment, model calibration, and improved understanding of nutrient behavior and nutrient-related effects in the Bay. Ship-based discrete samples will be collected by USGS aboard the R/V Peterson on ~12 full-bay cruises and an additional ~12 South Bay cruises.	$153,000		133-134
Nutrients	Open-Bay and slough moored sensors: data analysis, interpretation and maintenance	David Senn (SFEI)		Most data on dissolved oxygen concentrations over the past 20+ years have been collected in deep subtital habitats. Considerably less data is available for shallow margin habitats in San Francisco Bay, including sloughs, creeks, tidal wetlands, and former salt ponds undergoing restoration. It is hypothesized that lower dissolved oxygen waters are being advected from margin habitats, including the extensive network of sloughs and creeks in Lower South Bay, causing dissolved oxygen to dip near or below 5 mg/L at locations in the South and Lower South Bay. In 2015, a network of moored sensors were installed in the margin areas of Lower South Bay to test this hypothesis. This funding will support year 3 of moored sensor monitoring at open bay stations, the completion of moored sensor deployment in the sloughs and creeks of Lower South Bay, sensor network maintenance, and data management.	$342,000		135-136

2017 Special Studies Proposal Abstracts

Workgroup	Proposal Name	Principal Investigator	Funding Need / Decisions Impacted	Abstract	Funding Request	Notes	Page Number in Agenda Package
Dioxin	Dioxin Synthesis Report	Don Yee (SFEI)	Goal to support 303(d) 4B listing	Additional data on dioxin concentrations and loads have been collected in various media since the last dioxin synthesis in 2004. This effort would formally report and interpret this new information and evaluate the needs or potential for additional data collection or management action for dioxins. This effort is needed in 2017 to resolve the 303(d) impairment listings and in support of NPDES permitting strategy. In addition, the dioxin dataset generated under the RMP Dioxin Strategy was primarily generated in 2009-2012 and is getting dated - synthesis and interpretation of these data now will avoid any real or perceived consequence of using a dated dataset and a need to resample.	$40,000	Goal is 303d listing as 4B	137-139
PCBs	PCB Strategy Coordination and Technical Support	Jay Davis (SFEI)	Inform 2020 PCB TMDL revision and the next iteration of the MRP; identify the most effective management actions to reduce PCB loads; identify performance measures for stormwater load reduction efforts	The objective of this task is to provide coordination and technical support for continuing development of the PCB strategy. Funds for this task would enable SFEI to continue to consult with the PCB Workgroup and Small Tributary Loadings Strategy Team regarding plans for the next iteration of the PCB TMDL and RMP activities that can inform the TMDL. Funds would also support small-scale synthesis of information that is needed to support these discussions. The plan will include a multi-year schedule of budgets and deliverables aimed at providing a technical foundation for the next iteration of the TMDL.	$10,000	Also receiving $132K in SEP funds	140-141
PCBs	Priority Margin Unit Conceptual Model Development	Jay Davis (SFEI)	Inform 2020 PCB TMDL revision and the next iteration of the MRP; identify the most effective management actions to reduce PCB loads; identify performance measures for stormwater load reduction efforts	The goal of RMP PCB Strategy work over the next few years is to inform the review and possible revision of the PCB TMDL and the reissuance of the Municipal Regional Permit for Stormwater (MRP), both of which are tentatively scheduled to occur in 2020. Conceptual model development for a set of four representative priority margin units will provide a foundation for establishing an effective and efficient monitoring plan to track responses to load reductions and also help guide planning of management actions. The Emeryville Crescent was the first PMU to be studied in 2015-2016. The San Leandro Bay PMU is second (2016-2017). The third PMU will Steinberger Slough in San Carlos. A report on this third PMU will be completed in 2017.	$60,000	High priority	142-147

2017 Special Studies Proposal Abstracts

Workgroup	Proposal Name	Principal Investigator	Funding Need / Decisions Impacted	Abstract	Funding Request	Notes	Page Number in Agenda Package
Selenium	Selenium Strategy Support	Jay Davis (SFEI)	Implement North Bay TMDL; implement EPA site-specific selenium criteria; inform consideration of a TMDL for South Bay	In April 2014 the RMP formed a Selenium Strategy Team to evaluate information needs that can be addressed by the Program in the next several years. The charge given to the Team by the RMP Steering Committee was to focus on low-cost, near-term monitoring elements that could provide information that provides high value in support of policy development and decision-making. A TMDL for the North Bay has been developed and approved by the Regional Water Board and the State Water Board, and is awaiting approval by USEPA. Development of a TMDL for the South Bay will be considered after the North Bay TMDL is completed. The need for greater investment in studies in support of managing selenium in the Bay is currently being considered by the Workgroup.	$10,000		148
Selenium	2017 Sturgeon Derby Monitoring	Jay Davis (SFEI)	Implement North Bay TMDL; implement EPA site-specific selenium criteria	In March 2016, the State Water Resources Control Board approved a Selenium TMDL for North San Francisco Bay, which established a white sturgeon muscle tissue target of 11.3 ug/g dry weight as the basis for evaluating impairment. In 2015 and 2016, the RMP funded a study in collaboration with USFWS and Stantec, Inc. to collect tissue samples from angler-harvested female sturgeon collected as part of the annual Sturgeon Derby held out of Bay Point. The objective of this study was to establish relationships between selenium concentrations measured in non-lethally collected tissues (muscle plugs, fin rays) and those that are more closely tied to, or predictive of, adverse impacts in white sturgeon due to selenium (ovaries, otoliths). This study proposes a continuation of this sampling in 2017.	$42,000	If Derby does not take place, get approval to change scope	149-155
Selenium	2016-2017 Selenium Monitoring Workshop	Jay Davis (SFEI)	Implement North Bay TMDL; implement EPA site-specific selenium criteria; establish indicator suite to track impacts of changes in hydrology and loading in the Delta and Central Valley	At their May 2016 meeting, the Selenium Workgroup, at the request of the Water Board, discussed the need to develop a technical consensus on a robust suite of trend indicators of selenium impairment in the North Bay. The goal is to identify leading indicators of change to allow prompt management response to signs of increasing impairment. Of particular concern are the possible impacts of changes in hydrology in the Delta or changes in selenium loads to Bay-Delta tributaries in the Central Valley. A technical workshop on this topic will be convened this summer. This funding request is a placeholder that will allow for followup activities stemming from the workshop. The funds could be used for additional planning or to augment existing monitoring to address high priority information needs.	$20,000	True funding needs will become clear after the workshop is held in late July and will be requested from the SC.	156

2017 Special Studies Proposal Abstracts

Workgroup	Proposal Name	Principal Investigator	Funding Need / Decisions Impacted	Abstract	Funding Request	Notes	Page Number in Agenda Package
Sources, Pathways and Loadings	Small Tributaries POC Loading Program Management	Lester McKee, Alicia Gilbreath, Jennifer Hunt (SFEI)	Inform 2020 MRP and PCB TMDL revisions. Support BASMAA's $1 - $1.5 million stormwater monitoring program.	The goal of the Small Tributaries Loadings Strategy (STLS) Program over the next few years is to continue to provide information to RMP Stakeholders and the public that directly supports the identification and management of PCBs and Hg sources, concentrations, loads, and the determination of trends in relation to management efforts and beneficial uses in San Francisco Bay. To support the Small Tributaries POC stormwater concentration and loading program, the outcome of this task will be to maintain monthly communication with BASMAA program and Water Board representatives. This will be completed through regular check in phone calls, planning for and development of meeting agendas and materials, preparation of meeting summaries, and monitoring the agenda of and attendance at key external meetings.	$30,000		157-158
Sources, Pathways and Loadings	Small Tributaries Loading POC Watershed Characterization Reconnaissance Monitoring	Lester McKee et al. (SFEI)	Inform 2020 MRP and PCB TMDL revisions.	To support a weight-of evidence approach for the identification and management of PCBs and Hg sources, the outcome of this proposal will be further knowledge about concentrations and particle ratios in stormwater in areas that have a historically and disproportionally larger area of older urban and industrial land use.	$200,000		159-161
Sources, Pathways and Loadings	Small Tributaries Loading Regional Watershed Spreadsheet Model	Jing Wu, Lester McKee, Alicia Gilbreath (SFEI)	Inform how much management activity is needed to support load reductions.	To support improved estimates of regional scale watershed loads, the outcome of this proposal will be a GIS map of watershed scale loads for the region estimated from the RWSM that will be calibrated or verified with a minimum of 60 sites now characterized for of PCBs and Hg concentrations. The information generated from this model, including updated land use specific yields, will also be useful for assisting BASMAA program staff at smaller scales with their proposed effectiveness evaluation methods for stormwater BMPs.	$40,000		162-165
Sources, Pathways and Loadings	Small Tributaries Loading POC Trends Strategy and Trends Monitoring	Lester McKee, Alicia Gilbreath, Jennifer Hunt (SFEI)	Inform 2020 MRP and PCB TMDL revisions.	To support stormwater concentration and loading trends evaluation, the outcomes of this proposal will be provision of an improved dataset (more samples targeted at improving the description of source, release, and transport processes at selected tributary monitoring sites) following the monitoring design laid out at the conclusion of the 2016 Trends Strategy workplan, data evaluation to prepare refine the monitoring plan for subsequent winter seasons (i.e., 2018 and 2019), and further evaluation of data and information to continue the dialogue on the ultimate design of a long-term monitoring program for trends.	$200,000		166-169

Special Study Proposal: Emerging Contaminants Strategy

Summary:

Increasing interest in emerging contaminants issues by the San Francisco Bay Regional Water Board, RMP stakeholders, and the general public is reflected in headline news as well as policy actions at local, state, and federal levels. The amount of effort needed to manage the RMP Emerging Contaminants Strategy has increased significantly in recent years. Core deliverables have been tracking new information regarding contaminant occurrence and toxicity and updating the RMP's Tiered Risk and Management Action Framework. New requests for information include assisting the Water Board with emerging contaminants action plans. Coordination of *pro bono* analyses by partners, such as BACWA and universities, is another rapidly expanding component of strategy implementation. A Bay-specific contaminant transport model will also be revised to incorporate better information on pathways, in response to a need for improved modeling capabilities identified by stakeholders and experts. Finally, an exploration of quantitative passive sampling capabilities has been identified as another near-term strategic goal. For these reasons, this proposal requests an increase in funding for managing the RMP Emerging Contaminants Strategy.

Estimated Cost: $50,000
Oversight Group: ECWG
Proposed by: Rebecca Sutton (SFEI)

PROPOSED DELIVERABLES AND TIMELINE

Deliverable	Due Date
Task 1. Information gathering from a variety of sources throughout the year, including presentations at scientific conferences	12/31/2017
Task 2. Assist Water Board and other stakeholders with science summaries relating to policy including emerging contaminants action plans and comment letters regarding proposed actions of other agencies	12/31/2017
Task 3. Present an update of emerging contaminants strategy, ongoing or completed special and pro bono studies, and new studies to the Steering Committee	12/31/2017
Task 4. Review tiered monitoring and management risk framework, present findings to the Water Board	12/31/2017
Task 5. Provide brief update to the RMP CEC Strategy document, including revised tiered framework tables and multi-year plan	12/31/2017
Task 6. Update existing Bay contaminant transport model with improved stormwater and runoff information	12/31/2017
Task 7. Inform experts and stakeholders regarding the practical application of quantitative passive sampling methods in estuarine settings	12/31/2016

Background

The science and management of contaminants of emerging concern (CECs) is an area of dynamic recent development. In 2015, the House and Senate both passed bills that would alter the primary legislation governing production and use of chemicals in the U.S., the federal Toxic Substances Control Act. While a single bill has not yet emerged from the reconciliation process, passage of legislation designed to modify a law that has been unchanged for 40 years is a clear sign of the growing concern surrounding the widespread introduction of thousands of chemicals into commerce without significant testing to establish safety for humans or wildlife. The general public has also become increasingly engaged on issues of chemical safety and potential ecological harm, informed by headlines in major newspapers across the country.

The RMP, a global leader on contaminants of emerging concern (CECs), stays ahead of the curve by identifying problem pollutants *before* they can harm wildlife. The RMP has completed a strategy document outlining a comprehensive, forward-looking approach to addressing CECs in San Francisco Bay (Sutton et al. 2013). The RMP's CECs strategy consists of three major elements. First, for contaminants known to occur in the Bay, the RMP evaluates relative risk using a Tiered Risk and Management Action Framework. This risk-based framework guides future monitoring proposals for each of these contaminants. The second element of the strategy involves review of scientific literature and other aquatic monitoring programs to identify new contaminants for which no Bay data yet exist. Finally, the third element of the strategy consists of non-targeted monitoring, including broadscan analyses and development of bioanalytical tools. In 2016, this strategy document will undergo a major revision to stay current with a wealth of recent scientific findings and management actions.

For the RMP CECs Strategy to remain relevant and timely, it needs annual updates with new information on analytical methods and study findings from the RMP and others. Funds are needed to review new results, track research conducted elsewhere, and keep stakeholders apprised of findings. Coordination of pro bono analyses is another rapidly expanding component of the strategy fund. At the same time, it is important for the RMP to provide relevant, objective science to inform the growing number of policy actions concerning emerging contaminants, an increasing demand on staff time.

In 2016, the RMP Steering Committee approved $33,000 for this strategy support task, recognizing especially the increased need for coordination of pro bono studies. An additional $15,000 was budgeted for revision of the strategy document, for a total of $48,000. With the potential for increased resources directed towards emerging contaminants in 2017, including specific deliverables regarding modeling and the exploration of new technologies (passive sampling), the recommended budget needed for managing the RMP CEC Strategy is $50,000. Additional budget details are provided in the following sections.

Study Objectives and Applicable RMP Management Questions

Table 1: Study objectives and questions relevant to RMP management questions

Management Question	Study Objective	Example Information Application
1) Are chemical concentrations in the Estuary at levels of potential concern and are associated impacts likely?	Compare existing occurrence data with new toxicity information reported in the scientific literature. Evaluate future monitoring needs and toxicity data gaps.	Does the latest science suggest a reprioritization of chemicals as we learn more about them? Which newly identified contaminants merit further monitoring?
2) What are the concentrations and masses of contaminants in the Estuary and its segments? 2.1 Are there particular regions of concern?	Does new knowledge including recently published toxicity data and/or source/pathway information suggest different relative risks for any of the five subembayments?	What are the key regional influences on different subembayments that impact concentrations, masses, and potential risk of emerging contaminants?
3) What are the sources, pathways, loadings, and processes leading to contaminant-related impacts in the Estuary? 3.1. Which sources, pathways, etc. contribute most to impacts?	Refine modeling capabilities through incorporation of improved data on pathways. Does new research in other regions provide insight as to key sources, pathways, loadings, and processes that affect impacts of emerging contaminants?	Are relative levels of contaminants in different matrices or subembayments consistent with our expectations for various contaminant processes?
4) Have the concentrations, masses, and associated impacts of contaminants in the Estuary increased or decreased? 4.1. What are the effects of management actions on concentrations and mass?	Does trend data from other regions suggest likely trends in the Bay? Which new management actions are likely to impact contaminant levels?	Are additional or different actions needed to reduce levels below aquatic toxicity thresholds?
5) What are the projected concentrations, masses, and associated impacts of contaminants in the Estuary?	Do data on production, use, and source trends in the scientific and trade literature provide a means of prioritizing relative risk of Bay contaminants?	Do production, use, and source trends suggest likely changes in the relative risk of specific emerging contaminants?

Emerging contaminants strategy work most directly addresses questions 1, 3, and 5, by assuring that all manner of relevant new information is brought to bear in evaluating the relative risk of emerging contaminants to Bay wildlife. For example, a new study identifying a lower toxicity threshold for a particular contaminant might suggest that the risk tier in which that contaminant had been placed should be revised.

In addition, the study will address the emerging contaminants priority question: What emerging contaminants have the potential to adversely impact beneficial uses of the Bay?

Approach

The emerging contaminants strategy funding supports the review of key information sources throughout the year. These sources include:

- Abstracts and newly published articles in key peer-reviewed journals (e.g., Environmental Science and Technology, Environmental Toxicology and Chemistry, Environment International)
- Documents produced by other programs (e.g., USEPA, Environment Canada, European Chemicals Agency, Great Lakes CEC Program)
- Abstracts and proceedings from relevant conferences (e.g., Society of Environmental Toxicology and Chemistry, International Symposium on Brominated Flame Retardants)

In addition, strategy funding allows staff to provide additional services, such as:

- Numerous presentations, briefings, and stakeholder interactions
- Scientific assistance to the Water Board as the agency prepares emerging contaminant action plans
- Scientific assistance to stakeholders engaged in emerging contaminants policy
- Coordination of pro bono analyses
- Improved modeling capabilities: The San Francisco Bay transport model will be updated with a four-fold increase in stormwater and runoff sources. Estimated flows from these 300+ watersheds will be based on a combination of an updated Regional Watershed Spreadsheet Model and USGS streamflow data. The model will then be used to predict the distribution in space and time of each watershed's contribution to the Bay waters, calculated across a full water year.
- Webinar or similar platform to inform stakeholders and experts as to the potential advantages and disadvantages associated with incorporating quantitative passive sampling methods into estuarine monitoring for emerging contaminants

The following table lists the specific tasks to be completed and their due dates.

Deliverable	**Due Date**
Task 1. Information gathering from a variety of sources throughout the year, including presentations at scientific conferences	12/31/2017
Task 2. Assist Water Board and other stakeholders with science summaries relating to policy including emerging contaminants action plans and comment letters regarding proposed actions of other agencies	12/31/2017
Task 3. Present an update of emerging contaminants strategy, ongoing or completed special and pro bono studies, and new studies to the Steering Committee	12/31/2017
Task 4. Review tiered monitoring and management risk framework, present	12/31/2017

findings to the Water Board	
Task 5. Provide brief update to the RMP CEC Strategy document, including revised tiered framework tables and multi-year plan	12/31/2017
Task 6. Update existing Bay contaminant transport model with improved stormwater and runoff information	12/31/2017
Task 7. Inform experts and stakeholders regarding the practical application of quantitative passive sampling methods in estuarine settings	12/31/2016

Budget

The following budget represents estimated costs for 2017 Emerging Contaminants Strategy.

Table 2. 2017 Emerging Contaminants Strategy budget

Deliverables	**Budget**
Tasks 1-7: Information gathering from a variety of sources throughout the year, including presentations at scientific conferences; Assist Water Board and other stakeholders with science summaries relating to policy including emerging contaminants action plans and comment letters regarding proposed actions of other agencies; Present an update of emerging contaminants strategy, ongoing or completed special and pro bono studies, and new studies to the Steering Committee; Review tiered monitoring and management risk framework, brief the Water Board; Provide brief update to the RMP CEC strategy document, including revised tiered framework tables and multi-year plan; Improve Bay contaminant transport models; Explore potential for quantitative passive sampling methods in estuarine settings	$50,000

Budget Justification

Funding for managing the CEC Strategy has traditionally covered updates to the Tiered Risk and Management Framework (element one of the RMP CEC strategy), review of the state of the science concerning CECs and interaction with other monitoring groups (element two), and interpretation of the findings of non-targeted analysis (element three) to determine new monitoring priorities.

Additional demands placed on the RMP's emerging contaminants team in recent years include: a) scientific assistance to the Water Board as agency staff prepare action plans for specific CECs; b) increased engagement with stakeholders (e.g., briefings for the Water Board and the RMP Steering Committee); c) scientific advisory support for the Water Board and other stakeholders concerning relevant policy proposals and actions at the local, state, and federal levels (e.g., USEPA proposed significant new use rules); d) increasing coordination of pro bono analyses that leverage RMP funds; and e) improved contaminant transport modeling capabilities. To assure that the RMP is able to provide cost-effective expertise to address these demands, this proposal requests a higher level of funding for 2017 to assure that the policies that are developed are based on sound science.

In 2016, the RMP Steering Committee approved $33,000 for this strategy support task, recognizing especially the increased need for coordination of pro bono studies. In 2017, we are requesting $50,000 in order to cover the new demands listed in the preceding paragraph. This increase in cost is justified by the cost to perform the work. For example, developing a single memo for the Water Board describing the state of science and policy for a particular contaminant for which an action plan is being developed may require 20 hours of senior staff time @ $150/hr, resulting in an expenditure of $3,000.

By providing funding for the emerging contaminants strategy, the RMP can be assured it is getting "the most bang for its buck," targeting the highest priority contaminants among the many thousands in commerce and potentially discharged to the Bay. The RMP is a global leader in CEC monitoring, yet it must be efficient and pragmatic in the face of finite resources. An increase in funding for this task will allow for strategic thinking using the latest science, so that the RMP can continue to generate the information water managers need to effectively address emerging contaminants in the Bay.

Reporting

A number of RMP CEC Strategy presentations (Emerging Contaminants Workgroup, Steering Committee, and Annual Meeting) and briefings (Water Board, others as needed) provide opportunities to report on this work. A brief update to the RMP CEC Strategy, including revised tiered framework tables and multi-year plan, represents another key reporting mechanism for the RMP.

References

Sutton R, Sedlak M, Davis J. 2013. Contaminants of Emerging Concern in San Francisco Bay: A Strategy for Future Investigations. SFEI Contribution 700. San Francisco Estuary Institute, Richmond, CA.
http://www.sfei.org/documents/contaminants-emerging-concern-san-francisco-bay-strategy-future-investigations

Special Study Proposal: Imidacloprid in Ambient Bay Water

Summary: Imidacloprid is a widely used neonicotinoid insecticide. Recent RMP-funded monitoring of 24-hour composite samples of influent and effluent from eight Bay wastewater treatment plants (WWTPs) found levels in discharged effluent that exceed an established aquatic toxicity threshold. Imidacloprid has been intermittently detected in Bay Area creeks at levels above this threshold. The proposed study would screen ambient water samples from San Francisco Bay to determine whether levels of imidacloprid, common imidacloprid degradates, and other neonicotinoid pesticides approved for use in California exceed aquatic toxicity thresholds. Findings are essential to appropriate classification of imidacloprid and other neonicotinoids within the RMP's tiered risk framework for contaminants of emerging concern (CECs), and may influence ongoing efforts within the California Department of Pesticide Regulation aimed at reducing environmental contamination and ecological impacts of current use pesticides.

Estimated Cost: $40,110

Oversight Group: ECWG

Proposed by: Rebecca Sutton and Jennifer Sun (SFEI)

PROPOSED DELIVERABLES AND TIMELINE

Deliverable	Due Date
Task 1. Project Management (manage subcontracts, track budgets)	2017
Task 2. Develop detailed sampling plan	Spring 2017
Task 3. Field Sampling	Summer 2017
Task 4. Lab analysis	Fall 2017
Task 5. QA/QC and data management	Winter 2017
Task 6. Draft fact sheet	3/31/2018
Task 7. Final fact sheet	6/30/2018

Background

Imidacloprid, a common neonicotinoid insecticide with many urban uses, has recently been identified as highly toxic to aquatic organisms (Morrissey et al. 2015). Chronic toxicity data indicate that mayflies, chironomids, and mysids can experience long-term effects like immobilization at concentrations <100 ng/L (Morrissey et al. 2015). A recent European Union evaluation of imidacloprid toxicity data (EC 2015) has established a predicted no effect concentration (PNEC) of 4.8 ng/L based on impacts to mayfly nymphs (Roessink et al. 2013). A PNEC specific to the marine or estuarine environment has not been established;

the freshwater PNEC is recommended as the most relevant and protective existing toxicity threshold.

In response to these concerns, the RMP funded a 2016 Special Study, now nearing completion, to assess imidacloprid levels in influent and effluent from Bay Area wastewater treatment plants (Sadaria et al., in prep). Imidacloprid was detected in all samples, with influent levels in the range 58-310 ng/L and effluent levels in the range 84-310 ng/L. Levels in discharged effluent were as much as 60 times greater than the PNEC of 4.8 ng/L. Imidacloprid has also been detected in urban creeks in the Bay Area at levels that exceed this toxicity threshold (Weston et al. 2015).

As both stormwater and wastewater in the Bay Area have been found to contain levels of imidacloprid exceeding a protective aquatic toxicity threshold, monitoring of ambient Bay waters is now recommended. Should dilution and other relevant environmental processes prove insufficient to reduce the levels of imidacloprid below the PNEC of 4.8 ng/L, it may be considered appropriate to classify this widely used pesticide as a Moderate Concern (Tier III) emerging contaminant in San Francisco Bay via the RMP CEC Risk and Management Action Framework (Sutton et al. 2013; Sutton and Sedlak 2015). Common imidacloprid degradates, as well as other neonicotinoid pesticides approved for use in California, will also be monitored as part of this study.

Study Objectives and Applicable RMP Management Questions

This study will provide data essential to determining the placement of imidacloprid and other neonicotinoids in the RMP's tiered risk framework, which guides monitoring and management actions on emerging contaminants in San Francisco Bay (Sutton et al. 2013; Sutton and Sedlak 2015). Existing data on imidacloprid in stormwater and wastewater suggest this pesticide in particular is a priority target for monitoring in Bay water. Management questions to be addressed by this study are the same as those of the overall RMP program, as shown in Table 1.

Table 1. Study objectives and questions relevant to RMP management questions.

Management Question	Study Objective	Example Information Application
1) Are chemical concentrations in the Estuary at levels of potential concern and are associated impacts likely?	Compare measured concentrations to toxicity thresholds.	Do findings suggest individual neonicotinoids should be classified as moderate concern, low concern, or possible concern emerging contaminant within the RMP's tiered risk framework? Do data indicate a need for management actions?
2) What are the concentrations and masses of contaminants in the Estuary and its segments? 2.1 Are there particular regions of concern?	Compare levels in different embayments.	Do specific embayments or regions appear to have greater levels of contamination?
3) What are the sources, pathways, loadings, and processes leading to contaminant-related impacts in the Estuary? 3.1. Which sources, pathways, etc. contribute most to impacts?	*(Previous RMP Special Study directly addresses this management question for imidacloprid.)*	
4) Have the concentrations, masses, and associated impacts of contaminants in the Estuary increased or decreased? 4.1. What are the effects of management actions on concentrations and mass?		
5) What are the projected concentrations, masses, and associated impacts of contaminants in the Estuary?	Review results alongside available projections of use and potential control actions under consideration by state and federal pesticide agencies.	Which anticipated changes or actions are likely to have the greatest impact on neonicotinoid pollution? Are additional/different actions needed?

This monitoring effort would most directly address question 1, determining whether contaminant levels exceed a toxicity threshold. Inferences regarding regional or future pollution patterns could involve interpretation of the data within the context of regional use data and potential changes in use or regulation of this pesticide, all of which may play a role in addressing questions 2 and 5.

In addition, the study will address the established emerging contaminants priority question: What emerging contaminants have the potential to adversely impact beneficial uses of the Bay? The RMP Tiered Risk and Management Action Framework does not include a specific classification for imidacloprid; findings should allow this pesticide to be listed as either a moderate concern (Tier III), low concern (Tier II), or possible concern (Tier I) for San Francisco Bay.

Approach

Ambient Bay Water Sampling

Bay water sample collection will take place in the summer of 2017 as part of the RMP's regular Status and Trends water monitoring cruise. Grab samples of ambient Bay water (1 L, amber glass, 7 day hold time) will be collected at all 22 Bay sites. Two field replicates and a field blank will also be collected.

Analytical Methods

Samples will be analyzed by AXYS Analytical or a comparable laboratory. Per sample analytical costs are estimated to be ~$550 for AXYS.

AXYS Analytical is currently developing a new method to measure imidacloprid, common degradates including imidacloprid urea, and other neonicotinoid pesticides (e.g., acetamiprid, clothianidin, dinotefuran, nitenpyram, thiacloprid, thiamethoxam, imidaclothiz) in (total) water using a high performance liquid chromatograph coupled to a triple quadrupole mass spectrometer (HPLC-MS/MS). The expected instrument detection limit for imidacloprid is expected to be ≤ 2 ng/L, less than half the 4.8 ng/L PNEC (Roessink et al. 2013).

Budget

The following budget represents estimated costs for this proposed special study (Table 3). Efforts and costs can be scaled back by reducing the number of sites sampled.

Table 3. Proposed Budget.

Expense	Estimated Hours	Estimated Cost
Labor		
Project Staff	138	20,500
Senior Management Review	6	960
Project Management		0*
Contract Management		0*
Data Technical Services		2,500
GIS Services		300
Creative Services		750
IT Services		0
Communications		0
Operations		0
Subcontracts		
Name of contractor		
AXYS or comparable lab		13,750
Direct Costs		
Equipment		0
Travel		0
Printing		150
Shipping		1,200
Other		0
Grand Total		40,110

*services included in the base RMP funding

Budget Justification

Field Costs
Field costs are minimized through sample collection during the RMP's 2017 Status and Trends water sampling cruise.

Laboratory Costs
Analytical costs per sample are estimated to be ~$550. For 25 samples, including two field replicates and a field blank, the total analytical costs will be $13,750.

Data Management Costs
Standard data management procedures and costs will be used for this project. Final quality assured data will be uploaded to CEDEN and will be publicly accessible through CD3 (cd3.sfei.org).

Reporting

Results will be provided to the RMP committees in the form of a draft report by 1/31/18, which will be reviewed by ECWG and the TRC. Comments will be incorporated into the final report published by 4/30/18.

References

EC (European Commission). 2015. Directive 98/8/EC concerning the placing of biocidal products on the market; Imidacloprid; Product-type 18 (Insecticides, Acaricides and Products to control other Arthropods). Standing Committee on Biocidal Products.

Morrissey, C.A., Mineau, P., Devries, J.H., Sanchez-Bayo, F., Liess, M., Cavallaro, M.C., Liber, K., 2015. Neonicotinoid contamination of global surface waters and associated risk to aquatic invertebrates: a review. Environ Int 74, 291-303.

Roessink, I., Merga, L.B., Zweers, H.J., Van den Brink, P.J., 2013. The neonicotinoid imidacloprid shows high chronic toxicity to mayfly nymphs. Environ Toxicol Chem 32, 1096-1100.

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Monitoring Program for Water Quality in San Francisco Bay, San Francisco Estuary Institute, Richmond, CA.

USEPA (United States Environmental Protection Agency). 2008. Imidacloprid Summary Document Registration Review: Initial Docket December 2008; Registration Review Case No. 7605 PC Code 129099. Docket Number: EPA-HQ-OPP-2008-0844, Washington, D.C.

Weston, D.P., Chen, D., Lydy, M.J., 2015. Stormwater-related transport of the insecticides bifenthrin, fipronil, imidacloprid, and chlorpyrifos into a tidal wetland, San Francisco Bay, California. Sci Total Environ 527-528, 18-25.

Special Study Proposal: Perfluorinated and Polyfluorinated (PFAS) Compounds in San Francisco Bay: Synthesis and Strategy

Summary: Perfluoroalkyl and polyfluoroalkyl substances (PFASs) are a class of fluorine-rich chemicals with extremely high persistence. Well-studied members of this family have been shown to be highly toxic, while others have received little to no testing. Concentrations of one PFAS, perfluorooctane sulfonate (PFOS), in Bay Area seals and bird eggs in 2004/2006 were some of the highest detected globally. As a result, PFOS has been identified as moderate concern (Tier III CEC) for San Francisco Bay. Recent monitoring suggests decreases in PFOS concentrations in seals and cormorants, likely as a result of changing use patterns that include a nationwide phaseout in 2002.

However, concentrations of other members of the PFAS family, the commonly monitored carboxylates, have remained relatively constant albeit it at substantially lower levels overall. Meanwhile, a number of "precursors," PFAS that degrade to the more persistent PFOS or PFOA, have been detected in sediments. Recent studies of Bay Area stormwater and wastewater suggest that a significant fraction of these precursors are of unknown chemical composition. All PFAS besides PFOS are considered possible concerns (Tier I CEC) for the Bay, as toxicity data are often incomplete or unavailable.

A comprehensive review of PFAS monitoring and toxicity data is needed to determine whether PFOS is the only member of the family to merit regular surveillance. (The RMP currently monitors for 13 perfluorinated chemicals including perfluorooctanoic acid (PFOA) and perfluorooctane sulfonamide (PFOSA).) The purpose of this study is to synthesize the PFAS monitoring to date, to evaluate the classification of these compounds according to the RMP CEC tiers, and to develop a strategy for monitoring PFASs.

Estimated Cost: $56,300

Oversight Group: ECWG

Proposed by: Meg Sedlak, Adam Wong, and Rebecca Sutton (SFEI)

PROPOSED DELIVERABLES AND TIMELINE

Deliverable	***Due Date***
Task 1. Compile data sets, standardize, conduct statistical evaluations	February 2017
Task 2. Evaluation of data in context of recent literature	Spring 2017
Task 3. Assessment of individual PFASs into Tiers (where sufficient information exists)	Spring 2017
Task 4. Draft report	6/31/2017
Task 5. Final report	9/15/2017

Background

Since their first discovery in the mid-1950s, perfluoroalkyl and polyfluoroalkyl substances (PFASs) have been widely used in almost every sector of the economy in such varied applications as providing grease-protection in food-packaging materials, water and stain-repellency for textiles and carpets (e.g., Scotchgard, Gore Tex), coatings for nonstick applications (polytetrafluoroethylene [PFTE] coatings for cookware [Teflon], aerospace, printed circuit boards, cables etc.), and surfactants in semiconductor, metal-coating industries, and firefighting (e.g., AFFF) (Kissa 2001; Wang et al. 2013).

PFASs are carbon chains that have at least one fully fluorinated carbon atom (Buck et al. 2011). In addition to fluorine, the chains may have functional groups such as alcohols, sulfates, carboxylates, ethers, etc. In the case of perfluoroalkyl substances, all of the hydrogens on the carbon are replaced by fluorine, C_nF_{2n+1}–, to which a functional group (e.g., sulfate or carboxylate) is added. Perfluorooctanic acid (PFOA) is an example of a perfluoroalkyl substance. Polyfluoroalkyl substances are not fully fluorinated; an example of polyfluoroalkyl substances are the fluorotelomer alcohols (e.g., 8:2 FTOH $C_8F_{17}CH_2CH_2OH$, which can degrade to PFOA).

As a result of high volume of production and chemical stability, PFASs have been detected throughout the world, even in relatively remote and pristine areas such as the Arctic. In the mid-2000s, PFOS was detected in the human blood supply and the major US manufacturer of perfluoroalkyl sulfonates phased out the production of longer chained PFASs (greater than 8 carbons) (Wang et al 2013). More recently, the USEPA has identified PFOA in 94 drinking water supplies across the country (EWG 2015) and in some instances the concentrations are significantly above the provisional health advisory of 400 ng/L established in 2009 (see letter to Mayor of Hoosick NY- http://www.epa.gov/sites/production/files/2015-12/documents/hoosickfallsmayorpfoa.pdf).

PFOS and PFOA are associated with a number of adverse health effects. Based on the findings of an independent panel reviewing the scientific literature as part of a class action settlement, exposure to PFOA in humans has been associated with six possible outcomes including: testicular cancer, kidney cancer, ulcerative colitis, thyroid disruption, and pregnancy induced hypertension (see http://www.hpcbd.com/Personal-Injury/DuPont-C8/Science-Panel-Probable-Link-Findings.shtml). In laboratory animals, exposure to PFAS has resulted in a myriad of adverse outcomes including low birth weights, compromised immune systems, and tumor formation (Lau et al. 2007). Very few studies have been conducted on the effects of PFAS of estuarine and marine animals. In a study of California sea otters, a significant correlation between the incidence of disease and PFOS/PFOA concentrations in liver was observed (Kannan et al. 2006).

As a result of the adverse impacts, there has been a shift in Europe and North America to shorter-chained carboxylates and sulfates such as perfluorohexanoic acid (PFHxA), perfluorobutanoic acid (PFBA), perfluorobutanesulfonic acid (PFBS) as potential substitutes (Wang et al. 2013); however, the toxicity of these shorter-chained compounds and the precursors to these compounds are not well understood. In addition, there is some evidence to suggest that some precursors (such as the fluorotelomer alcohols) may be more toxic than the perfluorinated carboxylic acids that they degrade to (Phillips et al. 2007).

PFOS and to a lesser extent PFOA have been detected in birds and seals in the Bay Area at some of the highest concentrations observed globally (Sedlak and Greig 2012; Sedlak et al. in prep). The concentrations of PFOS have declined in recent years but nonetheless remain at levels of concern particularly for birds (Custer et al. 2013). Based on the most recent seal and bird data, the concentrations of carboxylates do not show a similar decrease in concentration that was observed for PFOS. There is some concern that some precursors may be degrading to the carboxylates.

Using the RMP's CEC risk and management action framework, the RMP has classified PFOS as a moderate concern (Tier III) chemical, based on the early Bay data for seals and bird eggs (Sutton et al. 2013; Sutton and Sedlak 2015). Remaining compounds have been categorized as a class as possible concerns (Tier I), due largely to limited toxicity data. It is an appropriate time to re-assess the categorization of PFOS and to see whether there is sufficient information to consider re-classifying any of the other PFASs detected in the Bay.

Study Objectives and Applicable RMP Management Questions

The purpose of this study is threefold. First, the project will synthesize existing San Francisco Bay PFAS data collected by the RMP and other scientists into one document.

Secondly, this project will classify the PFASs detected in the Bay using the RMP's tiered risk framework that guides monitoring and management actions on emerging contaminants in San Francisco Bay (Sutton et al. 2013; Sutton and Sedlak 2015). Currently, PFOS is placed in Tier III (Moderate concern); all other PFASs have been placed in Tier I (Possible concern). This study would review the literature to confirm that the PFOS classification is still appropriate in light of new information and, in the cases where there is sufficient information, to classify other PFASs detected.

Third, this project will propose a monitoring strategy for the RMP for PFAS. At present, only cormorant eggs (triennial) and sportfish (every five years) are routinely monitored under Status and Trends for a subset of PFASs that includes PFOS and PFOA (13 analytes total).

PFAS includes quite a broad class of compounds comprising thousands of chemicals. It is neither logistically nor financially feasible to measure each and every one of these chemicals. Strategic decisions will need to be made about which compounds to monitor, and in which matrices.

In the absence of information regarding which chemicals are currently being used, it may be possible to use more generalized techniques to quantify PFASs. Houtz and Sedlak (2012) developed a method for measuring total PFAS precursors levels without requiring molecular identification of each one. Using this method, Houtz and Sedlak estimated that on average 70 % of Bay Area storm water is composed of unidentified precursors. Techniques such as this will be evaluated as potential additions to the RMP monitoring strategy.

Table 1. Study objectives and questions relevant to RMP management questions.

Management Question	Study Objective	Example Information Application
1) Are chemical concentrations in the Estuary at levels of potential concern and are associated impacts likely?	Synthesize disparate data sets and evaluate concentrations to recent literature.	This information will be used to classify chemicals in the RMP Tiers.
2) What are the concentrations and masses of contaminants in the Estuary and its segments? 2.1 Are there particular regions of concern?	Evaluate spatial distributions.	South Bay seal and cormorant eggs have higher concentrations of PFOS/PFOA.
3) What are the sources, pathways, loadings, and processes leading to contaminant-related impacts in the Estuary? 3.1. Which sources, pathways, etc. contribute most to impacts?	Synthesis will include data on stormwater and effluent pathways.	Estimation of loads to the Bay from wastewater treatment facilities and storm water runoff.
4) Have the concentrations, masses, and associated impacts of contaminants in the Estuary increased or decreased? 4.1. What are the effects of management actions on concentrations and mass?	Evaluate temporal trends in biota.	Conduct statistical analyses of data to determine potential trends.
5) What are the projected concentrations, masses, and associated impacts of contaminants in the Estuary?	Review predicted manufacturing trends as well as available data on degradation of precursors to end-products PFOS/PFOA.	Projections may inform classification in Tiers.

This effort would most directly address questions 1 and 4.

Approach

Synthesis

The synthesis will include the following studies focused on the San Francisco Bay:

- Harbor seals. Blood from harbor seals collected in 2004 through 2014 and analyzed for PFASs (Sedlak and Grieg 2012; Sedlak et al. in prep).
- Cormorant eggs. Since 2006, triennial sampling of cormorant eggs have been analyzed for a subset of PFASs as part of the Status and Trends program. Similar to seals, distinct spatial and temporal patterns are evident (Sedlak and Grieg 2012; Sedlak et al. in prep). Data from 2006, 2009, 2012, and 2016 (assuming it is available in time) will be included.

- Fish. San Francisco Bay Sportfish were collected in 2009 and 2014 as part of the RMP Status and Trends monitoring effort and analyzed for PFAS (Davis et al. 2011). In addition, prey fish were collected in 2009, 2010, 2011, and 2012 and analyzed for PFAS (Sedlak and Grieg 2012; Sedlak et al. in prep).
- Mussels. Bay Mussels were collected in 2009/2010 as part of a special study conducted by NOAA mussel watch and analyzed for PFAS (Dodder et al 2014).
- Water. Ambient Bay water was analyzed in 2009 (Klosterhaus et al. 2013) and an urban creek in the South Bay in 2007 (Plumlee et al. 2008).
- Sediment. Bay sediment samples were collected and analyzed in 2004 for PFAS (Higgins et al. 2005) and in 2012 (Benskin et al. 2013).
- Stormwater. Stormwater samples were collected from 10 Bay Area watersheds and analyzed for PFAS in 2010 and 2011(Houtz and Sedlak 2012).
- Effluent. Effluent has been analyzed for PFAS (Houtz et al. 2016) as well as several of the precursors (Benskin et al. 2013).
- Groundwater. Shallow groundwater was collected from the South Bay in 2007 and analyzed for PFAS (Plumlee et al. 2008).

An outline of the synthesis is presented in the Appendix.

Strategy

As part of the synthesis, a monitoring design for PFAS will be proposed that indicates: the matrix, spatial distribution, frequency, and analytes. We will vet the proposed strategy and classification of compounds with known PFAS experts including Derek Muir and Jennifer Field as well as the ECWG and TRC. We anticipate that the PFAS strategy will be updated in future years as part of the CEC strategy review.

Budget

The following budget represents estimated costs for this proposed special study (Table 3).

Table 3. Proposed Budget.

Personnel	**Budget**
Project Staff	$44,450
Senior Management Review	$1,930
Contract Management	NA
Data Technical Services	$7,460
GIS Services	$960
Honorarium (J Field)	$1,500
Total	$56,300

Reporting

Results will be provided to the RMP committees in the form of a draft report by 6/31/17. Comments will be incorporated into the final report published by 9/30/17.

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Appendix: Outline of the PFAS Synthesis and Strategy Report

1. RMP Monitoring of PFASs in San Francisco Bay
    a. PFASs: Structure and Uses
    b. Growing Concerns: Ubiquitous Contaminant, Hot Spots, Toxicity Studies
    c. PFAS Sources and Pathways
    d. Fate in the Environment: transformation processes and terminal degradation products
    e. Management Actions – brief summary
        1. Voluntary phase out C8; PFOA Stewardship Program
        2. Alternatives – Regrettable substitutions?
2. Summary of PFAS Occurrence and Trends
    a. PFASs in San Francisco Bay: The Abiotic Environment
        i. Water
        ii. Sediment
    b. PFASs in San Francisco Bay: Biota
    c. PFAS in Mussel
    d. PFASs in San Francisco Bay Fish
        i. Prey fish
        ii. Sportfish
    e. PFASs in San Francisco Bay Aquatic Bird Eggs
        i. PFASs in Double-crested Cormorant Egg
            1. Spatial and temporal variation
    f. PFASs in San Francisco Bay Harbor Seals
            1. Spatial and temporal variation
3. PFAS Contamination and Bay Impairment
    a. Risks to Humans: PFAS Levels in Fish Are Safe for Human Consumption
    b. Risks to Wildlife:
        i. PFASs Pose ? Risks to Benthic Organisms
        ii. PFASs Pose ? Risks to Fish
        iii. PFASs Risk to Birds
        iv. PFASs Pose Risks to Harbor Seals
    c. Potential for Impairment: Summary
4. PFAS Pathways and Loads to San Francisco Bay
    a. Pathways of PFASs to the Bay: Stormwater and Large Tributary Inputs
    b. Pathways of PFAS to Bay: Effluent
    c. Pathways to the Bay: Groundwater
    d. Pathways to the Bay: Contaminated sites –Former landfills, Use of AFFF at Spills/ Airports/ Refineries
    e. Loadings of PFASs to the Bay
5. Past and Future Trends in Contamination
    a. Declining Levels of PFOS in San Francisco Bay Biota
    b. Trends in other PFASs
        i. PFOA and other Carboxylates
    c. Trends in PFASs Observed in Wastewater and Sediment
    d. Anticipated Future Trends
        i. ?Fluorotelomer?

ii. Shorter chain
iii. Polyfluorinated
iv. Other markets – BRIC -PFOS?

6. CEC Strategy: PFAS Tiers, Monitoring and Management Strategy
    a. Classification for PFOS
    b. Recommendation for classification PFOA
    c. Recommendation for other PFASs
    d. Monitoring Strategy (Table)
        i. Abiotic
        ii. Biotic
            1. Target organisms

    e. Management Actions
        i. Federal
            1. Voluntary phase out C8 PFOS
            2. PFOA stewardship
            3. SNURs
        ii. State
            1. RWQCB Action Plan
            2. Potential Prop 65

Special Study Proposal: Phosphate Flame Retardants in Ambient Bay Water

Summary: California's past implementation of unique flammability standards has resulted in decades of flame retardant additives in consumer goods. RMP-funded monitoring of ambient Bay water in 2013 revealed the presence of numerous phosphate flame retardants. Some South Bay samples exhibited levels of one particular flame retardant, triphenyl phosphate (TPhP), which approached an established marine aquatic toxicity threshold. New furniture testing data also reveal key flame retardants in current use that have yet to be monitored. The proposed study would screen ambient water samples from San Francisco Bay to determine whether levels of TPhP or other widely used phosphate flame retardants commonly exceed aquatic toxicity thresholds. Findings are necessary to determine whether these chemicals have been appropriately classified as "possible concerns" (Tier I) within the RMP's Tiered Risk Framework for contaminants of emerging concern (CECs), and may influence ongoing efforts within state agencies aimed at reducing environmental contamination and ecological impacts of flame retardants.

Estimated Cost: $47,125

Oversight Group: ECWG

Proposed by: Rebecca Sutton (SFEI)

PROPOSED DELIVERABLES AND TIMELINE

Deliverable	Due Date
Task 1. Project Management (write and manage sub-contracts, track budgets)	2017
Task 2. Develop detailed sampling plan	Spring 2017
Task 3. Field Sampling	Summer 2017
Task 4. Lab analysis	Fall 2017
Task 5. QA/QC and data management	Winter 2017
Task 6. Draft report	5/31/2018
Task 7. Final report	8/31/2018

Background

The state of California has implemented unique flammability standards for consumer products. In response to nationwide phase-outs of polybrominated diphenyl ether (PBDE) flame retardants, manufacturers began to substitute other flame retardant chemicals in their products in order to meet these standards. One particular class of chemicals used as PBDE replacements are phosphate-containing compounds. Some phosphate flame retardants have

been in use for decades, while others are new. Some have broader industrial uses, such as additives in plastic. Of greater significance, some exhibit notable aquatic toxicity or endocrine-disrupting properties in laboratory tests. Others have received little study.

The RMP funded a Special Study in 2014 that detected some of these phosphate flame retardants in Bay water, sediment, and biota (Sutton et al. 2014, 2015). Ambient Bay water measurements indicated phosphate flame retardants were widely detected in San Francisco Bay. Tris (2-chloroehtyl) phosphate (TCPP) was typically the most abundant phosphate flame retardant in Bay water samples, followed by tris (2-butoxyethyl) phosphate (TBEP) and TPhP (Table 1).

Phosphate flame retardants were more concentrated in southern parts of the Bay, where surface waters experience the least amount of mixing with non-effluent flow and have the highest hydraulic residence time compared to other segments. The average total concentration of phosphate flame retardants in South and Lower South Bays was four times higher than in the rest of the Bay (Sutton et al. 2014). Averages of all individual phosphates were also higher in southern parts of the Bay (Sutton et al. 2014). San Francisco Bay has higher levels of contamination for most phosphate flame retardants relative to other estuarine or marine regions (Table 1). However, these findings are based on only 10 ambient Bay surface water samples.

Of greater concern than simple detection, some South Bay samples exhibited levels of TPhP approaching the marine aquatic toxicity threshold of 370 ng/L (predicted no effect concentration [PNEC]; ECHA 2014). The RMP's tiered risk and management action framework currently lists alternative (non-PBDE) flame retardants, which includes phosphate flame retardants, as a possible concern (Tier I) for the Bay due to insufficient monitoring and toxicity data. While TPhP was found to exceed a marine toxicity threshold, the limited number of exceedances did not support classification as a moderate concern (Tier III) for the Bay.

Should additional monitoring indicate such levels are common, this flame retardant could be considered to pose potential risks to Bay wildlife, potentially supporting the listing of TPhP as a moderate concern (Tier III) emerging contaminant for San Francisco Bay. The proposed study is designed to fill this critical data gap concerning the frequency of detections at or near a key toxicity threshold. Findings from the proposed study should provide sufficient data for TPhP and other phosphate flame retardants to be listed as either a moderate concern (Tier III), low concern (Tier II), or possible concern (Tier I) for the Bay.

Starting in 2014, changes to California's flammability standards may lessen use of chemical flame retardants in some consumer goods, and therefore possibly reduce contamination in the Bay. Monitoring may provide initial information as to the potential impacts of these actions. Unfortunately, recent foam furniture testing suggests widespread use of newly identified phosphates such as tertbutylphenyl diphenyl phosphate and isopropylphenyl diphenyl phosphate, which have not been examined in the Bay (Heather Stapleton, personal communication). USEPA Chemical Data Reporting from manufacturers in 2012 also suggests use of compounds not yet monitored, such as trixylyl phosphate, resorcinol bisdiphenyl phosphate, isodecyl diphenyl phosphate, di-tert-butylphenyl phenyl phosphate, and isopropylated triphenyl phosphate.

Table 1: Phosphate flame retardants in estuarine or marine environments (ng/L).

Location	Year	TCEP	TCPP	TDCPP	TPhP	TBP	TCrP	TBEP	TEHP	EHDPP	T35DMPP	T2IPPP	Reference
Estuarine / Marine													
San Francisco Bay	2013	6.9 - 300	44 - 2,900	5.3 - 450	13 - 300	3.3 - 39	ND - 5.5	24 - 840	ND - 4.2	ND - 2.3	ND	ND	*this study*
Southern California Bight	2006 - 2007	ND	ND - 56										Vidal-Dorsch et al. 2012
River Elbe Estuary	2010	5 - 20	40 - 250	6 - 30	0.3 - 4	2 - 7.5		ND - 80					Bollmann et al. 2012
North Sea (German Bight)	2010		3 - 28					ND - 6					Bollmann et al. 2012

Abbrev.	**Flame retardant**
Phosphates	
TCEP	Tris (2-chloroethyl) phosphate
TCPP	Tris (1-chloro-2-propyl) phosphate (multiple isomers)
TDCPP	Tris (1,3-dichloro-2-propyl) phosphate
TPhP	Triphenyl phosphate
TBP	Tri-n-butyl phosphate
TCrP	Tricresyl phosphate
TBEP	Tris (2-butoxyethyl) phosphate
TEHP	Tris (2-ethylhexyl) phosphate
EHDPP	2-Ethylhexyl diphenyl phosphate
T35DMPP	Tris (3,5-dimethylphenyl) phosphate
T2IPPP	Tris (2-isopropylphenyl) phosphate

Study Objectives and Applicable RMP Management Questions

This study will provide data essential to determining the placement of a number of phosphate flame retardants in the RMP's tiered risk framework, which guides monitoring and management actions on emerging contaminants in San Francisco Bay (Sutton et al. 2013; Sutton and Sedlak 2015). Previous detections suggest triphenyl phosphate in particular may require additional study (Sutton et al. 2014). Management questions to be addressed by this study are the same as those of the overall RMP program, as shown in Table 2.

Table 2. Study objectives and questions relevant to RMP management questions.

Management Question	Study Objective	Example Information Application
1) Are chemical concentrations in the Estuary at levels of potential concern and are associated impacts likely?	Compare measured concentrations to toxicity thresholds.	Do findings suggest specific phosphate flame retardants should be classified as moderate concern, low concern, or possible concern emerging contaminant within the RMP's tiered risk framework? Do data indicate a need for management actions?
2) What are the concentrations and masses of contaminants in the Estuary and its segments? 2.1 Are there particular regions of concern?	Compare levels in different embayments.	Do specific embayments or regions appear to have greater levels of contamination?
3) What are the sources, pathways, loadings, and processes leading to contaminant-related impacts in the Estuary? 3.1. Which sources, pathways, etc. contribute most to impacts?		
4) Have the concentrations, masses, and associated impacts of contaminants in the Estuary increased or decreased? 4.1. What are the effects of management actions on concentrations and mass?	Compare measurements to existing data from 2013.	Are there suggestions of trends in contamination levels, taking into account data limitations and differences in methods?
5) What are the projected concentrations, masses, and associated impacts of contaminants in the Estuary?	Review results alongside available projections of use and potential control actions under consideration by state and federal agencies.	Which anticipated changes or actions are likely to have the greatest impact on phosphate flame retardant pollution? Are additional/different actions needed?

This monitoring effort would most directly address question 1, determining whether contaminant levels exceed a toxicity threshold. Inferences regarding regional pollution patterns and temporal trends or future predictions could involve interpretation of the data within the context of Bay Area geography, existing data, and potential changes in use or regulation of flame retardants, all of which may play a role in addressing questions 2, 4, and 5.

In addition, the study will address the established emerging contaminants priority question: What emerging contaminants have the potential to adversely impact beneficial uses of the Bay?

Approach

Ambient Bay Water Sampling

Bay water sample collection will take place in the summer of 2017 as part of the RMP's regular Status and Trends water monitoring cruise. Grab samples of ambient Bay water (2 L, amber glass, 14 day hold time) will be collected at all Bay sites. Two field replicates and a field blank will also be collected. Some phosphate flame retardants are also used as plasticizers, so exposure to plastics will be avoided.

Analytical Methods

Samples will be analyzed by Dr. Da Chen of Southern Illinois University. Dr. Chen will measure the total suspended solids (TSS) of each sample, then characterize contaminants within the aqueous and solid phases using highly sensitive liquid chromatography–triple quadrupole mass spectrometry (LC–QQQ-MS/MS) based analysis methods (Chen et al. 2012; Chu et al. 2011). Limits of detection are typically in the range of 0.1 ppb.

Dr. Chen has agreed to undertake method development to add newly identified phosphate flame retardants, including tertbutylphenyl diphenyl phosphate and isopropylphenyl diphenyl phosphate, to his already extensive list of target analytes. Analysis is expected to cost around $600 per sample.

Budget

The following budget represents estimated costs for this proposed special study (Table 3). Efforts and costs can be scaled back by reducing the number of sites sampled.

Table 3. Proposed Budget.

Expense	Estimated Hours	Estimated Cost
Labor		
Project Staff	168	24,068
Senior Management Review	6	960
Project Management		NA*
Contract Management		NA*
Data Technical Services		4,500
GIS Services	3	280
Creative Services	4	317
IT Services		0
Communications		0
Operations		0
Subcontracts		
Name of contractor		
Dr. Chen, SIU, or comparable lab		15,000
Direct Costs		
Equipment		0
Travel		0
Printing		0
Shipping		2,000
Other		0
Grand Total		47,125

*services included in the base RMP funding

Budget Justification

Field Costs
Field costs are minimized through sample collection during the RMP's 2017 Status and Trends water sampling cruise.

Laboratory Costs
Analytical costs per sample are estimated to be $600. For 25 samples, including two field replicates and a field blank, the total analytical costs will be $15,000.

Data Management Costs
Standard data management procedures and costs will be used for this project. Final quality-assured data will be uploaded to CEDEN and made publicly available through CD3.

Reporting

Results will be provided to the RMP committees in the form of a draft report by 5/31/18, which will be reviewed by ECWG and the TRC. Comments will be incorporated into the final report published by 8/31/18.

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Special Study Proposal: Bisphenol Compounds in Ambient Bay Water

Summary: Bisphenols are a class of widely used endocrine-disrupting compounds, commonly found in polycarbonate plastics and epoxy resins and frequently detected in many environmental matrices. Bisphenol A (BPA) is a high-production volume compound, and use volumes of several BPA alternatives have increased in recent years. This study would screen ambient water samples from San Francisco Bay for 16 bisphenol compounds. The results of this initial screening will inform the classification of bisphenols within the RMP's tiered risk framework for contaminants of emerging concern (CECs).

Estimated Cost: $50,000

Oversight Group: ECWG

Proposed by: Jennifer Sun and Rebecca Sutton (SFEI)

PROPOSED DELIVERABLES AND TIMELINE

Deliverable	***Due Date***
Task 1. Project Management (manage subcontracts, track budgets)	2017-2018
Task 2. Develop detailed sampling plan	Spring 2017
Task 3. Field sampling – ambient Bay water	Summer 2017
Task 4. Lab analysis	Fall-Winter 2017
Task 5. QA/QC and data management	Spring 2018
Task 6. Draft technical report	9/30/18
Task 7. Final technical report	12/31/18

Background

Bisphenols are a class of widely produced endocrine-disrupting chemicals that are used in the manufacturing of polycarbonate plastics and epoxy resins, as well as various other products, including as developers applied on thermal receipt paper. Bisphenol A (BPA), the most widely used and studied bisphenol, is one of the highest production volume chemicals in the world (4.6 million tons in 2012), and can be found in products ranging from automotive and electrical equipment, linings for food containers and drinking water pipes, and thermal paper used in receipts such as those used at ATMs, gas stations, restaurants, and grocery stores (MRC, 2014; EPA Action Plan, 2010).

Leading up to California state and federal bans on BPA in certain feeding containers for children and babies in the early 2010s, several major manufacturers began replacing BPA in their products with alternative compounds – most commonly, Bisphenol S (BPS) and bisphenol F (BPF), two of the most structurally similar bisphenols to BPA. Measured concentrations of BPS and BPF in human urine in the United States appear to reflect that use volumes of these alternative bisphenol compounds have been increasing in recent years (Ye et al., 2015).

At the same time, concentrations of BPA use in other materials remain high. Recent studies have found high concentrations of both BPA and BPS (for example, 14 mg of BPA on a 3.125 x 12 in receipt) on thermal receipt papers, on which these compounds are used as developers (Apfelbacher, 2014). Bisphenols applied to the surface of the receipt paper are not bound to a polymer, and thus are very transferrable both to humans and the environment. Studies have shown that concentrations of BPA can be up to 10 times higher in the urine of humans that have handled BPA-coated receipt paper for just four minutes (Hehn, 2015; Hormann et al., 2014).

These compounds have been linked to a variety of potential negative health impacts in humans and wildlife, including estrogenic and genotoxic effects (Rosenmai et al., 2011; OEHHA, 2012; Lee et al. 2013). In 2011, a new aquatic hazard assessment lowered an aquatic health threshold (Predicted No Effects Concentration (PNEC)) for BPA from 100 ug/L to 0.06 ug/L, based on an assessment of 61 studies evaluating the ecotoxicological endpoints of survival, growth, development and reproduction in freshwater and marine organisms (Wright-Walters et al., 2011). This suggests that many previous measurements of BPA with method detection limits (MDLs) higher than 0.06 ug/L may no longer be adequate for assessing the risk of BPA toxicity.

Empirical data on the toxicity and environmental fate of most alternative bisphenol compounds are scarce, but a 2015 USEPA review of BPA and 4 bisphenol alternatives (BPS, BPF, BPC, BPAP, BPPH) in thermal paper gave the alternatives "Moderate" or "High" hazard designations for most human health or aquatic toxicity endpoints, and identified no clearly safer alternatives to BPA (US EPA, 2015). A review conducted by Biomonitoring California (a joint program of the California Department of Public Health, Department of Toxic Substancse Control, and Office of Environmental Health Hazard Assessment) in 2012 also predicted that many of the alternatives such as Bisphenol A-diglycidyl ether (BA-DGE), Bisphenol AF (BPAF), Bisphenol AP (BPAP), Bisphenol B (BPB), Bisphenol C (BPC), Bisphenol F (BPF), and Bisphenol PH (BPPH) were likely to be toxic or very toxic to aquatic organisms, according to US EPA criteria (OEHHA, 2012).

Although BPA and several of its alternatives photo- and biodegrade relatively quickly under aerobic conditions, degradation for BPA, BPE, BPB, and BPS has been shown in laboratory experiments to be slow under anaerobic conditions, such as in anoxic estuarine sediments (Voordeckers et al., 2002; Ike et al., 2006). Biodegradation of BPS in particular has also been shown in laboratory experiments to be slow in both artificial and field-collected seawater (no degradation detected in 30 days; Danzl et al., 2009). Several bisphenol alternatives evaluated by the US EPA's Persistent, Bioaccumulative and Toxic (PBT) Profiler are predicted to be "persistent" or "very persistent" in water (BA-DGE and BPAF) and sediment (BA-DGE, BPAF, BPAP, BPB, BPC, BPF, BPAP, BPS) according to US EPA criteria (OEHHA, 2012). Furthermore, regardless of degradation potential, the high production volume of these compounds suggests a constant source entering the environment, which may render even those compounds that degrade quickly a potential exposure concern for wildlife. Bisphenols are regularly detected in estuarine and marine waters, wastewater effluent and sludge, stormwater runoff, wildlife, sediment, freshwater bodies, groundwater, rainfall, air, and other environmental matrices (Flint et al., 2012; Huang et al., 2011; Cargheni, 2015), as well as human urine samples (BPA, BPS, BPF, and BPAF) (Ye et al., 2015; Liao et al., 2012).

The RMP had previously analyzed ambient Bay water samples for BPA (but no alternatives) as part of a broader pharmaceuticals scan in 2010 (Klosterhaus et al., 2013), but the detection limit used in

the analysis was 2.5 ug/L, well above the more recently established 0.06 ug/L PNEC (Wright-Walters et al., 2011), because the method is not specifically optimized for BPA detection. As a result, bisphenols are currently classified as an emerging contaminant of Possible Concern (Tier 1) in the RMP's CEC risk and management action framework, due to a lack of monitoring information (Sutton and Sedlak 2015). In 2014, the Emerging Contaminants Workgroup suggested that staff prepare a proposal to monitor for a broader panel of analytes that would include all possible bisphenols in production and amenable to analysis.

RMP has been working with laboratories to support better method detection limits for bisphenols and we believed that the methods are now robust enough to conduct a study to evaluate this class of compounds in the Bay. Most recently, the RMP participated in a pro-bono collaboration with Dr. Da Chen at Southern Illinois University to support development of a method for analyzing for a suite of bisphenol compounds in ambient Bay water samples. Method development is now complete, and provides the broadest assessment of bisphenols available.

This proposal outlines a study to monitor for BPA and 15 alternative bisphenol compounds in ambient Bay water. The results from this study will help indicate the level of risk posed by BPA and alternative bisphenols to wildlife in the Bay.

Study Objectives and Applicable RMP Management Questions

This study will provide data essential to determining the placement of bisphenols in the RMP's tiered risk framework, which guides monitoring and management actions on emerging contaminants in San Francisco Bay (Sutton et al. 2013; Sutton and Sedlak 2015). While limited monitoring data on bisphenols in the Bay is available, use volumes suggest that bisphenols are ubiquitous in the environment. Management questions to be addressed by this study are the same as those of the overall RMP program, as shown in Table 1.

Table 1. Study objectives and questions relevant to RMP management questions.

Management Question	Study Objective	Example Information Application
1) Are chemical concentrations in the Estuary at levels of potential concern and are associated impacts likely?	Compare measured concentrations to toxicity thresholds.	Do findings suggest BPA and other bisphenols should be classified as moderate concern, low concern, or possible concern emerging contaminant within the RMP's tiered risk framework? Do the data indicate a need for management actions?
2) What are the concentrations and masses of contaminants in the Estuary and its segments? 2.1 Are there particular regions of concern?	Compare levels in different embayments.	Do specific embayments or regions appear to have greater levels of contamination?
3) What are the sources, pathways, loadings, and processes leading to contaminant-related impacts in the Estuary? 3.1. Which sources, pathways, etc. contribute most to impacts?		
4) Have the concentrations, masses, and associated impacts of contaminants in the Estuary increased or decreased? 4.1. What are the effects of management actions on concentrations and mass?		
5) What are the projected concentrations, masses, and associated impacts of contaminants in the Estuary?		

In addition to addressing questions 1 and 2, the study will address the established emerging contaminants priority question: What emerging contaminants have the potential to adversely impact beneficial uses of the Bay? BPA is currently listed as a contaminant of possible concern (Tier 1) in RMP's tiered risk and management action framework due to a lack of information; findings will allow the ranking of this chemical to be reevaluated.

Approach

Ambient Bay Water Sampling

BPA and other bisphenols have been detected in ambient estuary water from urbanized estuaries around the world, where they may pose a threat to both human and wildlife health. BPA

concentrations in Puget Sound, a comparably urbanized estuarine system relative to the San Francisco Bay, were found to range from 0.0028 – 0.0043 ug/L. At these concentrations, BPA was shown to accumulate up to concentrations of 0.041 ug/g (wet weight) in salmon and 0.0045 ug/g in sculpin that use the estuary (Meador et al., 2015). Ambient water concentrations measured in the Yangtze River Estuary and East China Sea ranged from 0.00098 to 0.043 ug/L during the wet season (Shi et al., 2013). These results suggest that while ambient Bay water concentrations would be expected to be low relative to source concentrations, estuary water BPA concentrations have been measured on the same order of magnitude as the 0.06 ug/L BPA PNEC in other urban estuary systems, and it is possible that such levels of bisphenol pollution are present in the Bay as well.

Bay water sample collection will take place in the summer of 2017 as part of the RMP's regular Status and Trends water monitoring cruise. Grab samples of ambient Bay water (4 L, amber glass, 3 day hold time) will be collected at 22 Bay sites, including the 5 historical fixed sites and 17 random sites (three or four samples in each segment of the Bay). One field replicate and one field blank will also be collected.

Analytical Methods

BPA is moderately hydrophilic and bioaccumulative (log Kow = 3.4). In measurements of surface water and wastewater samples, BPA has been predominantly measured in the dissolved water fraction compared to particulates (Kalmykova et al. 2013). However, other BPA alternatives are predicted to more strongly adhere to sediments (log Kows: BPAF 4.47; BPB 4.13; BPAP 4.86; BPC 4.73) (OEHHA 2012). Thus, water samples will be collected and analyzed in total phase, including separate analyses for the dissolved and particulate fractions. Findings from this study may suggest whether or not future monitoring of sediment is warranted.

Total water samples will be analyzed by Dr. Da Chen of Southern Illinois University using a highly sensitive liquid chromatography–electrospray ionization(-)-triple quadrupole mass spectrometry (LC–ESI(-)-QQQ-MS/MS) based analysis method. This method will include analysis of bisphenol A, as well as suite of alternative bisphenol compounds, including bisphenols B, C, AF, AP, BP, M, E, P, F, PH, Z, G, TMC, and C-dichloride, as well as bisphenol A diglycidyl ether (BPA-DGE). Limits of detection are typically in the range of 0.1-0.5 ng/L, except for BPA-DGE (0.8 ng/L) and BPA-dichloride (1.0 ng/L). Per sample analytical costs are estimated to be $500.

Reporting

The following budget represents estimated costs for this proposed special study (Table 2). Efforts and costs can be scaled back by reducing the number of sites or matrices sampled.

Table 2. Proposed Budget

Task	Estimated Cost
Labor*	
Project Planning	$2,000
Field Work – 2017 Status & Trends Water Cruise	$0
Data Management	$2,000
Analysis & Reporting	$31,500
Subtotal	**$35,500**
Subcontracts	
Southern Illinois University – 25 samples @ $500/sample	$12,500
Subtotal	**$12,500**
Direct Costs	
Equipment	$100
Shipping	$1.700
Travel	$200
Subtotal	**$2,000**
Grand Total	**$50,000**

Budget Justification

Field Costs
Field costs are minimized through sample collection during the RMP's 2017 Status and Trends water sampling cruise.

Laboratory Costs
Analytical costs per sample are estimated to be $500. For 24 samples, including one field replicate and one field blank, the total analytical cost will be $12,000.

Data Management Costs
To minimize data management costs, data will undergo QA/QC by the laboratory and project PI, but will not formatted and uploaded to CEDEN. If bisphenol compounds are incorporated into standard RMP sampling events, this data may be added to CEDEN at a later date.

Reporting

Results will be provided to the RMP committees in a technical report, which will be distributed for internal RMP review only prior to the publication of a peer-reviewed journal manuscript. A draft of the report will be provided for review by 9/30/18. Comments will be incorporated into the final report by 12/13/18.

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Special Study Proposal: Triclosan in Small Fish

Summary: The RMP classification of the widely used antibacterial ingredient triclosan as an emerging contaminant of low concern (Tier II) for San Francisco Bay is based on a relatively small amount of data. A recent study of a West Coast estuary suggests monitoring in small fish may be a more sensitive indicator of impact; these data are lacking for San Francisco Bay. Characterization of triclosan in whole fish composites of juvenile salmon from the Puget Sound indicates levels of potential concern, despite low concentrations in estuary waters. Food web transfer is suspected of leading to the higher concentrations observed in small fish. The proposed study would screen small Bay fish for triclosan and its metabolite, methyl triclosan, to determine whether levels may pose concerns. These data are essential to appropriately classify triclosan within the RMP's tiered risk framework for contaminants of emerging concern (CECs), and may influence ongoing efforts among stakeholders and local and state agencies aimed at reducing environmental contamination and ecological impacts of this antibacterial agent.

Estimated Cost: $41,300

Oversight Group: ECWG

Proposed by: Rebecca Sutton and Meg Sedlak (SFEI)

PROPOSED DELIVERABLES AND TIMELINE

Deliverable	***Due Date***
Task 1. Project Management (manage subcontracts, track budgets)	2017
Task 2. Develop detailed sampling plan	Spring 2017
Task 3. Field Sampling	Summer 2017
Task 4. Lab analysis	Fall 2017
Task 5. QA/QC and data management	Winter 2017
Task 6. Draft report	4/30/2018
Task 7. Final report	7/31/2018

Background

Triclosan is an antimicrobial chemical used widely in personal care products, such as liquid hand soaps, and many other consumer goods. Triclosan has been detected in Bay sediment and surface water (up to 68 ± 26 ng/L; Kerrigan et al. 2015), with observed concentrations below available aquatic toxicity thresholds (e.g., a predicted no effects concentration [PNEC] of 115 ng/L; EC 2012). Triclosan was not detected in mussels collected from the Bay in 2010 (< 33 ng/g wet weight; see 2013 Pulse of the Bay), though trace levels of the

metabolite methyl triclosan were identified in mussel tissue subjected to non-targeted analysis (Sutton and Kucklick 2015).

Based on the available data for the Bay, the RMP has classified triclosan as a low concern (Tier II) contaminant, according to the tiered risk and management action framework (Sutton et al. 2013). However, recent monitoring in Puget Sound found that though estuary water contained just 5.2 ng/L triclosan (Sinclair Inlet), levels in juvenile salmon averaged 24.4 ng/g (whole fish composites), suggesting considerable food web transfer (Meador et al. 2016).

To assess whether these observed tissue concentrations are a cause for concern, it would be best to compare them to a toxicity threshold that is also based on tissue concentrations, essentially comparing apples to apples. However, this sort of tissue-specific toxicity threshold is not available. Existing toxicological studies on fish provide toxicity endpoints tied to concentrations in water to which the fish are exposed in controlled laboratory environments (e.g., Schultz et al. 2012). Unlike the fish in Puget Sound, the fish in lab studies are exposed to triclosan only through water, and not through the food web. Using a bioaccumulation factor to account for the food-based exposure pathway, we can estimate the hypothetical water concentration that would lead to observed tissue levels in Puget Sound fish. Fish exposed in the lab to this hypothetical, calculated water concentration, and fed food free of triclosan, would be expected to contain the same level of triclosan in their tissues as seen in the Puget Sound fish exposed to triclosan via the food web.

The Puget Sound scientists calculated this hypothetical water exposure concentration to be 271 ng/L. This hypothetical water exposure concentration could then be compared directly to concentrations used in toxicology experiments involving fish raised in a controlled environment that are exposed to triclosan only through the water, not via the food web. The calculated water equivalent level, 271 ng/L of triclosan, is near a level of triclosan (560 ng/L) that has been shown to significantly increase aggressive behavior in fathead minnows when exposed in combination with another widely used antibacterial agent, triclocarban (179 ng/L; Schultz et al. 2012). These two compounds are known to co-occur in the environment, often at comparable levels (Halden and Paull 2005).

The RMP's previous review of triclosan noted data gaps regarding the potential for transfer through the food web to act as a source of additional exposure to wildlife (Klosterhaus et al. 2011). With new findings from the Puget Sound suggesting this may be occurring in a similar West Coast estuary (Meador et al. 2016), there is now stronger motivation to determine whether levels of triclosan in the Bay's small fish may be a potential concern. At present, the estimation method outlined above is the only way to account for the effects of food web transfer using existing toxicity data.

A notable strength of the present proposal is the evaluation of both triclosan and its metabolite, methyl triclosan, in tissue. Methyl triclosan is formed from biological methylation of triclosan. It is more likely to bioaccumulate than triclosan (Bedoux et al. 2012), and may be more toxic (Bedoux et al. 2012), yet it is rarely characterized in monitoring studies.

Of note, while fish can be exposed to higher levels of triclosan from their surroundings, algae and invertebrates are often considered more sensitive (Chalew and Halden 2009). A

number of different aquatic toxicity thresholds for triclosan are available in the literature. Colgate-Palmolive scientists used an unconventional method to develop a PNEC of 1,550 ng/L (Capdevielle et al. 2008). In contrast, a more traditional and conservative method based on acute algal toxicity has led to use of a PNEC of 4.7 ng/L (e.g., von der Ohe et al. 2012). Should the latter threshold be considered more appropriate for San Francisco Bay, the few recent ambient Bay surface water measurements available (up to 68 ± 26 ng/L; Kerrigan et al. 2015) may suggest cause for concern. However, existing data are too few to trigger reclassification of triclosan within the RMP's CEC risk and management action framework (Sutton et al. 2013; Sutton and Sedlak 2015). Until more data are generated, triclosan may remain classified as a low concern (Tier II) for San Francisco Bay.

Study Objectives and Applicable RMP Management Questions

This study will provide data essential to determining the appropriate placement of triclosan in the RMP's tiered risk framework, which guides monitoring and management actions on emerging contaminants in San Francisco Bay (Sutton et al. 2013; Sutton and Sedlak 2015). Existing data on triclosan have led to classification as a low concern (Tier II) contaminant (along with other pharmaceutical and personal care product chemicals monitored; Sutton et al. 2013), but a recent study of Puget Sound suggests small fish may be a more sensitive indicator of exposure and potential concern (Meador et al. 2016). Management questions to be addressed by this study are the same as those of the overall RMP program, as shown in Table 1.

Table 1. Study objectives and questions relevant to RMP management questions.

Management Question	Study Objective	Example Information Application
1) Are chemical concentrations in the Estuary at levels of potential concern and are associated impacts likely?	Compare measured concentrations to toxicity thresholds (back-calculated to account for food web magnification).	Do findings suggest triclosan is appropriately classified as a low concern for San Francisco Bay? Do data indicate a need for management actions?
2) What are the concentrations and masses of contaminants in the Estuary and its segments? 2.1 Are there particular regions of concern?		
3) What are the sources, pathways, loadings, and processes leading to contaminant-related impacts in the Estuary? 3.1. Which sources, pathways, etc. contribute most to impacts?		

4) Have the concentrations, masses, and associated impacts of contaminants in the Estuary increased or decreased? 4.1. What are the effects of management actions on concentrations and mass?		
5) What are the projected concentrations, masses, and associated impacts of contaminants in the Estuary?	Review results alongside available projections of use and potential control actions under consideration by local, state and federal agencies and organizations.	Which anticipated changes or actions are likely to have the greatest impact on triclosan pollution? Are additional/different actions needed?

This monitoring effort would most directly address question 1, determining whether contaminant levels exceed a toxicity threshold. Inferences regarding future pollution could involve interpretation of the data within the context of use information and potential changes in use or regulation of this antimicrobial pesticide, all of which may play a role in addressing question 5.

In addition, the study will address the established emerging contaminants priority question: What emerging contaminants have the potential to adversely impact beneficial uses of the Bay? The RMP's tiered risk and management action framework currently lists pharmaceuticals and personal care products including triclosan as a low concern (Tier II) for San Francisco Bay; findings would be used to update this classification based on a more sensitive indicator.

Approach

Ambient Bay Small Fish Sampling

Small fish will be collected through a strategic collaboration with an existing sampling effort in the Lower South Bay, the region of the Bay with the greatest likelihood for organism exposure to wastewater-derived chemicals. Dr. James Hobbs (UC Davis), the principal investigator of this on-going effort, has expressed willingness to collaborate.

Mississippi silversides are expected to be an appropriate sentinel species for this study, though others may be considered. Small fish will be shipped whole to AXYS Analytical (or a comparable laboratory) for preparation as whole-fish composites (4-10 individuals per composite, depending on species and size). A total of up to 17 composite samples will be tested, along with one field replicate, one field tissue blank, and a reference sample. Minimum sample size is 2.5 g.

Analytical Methods

Samples will be analyzed by AXYS Analytical or a comparable laboratory. AXYS will soon release a new method to determine both triclosan and methyl triclosan in tissue. The

instrument detection limit for triclosan is expected to be 1 ng/g, while for methyl triclosan it is expected to be in the range of 1-5 ng/g. Per sample analytical costs are estimated to be $440 for AXYS, which includes preparation of composites and lipid analysis as well as chemical analysis.

Budget

The following budget represents estimated costs for this proposed special study (Table 2). Efforts and costs can be scaled back by reducing the number of composites sampled.

Table 2. Proposed Budget.

Expense	Estimated Hours	Estimated Cost
Labor		
Project Staff	168	24,000
Senior Management Review	6	1,300
Project Management		0*
Contract Management		0*
Data Technical Services		4,000
GIS Services		0
Creative Services	6	500
IT Services		0
Communications		0
Operations		0
Subcontracts		
Name of contractor		
AXYS or comparable lab		8,800
Direct Costs		
Equipment		1,000
Travel		500
Printing		0
Shipping		1,200
Other		0
Grand Total		41,300

*services included in the base RMP funding

Budget Justification

Field Costs
Field costs are minimized through sample collection in collaboration with an existing monitoring effort.

Laboratory Costs
Analytical costs per sample are estimated to be $440. For up to 20 samples, including one field replicate, a field blank, and a reference specimen, the total analytical costs will be $8,800.

Data Management Costs
Standard data management procedures and costs will be used for this project. Data will not be uploaded to CEDEN at this time.

Reporting

Results will be provided to the RMP committees in the form of a report. A draft will be provided for review by 4/30/18. Comments will be incorporated into the final report published by 7/31/18.

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PS/SS: Estrogen receptor *in vitro* assay linkage studies

Estimated Cost: $45,000 for 2017.
Oversight Group: Emerging Contaminants Workgroup and Exposure and Effects Workgroup
Proposed by: Nancy Denslow (University of Florida)

Proposed Deliverables and Time Line

Deliverable		Completion Date
Task 1:	**ER dose response linkage in vitro/in vivo**	**12 months**
Task 2:	**Demonstrate usefulness of assay with environmental samples**	**12 months**
Task 3:	**Report**	**12 months**

BACKGROUND

There is no longer any question that pharmaceuticals and personal care products are found in surface waters in our environment at concentrations that have biological activities in aquatic organisms (reviewed in (Cooke et al. 2013). Alterations among higher order endpoints have been observed including alterations of gonadal sex differentiation, causing a disproportionate female sex ratio, changes in secondary sex characteristics, reduction in reproduction and growth, and alterations of courting behavior, among others (Matthiessen and Sumpter 1998; Rodgers-Gray et al. 2001; Sarria et al. 2011; Adedeji et al. 2012; Baumann et al. 2014). The most studied are chemicals that either mimic the function of 17β-estradiol (E2) or interfere with the biosynthesis or metabolism of the endogenous hormone. As might be anticipated, it is now recognized that the activities of multiple estrogen mimics when present together in mixtures in an effluent are additive (Brian et al. 2007), making it problematic to monitor effluents using the "one chemical at a time" approach.

While the gold standard is to measure higher order alterations directly *in vivo*, the experiments are costly in both time and money and require the use of hundreds to thousands of fish and furthermore are impractical to run routinely. Based on the recommendations of the National Academy of Sciences (NRC 2007), toxicologists are turning their attention to high throughput *in vitro* assays that are specific for mechanism of action and which are much more cost effective than *in vivo* assays (Dix et al. 2007; Judson et al. 2009; Martin et al. 2009; Conley et al. 2016). However, before these assays can be used in a regulatory framework, it is important to establish linkages from the *in vitro* assays to *in vivo* end points. While some studies have done this with fresh water fish, studies with estuarine fish are lacking. For the fresh water fish it is now clear that affinity of a chemical for the ligand binding domain of the estrogen receptor is a good predictor of higher order effects (Miyagawa et al. 2014). A strong linkage between the two for estuarine fish would enable managers to monitor routinely for estrogens in San Francisco Bay with a bioanalytical test. The gap in being able to predict *in vivo* endpoints from *in vitro* assays precludes this approach from being widely used. In this project, we will reduce the gap, clearly linking concentrations that are necessary for activity both *in vitro* and *in vivo*. Our preliminary data obtained from the phase 1 application to SFEI, clearly shows this will be

possible to do. In addition, we will pilot a small study to see how the *in vitro* assay would work on both water and contaminated sediments in San Francisco Bay. Recent publications suggest that sediment may be a sink for endocrine active compounds (Sangster et al. 2014; Zhang et al. 2015).

Study Objective and Applicable RMP Management Question

Our first phase study clearly showed that it would be possible to link *in vitro* ER assays to *in vivo* endpoints. Our conclusion was that the concentrations of estrogens needed to be above the EC_{50} point for the *in vitro* assays to see effects *in vivo* with *Menidia*. However, the dose response curve for the *in vivo* endpoints was broad and we missed several critical doses that would narrow the comparison from *in vitro* to *in vivo*. While the data allows us to extrapolate those values, it would be better to pinpoint the comparison a little more closely and also to repeat the whole study to see if the relationships continue to hold. Further, we intend for this assay to become a standard monitoring tool and will develop a pilot study to measure estrogen equivalencies at 6 locations in the bay, testing both the water and sediments, to determine the usefulness of the approach. Results from this study will begin to enable managers to determine whether or not additional cleanup is necessary for treated effluents that are disposed into sensitive estuarine environments. This work will not only be important for California, but also for other states that border marine environments and which may still be using old technologies for water treatment and discharge. The overall objective of this effort is to develop a tool that will assist in the identification of chemicals of emerging concern that are adversely affecting biota. This study would address the following RMP management question (MQ):

MQ1. Are chemical concentrations in the Estuary at levels of potential concern and are associated impacts likely?

This targeted study will have two objectives:
(1) To repeat the *in vivo* portion of the linkage study with tighter concentrations around the likely EC_{50} for *in vivo* responses.
(2) To test water and sediment from 6 locations in San Francisco Bay for estrogenic equivalencies as a pilot test for this approach.

Study Plan

In phase 1, we tested both strong and weak estrogens with the *in vitro* estrogen transactivation assay from InVitrogen. We also performed *in vivo* assays with two life stages, larvae (10-17 days post hatch (dph)) and juveniles (30-58 dph) and examined higher order endpoints including for larvae, survival, growth and gene expression and for juveniles, gonadal tissue differentiation, growth and gene expression. For this phase-2 project, we will concentrate our efforts on 17β-estradiol (E2), as a prototypic estrogen for which we will develop the linkage from *in vitro* to *in vivo*. We will use the juvenile life stage of *Menidia beryllina* (inland silversides), as this stage provided the most sensitivity for higher order effects from estrogens. For this assay we will measure gonadal tissue differentiation, growth and hepatic gene expression for two genes, whose expression in juvenile fish depends on the presence of E2. We will index estrogen equivalency concentrations required for altering higher order endpoints with biochemical responses within the fish and responses obtained with the commercially available estrogen receptor (ER) transactivation assay from InVitrogen. These linkages will enable the use of *in vitro* assays as measurements of both exposure and effect. The concentrations required for both *in vivo* and *in vitro* assays will be quantified to determine reference concentrations above which effects may be expected.

Task 1:	ER dose response linkage in vitro/in vivo

Building on our previous work, we will start with 30 dph Menidia and treat them with 7 concentrations of E2, including 2, 10, 20, 40, 80, 200 and 500 ng E2/L compared to control (no E2). The EC_{50} for the *in vitro* assay is 20 ng E2/L and we expect the curve for *in vivo* higher order effects to be slightly shifted to the right. We know from previous work that 200 ng/L is close to the plateau and by 500 ng/L we have reached the plateau (Fig. 1). The test chemicals will be mixed with a small volume of triethylene glycol (TEG) as a carrier to ensure the chemical gets into the water phase. Dilution water will dechlorinated tap water adjusted to 15 ppt salt (using Instant Ocean) and temperature will be controlled to 23 ± 1 °C, following our modifications of the standardized test guidelines for early life testing (US-EPA 1995) (Denslow et al.). Fish will be fed dechorionated/hatched artemia (E-Z egg) and all exposures will be performed in quadruplicate in tanks containing 6L of water. Exposure solutions will be changed daily at 75% of total volume. Confirmation of exposure concentrations will be performed using an ELISA for E2 (Cayman)(Allinson et al. 2010), as we have done previously (Denslow et al.).

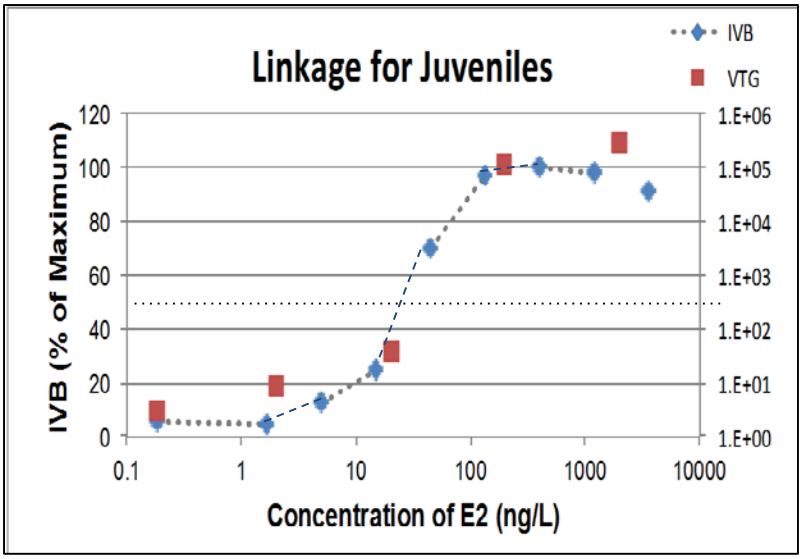

Figure 1. *In vitro* to *in vivo* linkage results from Phase 1. The blue line represents the dose-response curve for the *in vitro* assay, showing an EC_{50} of about 20 ng/L. The red dots represent hepatic Vtg gene expression after 28 days from *in vivo* exposures. The two assays were superimposed on one graph. We are uncertain about the actual relationship of the two graphs. Feminization of fish occurred at concentrations greater than 200 ng E2/L at which point 80% of the fish were female. At 500 ng E2/L, 100% of the fish were female.

From our phase 1 experiment, we know that female *Menidia* differentiate their gonadal tissue in the 35 to 45 dph time frame, while males differentiate their tissues close to 120 dph. Consequently we will treat the juvenile *Menidia* for 28 days, starting with fish that are 30 dph and going to 58 dph, to capture the window for female tissue differentiation. After this time, some of the fish will be sampled and others will be grown in clean water for two months to capture the male gonadal differentiation period. We will take pictures of the fish at the beginning of the experiment, after 14 days, 28 days and at the end of the grow out period to capture growth.

After the 28-day exposure, some of the fish will be sacrificed and livers will be obtained using a dissecting scope. We will prepare hepatic total RNA and measure expression of vitellogenin (Vtg) and choriogenin (Chg), two genes that are known to be under the control of estradiol. We will use at least two housekeeping genes, ribosomal protein L8 (rpL8) and GAPDH.

For histopathology verification of gonadal sex differentiation, we will use cassettes with 4 compartments and capture the gonadal tissue as a sagittal section, using the methods we used in Phase 1 (Denslow et al.).

Task 2:	**Demonstrate usefulness of assay with environmental samples**

This will be a pilot study to show the utility of the *in vitro* assay in San Francisco Bay. We will work closely with staff at SFEI to collect water (1 L) in triplicate and sediments (50 g) in triplicate from 6 locations of varied condition in the Bay. We will provide HLB cartridges and a protocol to SFEI staff for the water collections, which they will put onto the HLB cartridges and mail them along with the triplicate sediment samples from the same location via FEDEX to the Denslow laboratory. We will elute the HLB cartridges with MEOH once we receive them. Sediments will be extracted with acetone using a sonication method we have developed previously (Dang et al. 2016). Extracts will be tested on the Invitrogen ER transactivation assay along with a full 9-point standard curve in both agonist and antagonist mode with the water and sediment extracts to obtain estrogen equivalencies. Each extract will be tested at 4 concentrations, using a binary dilution scheme, following methods we have previously developed (Escher et al. 2014; Maruya et al. 2015; Mehinto et al. 2015).

After examining the *in vitro* results, two concentrations of the extracts that are quantifiable within the linear range of the activity assay will be injected IP into adult male *Menidia* and these will be held for 48 h to confirm changes in hepatic gene expression for Vtg and Chg. We have determined previously that 48 h is sufficient time to see changes in gene expression for these genes in sheepshead minnow, another estuarine fish with approximately the same sensitivity as *Menidia* (Bowman et al. 2000; Denslow et al. 2001). We will also perform histopathology to confirm the sexes of the fish. These experiments will be performed with at least 8 fish per concentration. Livers will be dissected out for total RNA and gonads will be prepared for histopathology.

Expectations and Alternative Strategies. We expect to see very similar *in vitro* and *in vivo* results with *Menidia*, as we have obtained in the Phase 1 study (Denslow et al.), except that we will have enough concentrations to develop an *in vivo* dose response curve. From past experiments, we are confident that these concentrations will impact molecular endpoints within the fish resulting in alteration of gene expression, alterations of gonadal development and growth. Acceptable mortality in the experiments will be <10% for the quadruplicate tanks. The acceptable variance for duplicate determinations of gene expression by Q-PCR will also be 10%.

Task 3: Reporting

We plan to submit a report at the end of year 1. We expect that we will be able to derive relationships between the different levels of results, from the molecular *in vitro* high throughput assays to *in vivo* molecular endpoints and to *in vivo* higher order changes in growth and gonadal tissue differentiation. We expect this demonstration project to show the usefulness of the approach.

Budget

The scope of this study will require one year. We are requesting a total budget of $45,314. This project has already had significant leveraging through the completion of phase 1 of the project. Development of the transactivation assays were originally funded by the State of California Water Board in 2013 ($800,000) and completion of phase 1 of the project required substantial internal funding (on the order of $50,000), in addition to the funds provided by SFEI. We anticipate that this project will take a full year to complete, but have budgeted time very conservatively.

Project Budget

Description	Cost per unit	Total cost
Task 1: ER dose response linkage		
Supplies: in vivo exposure, gene expression by qPCR, histology, E2 dose verification	$10,500	$10,500
Labor -- 2 months	$12,167	$12,167
Task 2: Environmental samples from the Bay		
Supplies for 4 samples in triplicate X 3 = 12 samples -- includes 1 Invitrogen kit/4 samples, fish for IP injection, qPCR, histology, SPE columns	$2,500	$7,500
Labor -- 1 month	$6,084	$6,084
Total direct		$36,251
IDC at 25%		$9,063
Total requested from SFEI		$45,314

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Benthos and Sediment Toxicity Monitoring Strategy – June 2016 TRC Meeting

Strategy for Benthos and Sediment Toxicity Monitoring by the RMP

Estimated Cost: $10,000

Oversight Group: Exposure & Effects Workgroup

Proposed by: Phil Trowbridge

Background

Monitoring for benthic invertebrates and sediment toxicity has been part of the RMP Status & Trends Program for decades. From 2009-2016, a number of special studies have been completed on benthic assessment tools and the causes of moderate sediment toxicity in the Bay. No additional studies are planned. In 2018, the RMP is scheduled to collect the next round of benthic invertebrate and sediment toxicity data. Therefore, the Exposure and Effects Workgroup recommended developing a short strategy document outlining what has been learned over the past 7 years of special studies and how the RMP should proceed in the future with benthic monitoring.

Strategy Document Outline

1. Upcoming management decisions, management utility of the data
    a. Sediment Quality Objectives
    b. Benthic grazer abundance for NMS modeling and studies
    c. Baseline for biological invasions, "step changes" in Bay ecology
    d. Possible endpoint for effects of PAHs in sediment
2. Synthesis of RMP studies on benthos and sediment toxicity methods
    a. Summary of previous work (RMP and others)
    b. Highlight resolved and unresolved issues of management relevance
3. Summarize alternatives to the RMP methods for benthic monitoring
    a. Benthic cameras
    b. In-situ assays
4. Multi-Year Plan for benthos and sediment toxicity monitoring by the RMP
    a. S&T Monitoring Schedule (Note: the EEWG recommends collecting benthos and sediment toxicity data in 2018 as planned. The strategy would guide how that data should be collected and how they should be interpreted.)
    b. Special Studies

Expected document length: 10-20 pages

Deliverables and Schedule

Task 1. Stakeholder engagement on management relevance. 1-2 calls with interested stakeholders. Discussion at the TRC and EEWG meetings (by 6/15/17)

Task 2. White paper with Multi-Year Plan for Benthic Sampling (draft by 3/30/17 for TRC and EEWG meetings; final by 9/30/17 in time for multi-year planning workshop)

Budget

$10,000

Strategy for Monitoring Water Temperature, Salinity, and Acidification due to Climate Change in San Francisco Bay

Estimated Cost: $30,000

Oversight Group: Exposure & Effects Workgroup

Proposed by: Phil Trowbridge

Background

Due to climate change, the temperature, salinity, and acidity in San Francisco Bay is changing. Furthermore, changes in water recycling practices have the potential for local effects on salinity and fresh water inflows in specific areas. These changes are largely out of the control of local managers. However, the changes will affect habitat which could either hurt or help local management policies to achieve aquatic life beneficial uses, for example:

- Effects of temperature, salinity and acidity changes on algae and HAB formation in the Bay
- Effects of increased recycled water in Lower South Bay on salinity and species-specific habitat
- Effects of sea level rise on water quality as formerly developed lands are inundated
- Effects of reduced Delta outflow and increased North Bay salinity on selenium uptake and food web transfer
- Effects of increased acidity in Bay waters on metals availability and toxicity to benthos and fish

Therefore, it is important to anticipate the changes, have a program to document the changes that actually happen, and to understand the effect the changes could have on habitat quantity (i.e., range and volume) and quality for species of management interest.

The Exposure and Effects Workgroup recommended that the RMP develop a strategy for monitoring and assessment of climate change stressors in the Bay. Climate change is huge topic with many facets. The RMP's niche in this large topic could be regional monitoring for a limited number of physical and chemical parameters.

In the future, a phase II activity could be to identify species of interest for aquatic life beneficial uses that would be vulnerable to climate change and devise a research program. This phase II activity is currently beyond the scope of the RMP.

Approach

Task 1. Workshop on Ocean Acidification. In 2015, RMP developed a $30,000 proposal for a workshop on ocean acidification effects on the Bay. The RMP did not fund the proposal. However, EPA recently awarded SFEP, RTC and SFEI $10,000 for this task (as well as funds to deploy pH sensors on buoys in the Bay). The workshop is tentatively scheduled for October 2016. Without additional funds, the workshop will not be able to bring in outside experts or to write a comprehensive meeting outcomes summary. Funding from the RMP in the amount of $20,000 would make these outputs possible.

Task 2. Long-term Monitoring Design for Water Temperature, Salinity, and Acidification due to Climate Change in San Francisco Bay. The strength of the RMP is in designing efficient and effective regional monitoring programs. Many agencies are involved with climate change planning and the monitoring

programs are equally widely distributed. The RMP could serve a critical role as a coordinating entity for the various monitoring programs for sea level rise, water temperature, salinity, and acidification. The process for developing this monitoring program would be to work with partners such as SFEP, SFBNERR, and SFBJV to identify:

- the existing indicators for tracking climate change in the Bay,
- the existing monitoring to support those indicators, and
- the critical gaps that could be filled with regional monitoring.

Deliverables and Schedule

Task 1. Workshop on Ocean Acidification (by 12/31/16)

Task 2. Long-term Monitoring Design for Water Temperature, Salinity, and Acidification due to Climate Change in San Francisco Bay (draft by 5/1/17 for EEWG; final by 9/30/17)

Budget

Task 1: $20,000

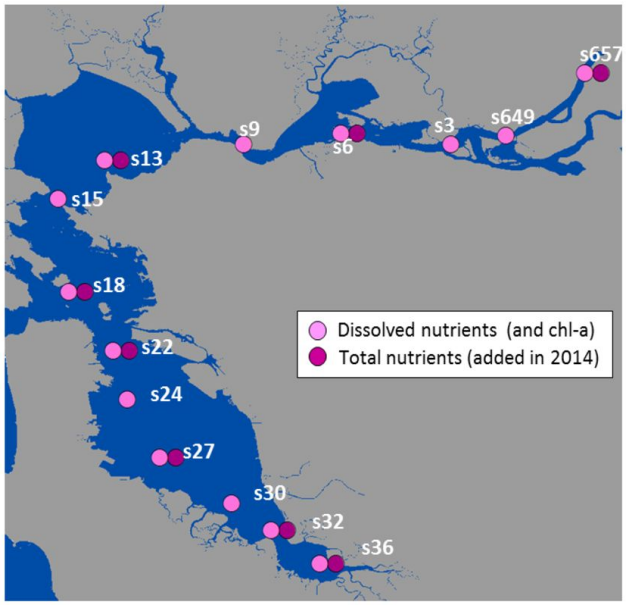
Task 2: $10,000

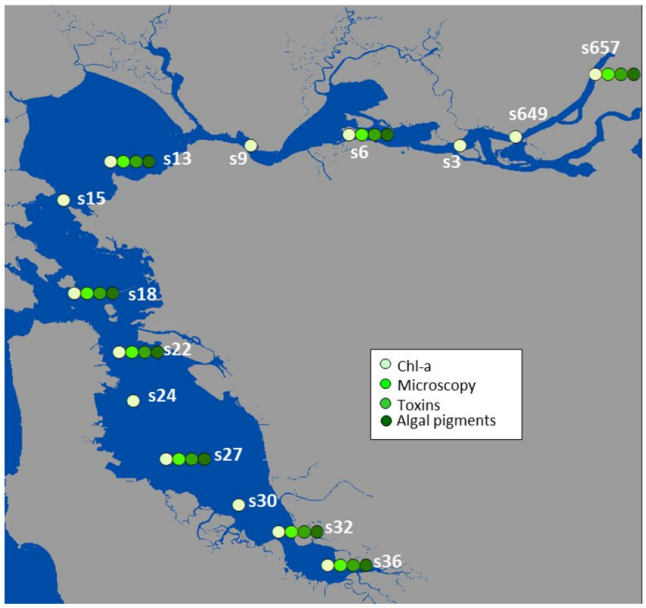
Total: $30,000

Nutrient Management Strategy Proposals for RMP Funding

C.1 Ship-based sampling and sample analysis
FY17 Estimated NMS Cost = $153,000
Collaborators: USGS, UCSC, SFEI

Ship-based samples will be collected and analyzed for a range of nutrient-related parameters. This data is essential for basic condition assessment, model calibration, and improved understanding of nutrient behavior and nutrient-related effects in the Bay. Ship-based discrete samples will be collected by USGS aboard the R/V Peterson on ~12 full-bay cruises and an additional ~12 South Bay cruises.





Costs covered by NMS

- Nutrient analyses (USGS national lab)
- Analysis of integrated toxin samples (SPATT), discrete toxin samples, and algal pigments (at UCSC)
- Basic data QA/QC and basic reporting
- Additional staff support on cruises to support the collection of NMS-related samples: inorganic nutrients, total nutrients, microscopy, algal pigments, and particulate algal toxins; spatially integrated toxin samples (SPATT)

Costs covered by USGS as part of their core program

- Collection of samples for chlorophyll and ancillary data (e.g., suspended particulate matter, dissolved oxygen, salinity)
- Vertical profiles for multiple parameters
- Underway flowthrough data collection (salinity, T, chl-a fluorescence, turbidity/optical backscatter)
- Program management, scientific oversight
- Data management for USGS parameters plus inorganic nutrients

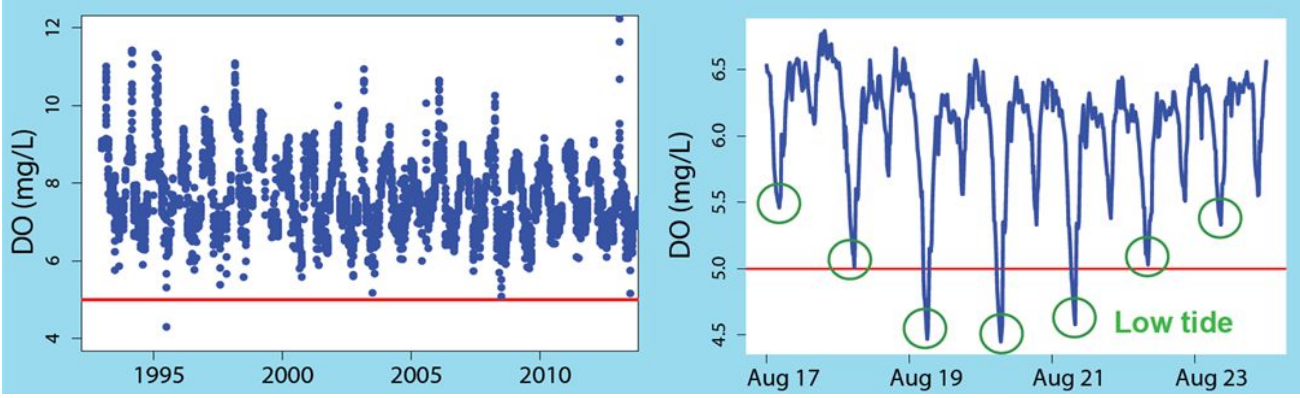
- Ship maintenance, fuel, crew, etc.

Deliverables
Nutrient and chl-a data will be made publicly available through USGS's website. Results will also be summarized in the NMS Annual Report. Data will be used for many NMS aspects (model calibration, condition assessment, assessment framework development).

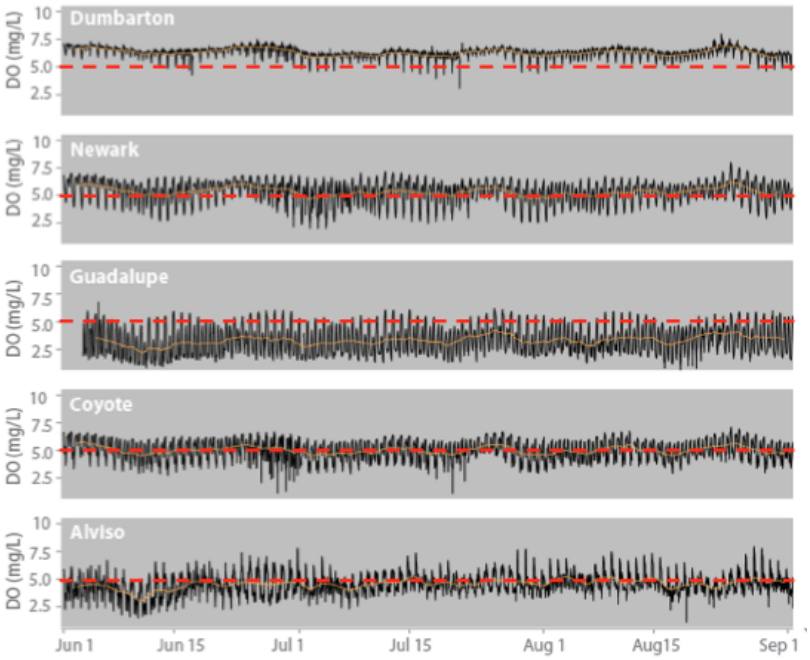
Budget Justification
Nutrient analyses for 300 station-date samples ($40,000; ammonium, nitrate + nitrite, reactive phosphorous, dissolved silicate; total N and P measured at a subset of sites samples); Taxonomy on ~200 samples for phytoplankton community composition and biovolume ($45k); toxin and algal pigment measurements ($55k); Additional staff support for field work ($20k).

C.3 Open-Bay and slough moored sensors: data analysis/interpretation and maintenance
FY17 Estimated NMS Cost = $342,000
Collaborators: SFEI, USGS-Sac, UC Berkeley

While San Francisco Bay is generally not known to be either eutrophic (primary production > 300 g C m^{-2} y^{-1}) or hypoxic (dissolved oxygen < 2 mg L^{-1}), a substantial portion of our knowledge of SFB biogeochemistry comes from a long-term dataset collected in the Bay's main channel. Over the past ~2 decades, dissolved oxygen rarely dipped below 5 mg L^{-1} during biweekly to monthly surveys at stations in South and Lower South Bay (below left). More recently, though, high-frequency moored *in situ* sensors at the Dumbarton Bridge have shown that dissolved oxygen concentrations frequently drop to levels not typically observed in the long time series. For example, dissolved oxygen repeatedly dipped near or below 5 mg L^{-1} in August 2013 during the lower low tide several days in a row (below, right). The DO signal was strongly coupled to the tides at multiple frequencies (semidiurnal: two highs and two lows per day; fortnightly: two spring tides and two neap tides per lunar month), with lowest DO observed around the spring tide on August 20, 2013. Since dissolved oxygen decreases on ebbing tides, we hypothesized that lower dissolved oxygen waters were being advected from margin habitats, including the extensive network of sloughs and creeks in Lower South Bay (SFEI 2015a).



We began testing this hypothesis in Spring/Summer 2015 by installing a network of moored sensors in margin areas of Lower South Bay, measuring dissolved oxygen and a range of other parameters (e.g., salinity, T, turbidity, chl-a fluorescence). Observations over Summer 2015 confirmed that DO frequently fell below 5 mg L^{-1} at multiple sites. The data also indicated that condition varied substantially among the sites, and that DO concentration was strongly influenced by the tides. In addition, DO-related condition at individual sites appears prone to large differences between years, based on comparisons of summer 2012 and 2015 data in Alviso Slough (SFEI 2015a).



Dissolved oxygen concentrations at a subset high-frequency moored sensors sites in Lower South Bay.

FY17 work will focus on the following:

- Complete Year 3 of open bay stations (San Mateo, Dumbarton Bridges) and Alviso Slough.
- Complete Year 1 of slough/creek deployments, and extend through a second summer/fall/winter.
- Data analysis, and quantitative mechanistic interpretations to identify factors contributing to observed conditions.
- Sensor network maintenance.
- Data management and QA/QC.

Deliverables:

- Mid-fiscal year (Dec 2016) update to inform FY18 priorities;
- Summary of major observations in the NMS FY17 Annual Report (e.g., SFEI 2015b), and technical report(s) included as appendices to the annual report describing:
    - Spatial/temporal variability in LSB/South Bay/open Bay and slough water quality (DO, chl, etc.)
    - Mechanistic interpretations, including physical forcings (including exchange between pond ← → sloughs ← → Bay)
    - Initial inferences related to the potential influence of anthropogenic nutrients on DO conditions at specific sites or in LSB margins more broadly, and the potential role of exchange with salt ponds on DO, phytoplankton biomass, and nutrient budgets in LSB.

Budget Justification: 2 staff (0.8 FTE, 0.65 FTE; $233,000) for field work, data management, data analysis, interpretation, and report preparation. Field support and additional technical support (including boat, fuel, field technicians; USGS, $80k); equipment/supplies ($30k, replacement sensors, maintenance).

DIOXIN SYNTHESIS REPORT

Donald Yee, Jay Davis, SFEI, Richmond, CA

ESTIMATED COST: $40,000
OVERSIGHT GROUP: Dioxin Workgroup

Proposed Deliverables And Timeline

Deliverable	Due Date
Task 1. Simple numerical models	Mar 2017
Task 2. Draft report	Oct 2017
Task 3. Final report	Dec 2017

Summary

Additional data on dioxin concentrations and loads have been collected in various media since the last dioxin synthesis in 2004. This effort would formally report and interpret this new information and evaluate the needs or potential for additional data collection or management action for dioxins. This effort is needed in 2017 to resolve the 303(d) impairment listings and in support of NPDES permitting strategy. In addition, the dioxin dataset generated under the RMP Dioxin Strategy was primarily generated in 2009-2012 and is getting dated - synthesis and interpretation of these data now will avoid any real or perceived consequence of using a dated dataset and a need to resample.

Background

San Francisco Bay was placed on the State of California's 303(d) list of impaired waters in 1998 as a result of elevated concentrations of dioxins and furans (commonly referred to as 'dioxin') in fish. RMP studies of contaminants in Bay sport fish conducted every three to five years since 1994 have found that dioxin concentrations are relatively unchanged over this time period and in some species, continue to greatly exceed screening values for human consumption. The available information for dioxin in the region was synthesized in a conceptual model/impairment assessment report in 2004 for the Clean Estuary Partnership. That report highlighted limited data and significant uncertainties and gaps in our understanding of spatial and temporal distributions of dioxin in Bay waters and sediments, and in estimated loading rates via various pathways. The Dioxin Strategy Workgroup and Workplan were established shortly thereafter to identify and address the highest priority data needs. Data on dioxin in ambient open bay sediments has been roughly doubled since then, and the number of water locations characterized increased ten-fold, but the last samples collected in these matrices were in 2011. Dioxin in wetland sediment cores collected in 2006 has also been characterized, suggesting a drastic decrease from recent (post WWII) past concentrations, whereas open Bay cores show more uniform distributions, with concentrations in upper sections higher than in very deep pre-industrial sediments, but generally similar to current surface sediment concentrations. Additional information on loads from pathways such as atmospheric deposition and stormwater runoff in selected watersheds has also been collected.

Together the information collected to date can be synthesized to update our understanding of environmental distributions and processes of dioxin, with the aim of addressing the highest priority

dioxin management questions (described below) and identifying remaining data needs or gaps/uncertainties.

This effort is needed in 2017 because the Water Board must resolve the 303(d) impairment listings and there is an associated NPDES interim permitting strategy that has allowed the Water Board and dischargers to avoid problematic limits in permits on the condition that studies are conducted to inform resolution of the listings. In addition, the dioxin dataset generated under the RMP Dioxin Strategy was primarily generated in 2009-2012 and is getting dated - synthesis and interpretation of these data now will avoid any real or perceived consequence of using a dated dataset and a need to resample.

Applicable RMP Objectives and Management Questions

The work to be synthesized in the report addresses the following RMP Objectives and Management Questions in the Dioxin Strategy, with the focus on questions identified by the Workgroup as most directly linked to possible management actions underlined:

MQ.1 Are chemical concentrations in the Bay at levels of potential concern and are associated impacts likely?

- Are the beneficial uses of San Francisco Bay impaired by dioxins?

MQ.2 What are the concentrations and masses of contaminants in the Bay and its segments?

- What is the spatial pattern of dioxin impairment?
- <u>What is the dioxin reservoir in Bay sediments and water?</u>

MQ.3 What are the sources, pathways, loadings, and processes leading to contaminant-related impacts in the Bay?

- <u>What is the relative contribution of each loading pathway as a source of dioxin impairment in the Bay?</u>

<u>MQ.4</u> Have the concentrations, masses, and associated impacts of contaminants in the Bay increased or decreased?

- <u>Have dioxin loadings/concentrations changed over time?</u>

MQ.5 What are the projected concentrations, masses, and associated impacts of contaminants in the Bay?

- What future impairment is predicted for dioxins in the Bay?

Approach

The available (past and more recent data collected over the past decade) information will be applied to a simple one-box mass budget model to identify and prioritize remaining data gaps and/or conflicts with current conceptual models and expectations, in order to evaluate the needs for and possible designs of future monitoring and modeling efforts. Additionally, information on the other data collected (cores, spatial and temporal patterns in biota and ambient concentrations) will be examined to evaluate the likely trajectory of future sources and impairment. Optionally the data can

also be applied to a simple bioaccumulation model (both previously applied to PCBs and other organics), which can help project MQ5 future scenarios, but is not needed for evaluating current trends.

Reporting

Results of applied models and associated monitoring data in various matrices for the Bay will be reported as a RMP Technical Report, to be delivered in the fourth quarter of 2017.

Proposed Budget

Estimated costs for each of the elements are presented. Even if data are not applied to a numerical mass budget model, information will still need to be considered in the context of conceptual models of contaminant processes and fate, so costs for the first task can be reduced (roughly halved), but not eliminated.

Task	**Estimated Cost**
1. Application of data to mass budget and simple bioaccumulation model	$20,000
2. Draft report	$15,000
3. Final report	$5,000
Total	**$40,000**

PCB Strategy: PCB Strategy Coordination and Technical Support

Oversight group: PCB Workgroup
Proposed by: Jay Davis, SFEI

Proposed Funding: $10,000

Proposed Deliverables And Timeline

Deliverable	Due Date
Updated PCB Multi-Year Plan	Jun 2017

Introduction and Background

The RMP PCB Strategy Team formulated a PCB Strategy in 2009. The Team recognized that a wealth of new information had been generated since the PCBs TMDL Staff Report (SFBRWQCB 2008) was prepared. The Strategy articulated management questions to guide a long-term program of studies to support reduction of PCB impairment in the Bay.

The 2014 update of the PCB Strategy called for a multi-year effort to implement the recommendations of the PCB Synthesis Report (Davis et al. 2014) pertaining to:

1. identifying margin units that are high priorities for management and monitoring,
2. development of conceptual models and mass budgets for margin units downstream of watersheds where management actions will occur, and
3. monitoring in these units as a performance measure.

A thorough and thoughtful planning effort is warranted given the large expenditures of funding and effort that will be needed to implement management actions to reduce PCB loads from urban stormwater. The goal of RMP PCB Strategy work over the next few years is to inform the review and possible revision of the PCB TMDL and the reissuance of the Municipal Regional Permit for Stormwater (MRP), both of which are tentatively scheduled to occur in 2020.

The multi-year plan for studying PCBs in the margins has three components: conceptual model development, field studies to support/confirm the models, and initiation of trend monitoring. Conceptual model development for a set of four representative priority margin units will provide a foundation for establishing an effective and efficient monitoring plan to track responses to load reductions and also help guide planning of management actions. Preliminary field studies and trend monitoring will be phased in as the level of funding for the PCB Strategy allows.

Study Objective and Applicable RMP Management Questions

The objective of this task is to provide coordination and technical support for continuing development of the PCB Strategy. This task would therefore address all of the questions articulated in the Strategy.

1. What are the rates of recovery of the Bay, its segments, and in-Bay contaminated sites from PCB contamination?
2. What are the present loads and long-term trends in loading from each of the major pathways?
3. What role do in-Bay contaminated sites play in segment-scale recovery rates?
4. Which small tributaries and contaminated margin sites are the highest priorities for cleanup?
5. What management actions have the greatest potential for accelerating recovery or reducing exposure?
6. What are the near-term effects of management actions on the potential for adverse impacts on humans and aquatic life due to Bay contamination?

The task would also address many of the overarching RMP management questions.

Tasks for 2017

Consult with PCB Workgroup and update multi-year plan in support of the TMDL ($10K)

Funds for this task would enable SFEI to continue to consult with the PCB Workgroup and the Small Tributary Loadings Strategy Team regarding plans for the next iteration of the TMDL and RMP activities that can inform the TMDL. Funds would also support small-scale synthesis of information that is needed to support these discussions. The plan will include a multi-year schedule of budgets and deliverables aimed at providing a technical foundation for the next iteration of the TMDL.

Timing and Deliverables: An updated PCB multi-year plan in June 2017. The plan will include a multi-year plan schedule of budgets and deliverables.

PCB Strategy: Priority Margin Unit Conceptual Model Development

Oversight group: PCB Workgroup
Proposed by: Jay Davis, SFEI

Proposed Funding

1) Completion of San Leandro Bay Conceptual Model:

($30,000 for this task will be provided as part of a
Supplemental Environmental Project settlement.
No RMP Special Study funds need to be allocated.)

2) Conceptual Model for Priority Margin Unit #3 (Steinberger Slough): $60,000

Proposed Deliverables And Timeline

Deliverable	Due Date
Draft report on San Leandro Bay	Dec 2016
Final report on San Leandro Bay	Mar 2017
Draft report on PMU #3	Apr 2017
Final report on PMU #3	Aug 2017

Summary

The goal of RMP PCB Strategy work over the next few years is to inform the review and possible revision of the PCB TMDL and the reissuance of the Municipal Regional Permit for Stormwater (MRP), both of which are tentatively scheduled to occur in 2020. Conceptual model development for a set of four representative priority margin units will provide a foundation for establishing an effective and efficient monitoring plan to track responses to load reductions and also help guide planning of management actions. The Emeryville Crescent was the first PMU to be studied in 2015-2016. The San Leandro Bay PMU is second (2016-2017). The third PMU will either be Santa Fe Channel/Parr Channel in Richmond Harbor, or Steinberger Slough in San Carlos. A report on this third PMU will be completed in 2017.

Introduction and Background

The RMP PCB Strategy Team formulated a PCB Strategy in 2009. The Team recognized that a wealth of new information had been generated since the PCBs TMDL Staff Report (SFBRWQCB 2008) was prepared. The Strategy articulated management questions

to guide a long-term program of studies to support reduction of PCB impairment in the Bay. The PCB Team recommended two studies to begin addressing these questions. The first recommended study was to take advantage of an opportunity to piggyback on the final year of the three-year prey fish mercury sampling in 2010 to collect data on PCBs in prey fish also. The second study that was recommended was a synthesis and conceptual model update based on the information that had been generated since the writing of the TMDL Staff Report.

The prey fish monitoring revealed extremely high concentrations of PCBs in the food web in several areas on the Bay margins (Greenfield and Allen 2013), and highlighted a need to develop a more detailed conceptual model than the one-box model used as a basis for the TMDL. A model that would support the implementation of actions to reduce loads from small tributaries, a primary focus of the TMDL, would be of particular value. A revised conceptual model was developed that shifted focus from the open Bay to the contaminated areas on the margins where impairment is greatest, where load reductions are being pursued, and where reductions in impairment in response to load reductions would be most apparent (Davis et al. 2014).

The margins appear to be a collection of distinct local food webs that share some general similarities but are largely functionally discrete from each other. Monitoring, forecasting, and management should therefore treat these margin locations as discrete local-scale units. Local-scale actions within a margin unit, or in upstream watersheds, will likely be needed to reduce exposure within that unit. Better characterization of impairment on the margins through more thorough sampling of sediment and biota would help focus attention on the margin units where the need for action is greatest ("priority margin units" or PMUs), and will also provide an important performance measure for load reduction actions taken in local watersheds. Davis et al. (2014) recommended a focus on assessing the effectiveness of small tributary load reduction actions in priority margin units, and provided an initial foundation for these activities.

The 2014 update of the PCB Strategy called for a multi-year effort to implement the recommendations of the PCB Synthesis Report (Davis et al. 2014) pertaining to:

1. identifying margin units that are high priorities for management and monitoring,
2. development of conceptual models and mass budgets for margin units downstream of watersheds where management actions will occur, and
3. monitoring in these units as a performance measure.

A thorough and thoughtful planning effort is warranted given the large expenditures of funding and effort that will be needed to implement management actions to reduce PCB loads from urban stormwater.

Work conducted in 2015 initiated the multi-year PMU effort. The first phase of the 2015 work consisted of a preliminary assessment of margin units downstream of six pilot watersheds that have been prioritized for management actions. In the second phase of the 2015 workplan (implementation of which has continued into 2016), a detailed assessment of one of the four PMUs (Emeryville Crescent) has been developed.

An updated draft of the multi-year plan is presented in Table 1. The goal of RMP PCB special studies over the next few years is to inform the review and possible revision of the PCB TMDL and the reissuance of the Municipal Regional Permit for Stormwater (MRP), both of which are tentatively scheduled to occur in 2020. Conceptual model development for the set of PMUs is the element of the PCB workplan that will have the greatest value in informing the consideration of a revised TMDL and MRP. A conceptual understanding of the anticipated response of these PMUs to load reductions, in addition to providing a foundation for establishing an effective and efficient monitoring plan, will also help guide planning of management actions. As conceptual models are developed for these PMUs, consideration will be given to whether a general model or family of models can be developed that could apply to margin units more broadly. The monitoring plans that are produced will be designed to maximize sensitivity to detecting reduced impairment in the margin units.

Study Objective and Applicable RMP Management Questions

The objectives of this study are:

1. to develop a conceptual understanding of the anticipated response of two PMUs to load reductions, and
2. to develop sensitive monitoring strategies to detect the effectiveness of watershed management actions in reducing PCB impairment in PMUs.

PCB Strategy Questions Addressed

1. What are the rates of recovery of the Bay, its segments, and in-Bay contaminated sites from PCB contamination?
4. Which small tributaries and contaminated margin sites are the highest priorities for cleanup?
5. What management actions have the greatest potential for accelerating recovery or reducing exposure?
6. What are the near-term effects of management actions on the potential for adverse impacts on humans and aquatic life due to Bay contamination?

RMP Management Questions Addressed

4. Have the concentrations, masses, and associated impacts of contaminants in the Estuary increased or decreased?
   B. What are the effects of management actions on the potential for adverse impacts on humans and aquatic life due to Bay contamination?

Study Approach

The multi-year plan for studying PCBs in the margins has three components: conceptual model development, field studies to support/confirm the models, and trend monitoring. The funding requested for 2016 and 2017 would support continued conceptual model development through synthesis and simple modeling based on existing information.

- The revised multi-year plan calls for the development of conceptual models for four PMUs (Emeryville Crescent, Richmond Harbor, Steinberger Slough, and San Leandro Bay) from 2015-2018. Work on this component began for Emeryville Crescent in 2015. Development of a conceptual model for San Leandro Bay was partially funded in 2016. This proposal includes funding for completion of the conceptual model for San Leandro Bay and for a conceptual model for the next PMU (Steinberger Slough).

- To support conceptual model development, a budget for field studies is also included in the multi-year plan. These studies could include, for example, analysis of spatial patterns in surface sediments or of sampling to determine the presence of indicator species and their PCB concentrations. Funding from the RMP Supplemental Environmental Project fund is likely to be available to support field work in San Leandro Bay in 2016. A proposed design for this work will be prepared for PCBWG review if the funding is in.

- According to the multi-year plan, as the conceptual models and preliminary field studies are completed, trend monitoring can be phased in. It is anticipated that this monitoring can begin in San Leandro Bay in 2018 because funding for the preliminary field studies has been identified. The cost will be estimated after the conceptual model is completed.

Given the long-term plan discussed above, the work proposed for 2016 and 2017 is to complete a conceptual site model for a second PMU (San Leandro Bay) and to develop a conceptual site model for a third PMU (Steinberger Slough). The timing of preliminary field studies and trend monitoring will depend on the level of funding for the PCB Strategy.

Tasks for 2016 and 2017

Task 1 (2016): Complete a conceptual site model and first order mass budget for San Leandro Bay
Budget: $30K for SFEI labor to synthesize information and conduct modeling. (These funds will be provided as part of a Supplemental Environmental Project settlement. No RMP Special Study funds need to be allocated.)

Conceptual model development for the second PMU (San Leandro Bay) began in 2016 and will be completed with the funding from this proposal. Additional funding is needed for this task because the original proposal was only partially funded in 2016. The conceptual model will follow the template established for the Emeryville Crescent PMU, with

evaluations of loading, initial deposition, long-term fate, and bioaccumulation. While ideally the site model evaluations will conclude that it is possible to detect reduced concentrations in the Bay, it is also possible that the effort will conclude that this is not feasible with a realistic effort given the relative magnitude of the reduced loading, the reservoir of PCBs already in the PMU, and environmental variation.

Timing and Deliverables:

- A draft technical report documenting a conceptual site model and monitoring plans for San Leandro Bay by December 2016. Final report in Mar 2017.

Task 2 (2017): Complete a conceptual site model and first order mass budget for Steinberger Slough

Budget: $60K for SFEI labor to synthesize information and conduct modeling.

The approach will be the same as that described under task 1.

Timing and Deliverables:

- A draft technical report documenting a conceptual site model and monitoring plans for Steinberger Slough by April 2017. Final report in Aug 2017.

References

Davis, J.A., L.J. McKee, T. Jabusch, D. Yee, and J.R.M. Ross. 2014. PCBs in San Francisco Bay: Assessment of the Current State of Knowledge and Priority Information Gaps. RMP Contribution No. 727. San Francisco Estuary Institute, Richmond, California.

Table 1. PCB studies and monitoring in the RMP from 2010 to 2019. Numbers indicate budget allocations in $1000s. Numbers in parentheses are expected funds from the RMP Supplemental Environmental Project fund.

Element	**PCB Questions Addressed**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**
Food Web Uptake (Small Fish)	1, 4	50									
PCB Conceptual Model Update	1,2,3,4,5,6		53								
Development and updating of multi-year workplan and continued support of PCB Workgroup meetings							10	10	10	10	10
Prioritize Margin Units	1, 4, 5, 6						30				
Develop Conceptual Site Models and Mass Balances for PMUs (4 PMUs)	1, 4, 5, 6						45	30 (30)	60	60	
PMU Field Studies to Support Development of Conceptual Site Models and Monitoring Plans	1, 4, 5, 6							(52)	TBD	TBD	TBD
PMU Trend Monitoring (5 PMUs)	1, 4, 5, 6									TBD	TBD
RMP Total		50	53				85	40	TBD	TBD	TBD
SEP Funding								82			
Overall Total									TBD		

Selenium Strategy Coordination and Technical Support

Oversight group: Selenium Workgroup
Proposed by: Jay Davis, SFEI

Funding requested for 2017: $10,000

Introduction and Background

In April 2014 the RMP formed a Selenium Strategy Team to evaluate information needs that can be addressed by the Program in the next several years. The charge given to the Team by the RMP Steering Committee was to focus on low-cost, near-term monitoring elements that could provide information that provides high value in support of policy development and decision-making. A TMDL for the North Bay has been developed and approved by the Regional Water Board and the State Water Board, and is awaiting approval by USEPA. Development of a TMDL for the South Bay will be considered after the North Bay TMDL is completed. The need for greater investment in studies in support of managing selenium in the Bay is currently being considered by the Workgroup.

Study Objective and Applicable RMP Management Questions

The objective of this task is to provide coordination and technical support for continuing development of the Selenium Strategy. This task would therefore address all of the questions currently articulated in the Strategy (an update of these questions is in progress).

1. What are appropriate thresholds?
2. Are the beneficial uses of San Francisco Bay impaired by selenium?
3. What is the spatial pattern of selenium impairment?
4. How do selenium concentrations and loadings change over time?
5. What is the relative contribution of each loading pathway as a source of selenium impairment in the Bay?

The task would also address many of the overarching RMP management questions.

Tasks for 2017

Funds for this task would enable SFEI to continue to convene the Selenium Workgroup to allow discussions of plans for studies in support of implementation of the North Bay TMDL and the consideration of a TMDL for South Bay, to develop RMP workplans to support these efforts, and for any small-scale synthesis of information that is needed to support these discussions. The plan will include a multi-year schedule of budgets and deliverables aimed at providing a technical foundation for the TMDLs.

Timing and Deliverables

An updated selenium multi-year plan will be prepared for June 2017. The plan will include a multi-year schedule of budgets and deliverables.

Special Study Proposal: Sturgeon Derby - Correlation of Selenium in Sturgeon Tissues

Summary: In March 2016, the State Water Resources Control Board approved a Selenium TMDL for North San Francisco Bay, which established a white sturgeon muscle tissue target of 11.3 ug/g dry weight as the basis for evaluating impairment. In 2015 and 2016, the RMP funded a study in collaboration with USFWS and Stantec, Inc. to collect tissue samples from angler-harvested female sturgeon collected as part of the annual Sturgeon Derby held out of Bay Point. The objective of this study was to establish relationships between selenium concentrations measured in non-lethally collected tissues (muscle plugs, fin rays) and those that are more closely tied to, or predictive of, adverse impacts in white sturgeon due to selenium (ovaries, otoliths). This study proposes a continuation of this sampling in 2017.

Estimated Cost: $42,000

Oversight Group: RMP Selenium Workgroup

Proposed by: Jennifer Sun and Jay Davis

Background

Since 1998, San Francisco Bay has been identified as impaired by selenium under the Clean Water Act. In April 2014, the RMP formed a Selenium Workgroup to evaluate information needs that can be addressed by the Program in the next several years. The charge given to the workgroup by the RMP Steering Committee was to focus on low-cost, near-term monitoring elements that can provide information that provides high value in support of policy development and decision-making.

In 2016, the State Water Resources Control Board approved a selenium TMDL for North San Francisco Bay. The TMDL established a target concentration of 11.3 ug/g dw in white sturgeon muscle tissue as the basis for evaluating impairment (Baginska 2015). In order to help implement this regulation, the Selenium Workgroup has recently focused on developing non-lethal monitoring methods that will allow for the routine collection of large numbers of white sturgeon muscle tissue samples.

Sampling sturgeon ovaries, although logistically more challenging than sampling using non-lethal methods, would provide a more direct metric of the risk to sturgeon reproduction. USEPA recently published draft selenium criteria for freshwater that highlight egg or ovary data as the preferred endpoint most directly tied to adverse effects (USEPA 2015). Data that would allow evaluation of the correlation between concentrations measured in non-lethally collected tissues and ovary concentrations would enhance the application of muscle plugs as an impairment indicator.

The RMP is currently working to establish two non-lethal sampling methods for measuring selenium concentrations in sturgeon tissues. During the 2009 and 2014 RMP sport fish sampling events, paired muscle plug and muscle fillet samples were analyzed for selenium to determine if muscle plugs could be used as surrogates for the more common measurement of muscle tissue – muscle fillets. Selenium concentrations in muscle plugs were found to correlate well with concentrations in muscle fillets for the 24 fish sampled. In 2016, paired muscle plug and muscle fillets were analyzed from nine female sturgeon collected during the Sturgeon Derby, and were also found to be significantly and positively correlated. The RMP has also further developed the muscle plug collection technique on live sturgeon in collaboration with the California Department of Fish and Wildlife (CDFW), during the 2014 and 2015 Selenium in White Sturgeon Muscle Plugs special studies (Sun et al. 2016, DuBois & Harris 2015).

As part of the 2015 and 2016 Sturgeon Derby studies, the RMP also collaborated with Dr. Vince Palace, currently with the International Institute of Sustainable Development (IISD) (formerly with Stantec, Inc.), and Dr. Norman Halden with the University of Manitoba, Department of Geological Sciences, to test a second non-lethal sampling method using fin rays using data collected at the annual Sturgeon Derby. In this Sturgeon Derby, held on Super Bowl weekend, anglers attempt to catch sturgeon that come closest to a selected size. Fish that are close to the target size are brought to a central location and sacrificed. For the past several years, the USFWS has collected tissues from these sturgeon and analyzed them for a suite of metals and organics, including selenium, in gonads (including ovaries), liver, and plasma. These data have not yet been published. During the 2015 and 2016 Sturgeon Derbies, the RMP successfully collaborated with USFWS and Dr. Palace to collect fin ray and otolith samples for selenium analysis, for comparison with concentrations measured in muscle plugs, ovaries, and other tissues.

Fin rays are taken as a clip and are easy to collect by non-specialists, and fin clips have been shown to be non-harmful to sturgeon (Collins and Smith 1996). Because fin rays have a regular growth pattern similar to growth rings of a tree, a laser ablation MS technique (laser ablation inductively coupled plasma mass spectrometry [LA-ICP-MS]) can be used to allow for the analysis of concentrations of selenium and other elements in each annual ring (i.e., concentrations in the fish tissue over the time). Data showing trends in selenium concentrations in North San Francisco Bay white sturgeon tissue over time will help elucidate the dynamic selenium bioaccumulation patterns in sturgeon, and begin to answer the question of whether or not changes in selenium water chemistry and prey over time relates to changes in tissue concentrations in sturgeon.

A recent study found that fish otolith selenium measurements are the best predictors of ovary selenium, enhancing data collected from tissues alone (Reash, Friedrich, and Halden 2014). However, otoliths can only be collected from sacrificed fish. Thus, fin ray analysis is being developed as a potential alternative to both muscle plug and otolith sampling. The research team is currently using otolith microchemistry analyses to establish the chemical stability of fin ray samples. Fin ray data will also be compared with muscle and ovary data to develop a model that establishes the relationship between selenium concentrations in these tissues.

During the 2016 Derby, endolymph samples were also collected for selenium analysis by Dr. Fei Wang at the University of Manitoba. Understanding selenium concentrations in the endolymph, or the fluid in which otoliths are suspended, will contribute to a more complete model of selenium partitioning from the blood plasma to the endolymph to the otoliths, which will then be compared to selenium in the fin rays.

The annual sturgeon fishing tournament in the Delta again provides an opportunity to obtain tissue samples from a small number of female sturgeon in 2017. These samples will be used to test the relationships between selenium concentrations measured in tissues collected using lethal (ie. ovaries) and non-lethal (ie. muscle plugs, fin rays) methods, and contribute the development of the fin ray microchemistry analysis technique.

In both 2015 and 2016, just under 30 fish were sacrificed during the Derby, including 8 females in 2015 and 9 females in 2016. Because sampling conditions and sex ratios may be unpredictable, the proposed target number of female fish sampled during the 2017 Sturgeon Derby will remain at 15.

This proposal is requesting funds for a third year of sampling at the sturgeon Derby in 2017, which will include measuring selenium in muscle plugs, ovaries, fin rays, otoliths, and endolymph. The continuation of endolymph selenium analysis in 2017 will be reviewed by the Selenium Workgroup following the analysis of data from the 2016 Derby samples.

Study Objectives and Applicable RMP Management Questions

The primary objectives of this monitoring element are to:

1. Develop methods for non-lethal white sturgeon tissue sample collection and selenium analysis, including muscle plug and fin ray sampling techniques; and
2. Evaluate the relationship between tissues that can be monitored non-lethally (muscle plug or fin rays) and tissues that are more directly tied to adverse reproductive effects (ovary and eggs); and
3. Track temporal trends in selenium impairment over time

This study addresses key questions identified by the Selenium Strategy and RMP (Table 1).

Selenium Strategy questions addressed:

2. Are the beneficial uses of San Francisco Bay impaired by selenium?
4. How do selenium concentrations and loadings change over time?

Table 1. Study objectives and questions relevant to RMP management questions.

Management Question	Study Objective	Example Information Application
1) Are chemical concentrations in the Estuary at levels of potential concern and are associated impacts likely? 1B. What potential for impacts on humans and aquatic life exists due to contaminants in the Estuary ecosystem?	Compare measured concentrations to toxicity and regulatory thresholds (North Bay Selenium TMDL, USEPA site-specific criteria).	Do the data indicate a need for management actions? What factors are influencing the observed selenium concentrations? How should the TMDL muscle tissue target be assessed?
2) What are the concentrations and masses of contaminants in the Estuary and its segments? 2.1 Are there particular regions of concern?		
3) What are the sources, pathways, loadings, and processes leading to contaminant-related impacts in the Estuary? 3.1. Which sources, pathways, etc. contribute most to impacts?		
4) Have the concentrations, masses, and associated impacts of contaminants in the Estuary increased or decreased? 4.B. What are the effects of management actions on the potential for adverse impacts on humans and aquatic life due to Bay contamination?	Compare measured concentrations to plug and fillet concentrations measured during past studies, including past iterations of this study.	Are selenium concentrations increasing or decreasing? What factors may be influencing these trends?
5) What are the projected concentrations, masses, and associated impacts of contaminants in the Estuary?		

Approach

This study would be performed in collaboration with IISD. IISD would perform the collection of tissue samples from female fish caught at the Derby, and conduct selenium microchemistry analyses on the fin rays and otoliths. Analyses of selenium in endolymph will be conducted by the University of Manitoba. RMP staff would plan the study, assist with tissue sample collection, manage the data, and write a brief

technical report. The Moss Landing Marine Laboratory, Marine Pollutions Studies Lab (MLML-MPSL) or a comparable laboratory would perform selenium analyses on ovaries and muscle plugs, and subsequently prepare and ship these samples to UC Davis to perform C, N, and S stable isotope analyses. The stable isotopes will provide information on diet and habitat use by the sturgeon.

Tissues would be collected and analyzed from up to 15 female white sturgeon. If fewer than 15 females are euthanized during the Derby, tissues would be collected from all females. If samples are collected from fewer than 15 females, the remaining analytical budget will be used to analyze selenium in the muscle fillets of female fish. The sampling would occur on Super Bowl weekend in 2017.

Budget
The proposed budget for this Special Study is $42,000.

Table 2. Budget for the 2017 Sturgeon Derby Proposal

Task	Estimated Cost
Labor*	
Project Planning & Coordination	$4,000
Field Work	$3,800
Data Management	$7,800
Reporting	$7,000
Subtotal	**$22,600**
Subcontracts	
MLML-MPSL – 15 Se analyses (muscle plugs) @ $222/sample	$3,330
MLML-MPSL – 15 Se analyses and sample homogenization (ovaries) @ $327/sample	$4,905
UCD - 15 C, N, S analyses (muscle plugs) @ $25/sample	$375
IISD- Travel ($3,000), instrument set-up ($2,500), 15 fin ray and 15 otolith selenium microchemistry analyses @ 115/sample	$8,950
University of Manitoba – 15 Se analyses (endolymph) @ $60/sample	$900
Subtotal	**$18,460**
Direct Costs	
Equipment - biopsy plugs, sample containers, etc.	$390
Shipping	$200
Travel - 2 days of travel for 2 RMP staff	$350
Subtotal	**$940**
Grand Total	$42,000

*Project management, contract management, and archiving costs will be included in the RMP base funding

Reporting

A draft technical report describing the results of the study will be prepared by September 30, 2017. The technical report will be reviewed by the Selenium Workgroup and the TRC and will be finalized by December 31, 2017.

References

Baginska, B. 2015. Total Maximum Daily Load Selenium in North San Francisco Bay: Staff Report for Proposed Basin Plan Amendment. Report prepared for the California Regional Water Resources Control Board, San Francisco Bay Region, November 2015. http://www.waterboards.ca.gov/sanfranciscobay/board_info/agendas/2015/November/6_appendix_c.pdf

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Reash, R., Friedrich, L., and N. Halden. 2014. Selenium bioaccumulation patterns in tissue and otoliths for fish from wastewater exposure and reference sites. Poster *Society of Environmental toxicology and Chemistry North america 35th Annual Meeting*. Vancouver, BC, Canada. November 9-13, 2014.

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United States Environmental Protection Agency. 2015. Draft Aquatic Life Ambient Water Quality Criterion For Selenium - Freshwater 2015. United States Environmental Protection Agency, Washington DC.http://www.waterboards.ca.gov/sanfranciscobay/water_issues/programs/TMDLs/northsfbayselenium/EPA%202015%20Draft%20Aquatic%20Life%20Ambient%20Criteria%20for%20Se-Freshwater.pdf

Selenium Monitoring Workshop Followup

Oversight group: Selenium Workgroup
Proposed by: Jay Davis, SFEI

Funding requested for 2017: $20,000

Description

At their May 2016 meeting, the Selenium Workgroup, at the request of the Water Board, discussed the need to develop a technical consensus on a robust suite of trend indicators of selenium impairment in the North Bay. The goal is to identify leading indicators of change to allow prompt management response to signs of increasing impairment. Of particular concern are the possible impacts of changes in hydrology in the Delta or changes in selenium loads to Bay-Delta tributaries in the Central Valley. A technical workshop on this topic will be convened this summer. This funding request is a placeholder that will allow for followup activities stemming from the workshop. The funds could be used for additional planning or to augment existing monitoring to address high priority information needs.

Special Study Proposal: Small Tributaries POC Loading Program Management

Summary: The goal of the Small Tributaries Loadings Strategy (STLS) Program over the next few years is to continue to provide information to RMP Stakeholders and the public that directly supports the identification and management of PCBs and Hg sources, concentrations, loads, and the determination of trends in relation to management efforts and beneficial uses in San Francisco Bay. To support the Small Tributaries POC stormwater concentration and loading program, the outcome of this task will be to maintain monthly communication with BASMAA program and Water Board representatives. This will be completed through regular check in phone calls, planning for and development of meeting agendas and materials, preparation of meeting summaries, and monitoring the agenda of and attendance at key external meetings.

Estimated Cost: Option 1: $30,000
Oversight Group: STLS/SPLWG
Proposed by: Lester McKee, Alicia Gilbreath, Jennifer Hunt (SFEI)

PROPOSED DELIVERABLES AND TIMELINE

Task	Deliverable	2017										
		J	F	M	A	M	J	J	A	S	O	N	D
A	STLS Management	!	!	!	!	!!	!	!	!	!	!	!	!

! = STLS check in for review and course corrections
!! = STLS/SPLWG oversight and review

Background

The San Francisco Bay Hg and PCBs TMDLs call for a reduction in loads by 50 and 90% by 2028 and 2030, respectively. In response, the first Municipal Regional Permit for Stormwater (MRP) Provision C.8.f. (SFRWQCB, 2009) called for a range of actions including gaining a better understanding of which Bay tributaries contribute the most loading to sensitive areas of biological interest on the Bay margin, better quantification of loads of sediments and trace contaminants on a watershed basis and regionally, a better understanding of how and where trends might best be measured, and an improved understanding of which management measures may be most effective in reducing impairment. These same needs were reflected in the small tributary loading strategy (STLS) (SFEI, 2009). On November 19, 2015 the second MRP was issued and provided an updated set of management questions (provided below) (SFRWQCB, 2015).

Study Objectives and Applicable RMP Management Questions

With an increased focus on collaboration synergy between projects funded by the RMP and those funded directly by BASMAA, it was recognized back in 2009 that an annual budget allocation was needed to ensure constant and efficient communication between RMP program staff and BASMAA and Water Board representatives. These objectives help to ensure quality planning and implementation of projects that aim to answer the following five management questions:

MRP 2.0 Q1: Source Identification / Leverage: Which sources or source areas provide greatest opportunity for load reductions?
MRP 2.0 Q2: Impairment: Which source areas contribute most to impairment of Bay?

MRP 2.0 Q3: Management effectiveness: Provide support for planning future management actions or evaluate existing actions.
MRP 2.0 Q4: Loads: Assess POC loads, concentrations, or presence/absence.
MRP 2.0 Q5: Trends: What are the spatial and temporal trends in loads or concentrations?

Approach

RMP staff will provide management of the STLS process and STLS projects. Tasks include:

- Monthly meetings (phone calls)
- Quarterly or as needed face-to-face meetings
- Planning for and development of meeting agendas and materials
- Preparation of meeting summaries, and
- Monitoring the agendas of, and attendance at key external meetings (e.g. BASMAA Monitoring / POC Committee meeting, BASMAA BoD meetings)

Reporting

Written meeting summaries are prepared during and after every meeting and archived. A list of action items and due dates are also maintained.

Linkages to other RMP Workgroups

RMP staff aim to help transfer information between other RMP workgroups and committees and the STLS and SPLWG. These include meetings of the Priority Margin Units (PCB Workgroup) and the Emerging Contaminants Workgroup (ECWG).

References

SFEI, 2009. RMP Small Tributaries Loading Strategy. A report prepared by the strategy team (L McKee, A Feng, C Sommers, R Looker) for the Regional Monitoring Program for Water Quality. SFEI Contribution #585. San Francisco Estuary Institute, Oakland, CA. http://www.sfei.org/sites/default/files/biblio_files/Small_Tributary_Loading_Strategy_FINAL.pdf

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Special Study Proposal: Small Tributaries Loading POC Watershed Characterization Reconnaissance Monitoring

Summary: The goal of the Small Tributaries Loadings Strategy (STLS) Program over the next few years is to continue to provide information to RMP Stakeholders and the public that directly supports the identification and management of PCBs and Hg sources, concentrations, loads, and the determination of trends in relation to management efforts and beneficial uses in San Francisco Bay. To support a weight-of evidence approach for the identification and management of PCBs and Hg sources, the outcome of this proposal will be further knowledge about concentrations and particle ratios in stormwater in areas that have a historically and disproportionally larger area of older urban and industrial land use.

Estimated Cost: Option 1: $200k
Oversight Group: STLS/SPLWG
Proposed by: Lester McKee, Jennifer Hunt, Alicia Gilbreath, Jing Wu, and Don Yee (SFEI)

PROPOSED DELIVERABLES AND TIMELINE

Task	Deliverable	Due date																		
		2016				2017												2018		
		S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M
A	Site selection	!																		
B	Wet season monitoring		!	!		!		!	!											
C	QA & Data Management									!!										
D	Interpretation & reporting															!				!!

[MQ] = Management Questions given in Provision C.8.f. of the Municipal Regional Stormwater Permit (MRP 2.0)
! = STLS check in for review and course corrections
!! = SPLWG oversight and review

Background

The San Francisco Bay Hg and PCBs TMDLs call for a reduction in loads by 50 and 90% by 2028 and 2030, respectively. In response, the first Municipal Regional Permit for Stormwater (MRP) Provision C.8.f. (SFRWQCB, 2009) called for a range of actions including gaining a better understanding of which Bay tributaries contribute the most loading to sensitive areas of biological interest on the Bay margin, better quantification of loads of sediments and trace contaminants on a watershed basis and regionally, a better understanding of how and where trends might best be measured, and an improved understanding of which management measures may be most effective in reducing impairment. These same needs were reflected in the small tributary loading strategy (STLS) (SFEI, 2009). On November 19, 2015 of the second MRP was issued and provided an updated set of management questions (provided below) (SFRWQCB, 2015).

During water year (WY) 2015, the RMP funded the new phase of a watershed characterization reconnaissance study aimed at locating more high leverage watersheds and sub-watersheds and developing a remote sampler method designed to decrease costs and increase ease of data collection in locations where sampling may be logistically challenged. The results from 20 locations collected using manual methods and for three locations using the remote sampler methods were recently reported (McKee et al., 2016 in SPLWG review). This report also collated previous data collected at 25 other sites in the Bay Area and provided a ranking of 45 sites. During the wet season of WY 2016, the same study design was continued with the successful collection of a further 17 locations using manual methods and for a further five locations using the remote sampler methods for a total of 66 sites now characterized[1].

[1] Data were also collected by the Santa Clara and San Mateo Stormwater programs using the watershed characterization reconnaissance study design. This data should be made available in later fall for comparison to the RMP data during the reporting phase of the project.

Through these efforts, an additional half dozen locations have been located that are showing highly elevated concentrations. Initial results also indicate that there is a reasonable comparison for PCBs between the particle concentrations observed from the remote samplers and particle ratios observed in the manual samples; data appear to indicated remote methods may be less well suited for Hg. Grainsize work completed in WY 2016 is expected to help resolved the differences observed and more nuanced interpretations. Also during 2016, funding was provided for further development and calibration of the RWSM and for development of the watershed loadings *Trends Strategy*. Data from the watershed characterization reconnaissance study is being used to help calibrate and verify the model outputs and will help to form the baseline of data to support future trends evaluations.

Study Objectives and Applicable RMP Management Questions

The main study objectives are two-fold:

1. Find watershed or sub-watershed locations with high concentrations of PCBs, Hg and other priority pollutants and rank these locations relative to each other and sources.
2. Develop and test two remote sampler designs (the Hamlin and the Walling tube) for characterization of particle concentrations and comparison to manual methods.

These address management question (MQ) 1 and 2 primarily but also support MQ 4 by providing calibration data for the Regional Watershed Spreadsheet Model and MQ 5 as possible baseline data for regional stormwater trends assessment, and less directly MQ 3 by providing a regional map of concentrations and loads for baseline comparison to the effects of BMP application.

MRP 2.0 Q1:	Source Identification / Leverage: Which sources or source areas provide greatest opportunity for load reductions?
MRP 2.0 Q2:	Impairment: Which source areas contribute most to impairment of Bay?
MRP 2.0 Q3:	Management effectiveness: Provide support for planning future management actions or evaluate existing actions.
MRP 2.0 Q4:	Loads: Assess POC loads, concentrations, or presence/absence.
MRP 2.0 Q5:	Trends: What are the spatial and temporal trends in loads or concentrations?

Approach

A wet weather field monitoring program proposed to continue in the WY 2017 winter sampling season that will largely mimic, with the exception of some minor improvements, the program implemented during WY 2011 (McKee et al., 2012), WY 2015 (McKee et al., 2016, in SPLWG review), and WY 2016 (preliminary results presented at the May 2016 SPLWG meeting).

- Monitoring Design:
  - Collection of 1 composite stormwater sample per site collected during a rainfall event that is forecast to exceed 0.5 inches of rainfall in a 6-hour period using one of three manual sampling techniques employing clean hands protocols (D95, b-reel, and boom-truck water quality sampler at sites with larger watershed areas, DH81 water quality sampler, or an ISCO pumping sampler)
  - Collection of 1 settled suspended sediment stormwater sample per site collected during a rainfall event that is forecast to exceed 0.5 inches of rainfall in a 6-hour period using one or both of two remote sampling techniques (Hamlin or Walling tube)
- Site Selection: A balance between two overarching rationale:
  - Nested sampling design to track sources upstream in known polluted areas to help better define source areas and management options.
  - Finding new polluted watersheds or sub-watershed areas (watershed locations near the Bay margin or further downstream than the source tracking approach).

  - Other selection rationale:
    - Larger watersheds with an existing USGS gauge
    - Re-sampling potential false negatives especially where there is putative evidence
    - Contingency for resampling Guadalupe River for trends
    - Filling gaps along environmental gradients in relation to source areas (most specifically to support RWSM development [MQ4])
- Number of sites: Dependent on site logistics, proximal site associations, analytes, budget and other factors, but likely 10-12 sites.
- The 2016 analytes list be continued (PCBs, Hg, SSC, TOC, grainsize, salinity)

Reporting

The outcome of the study will be a technical report (draft in December 2017; final in March 2018). The draft report will include the 2017 data and perhaps some more interpretative reporting including statistical analysis of the land use and source areas context and comparison to selected literature. The main objectives of the report will be to 1) document the outcomes of the remote sampler sub-study and describe the circumstances for its possible inclusion into future sampling programs; and 2) report and rank concentrations and particle ratios observed at each location and compare these to existing data.

Linkages to other RMP Workgroups

Some of the sampling sites may be selected in the watersheds of the Priority Margin Units (PCB WG) and monitored for emerging contaminants with funding from the ECWG.

References

McKee, L.J., Gilbreath, A.N., Hunt, J.A., and Greenfield, B.K., 2012. Pollutants of concern (POC) loads monitoring data, Water Year (WY) 2011. A technical report prepared for the Regional Monitoring Program for Water Quality in San Francisco Bay (RMP), Small Tributaries Loading Strategy (STLS). Contribution No. 680. San Francisco Estuary Institute, Richmond, California. http://www.sfei.org/documents/pollutants-concern-poc-loads-monitoring-data-water-year-wy-2011

McKee, L.J., Gilbreath, A.N., Yee, D., and Hunt, J.A., 2016 (in SPLWG review). Pollutants of concern (POC) reconnaissance monitoring draft progress report, water year (WY) 2015. A technical report prepared for the Regional Monitoring Program for Water Quality in San Francisco Bay (RMP), Sources, Pathways and Loadings Workgroup (SPLWG), Small Tributaries Loading Strategy (STLS). Contribution No. xxx. San Francisco Estuary Institute, Richmond, California.

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Special Study Proposal: Small Tributaries Loading Regional Watershed Spreadsheet Model

Summary: The goal of the Small Tributaries Loadings Strategy (STLS) Program over the next few years is to continue to provide information to RMP Stakeholders and the public that directly supports the identification and management of PCBs and Hg sources, concentrations, loads, and the determination of trends in relation to management efforts and beneficial uses in San Francisco Bay. To support improved estimates of regional scale watershed loads, the outcome of this proposal will be a GIS map of watershed scale loads for the region estimated from the RWSM that will be calibrated or verified with a minimum of 60 sites now characterized for of PCBs and Hg concentrations[1]. The information generated from this model, including updated land use specific yields, will also be useful for assisting BASMAA program staff at smaller scales with their proposed effectiveness evaluation methods for stormwater BMPs.

Estimated Cost: Option 1: $40,000
Oversight Group: STLS/SPLWG
Proposed by: Jing Wu, Lester McKee, Alicia Gilbreath (SFEI)

PROPOSED DELIVERABLES AND TIMELINE

Task	Deliverable	Due date															
		2016				2017											
		S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
A	Finalize work plan based on latest info. and priorities		!!														
B	Compile latest data (GIS & stormwater data)	!		!													
C	Recalibrate model, estimate loads, & update model report	!		!!		!		!!	!	!!							

[MQ] = Management Questions given in Provision C.8.f. of the Municipal Regional Stormwater Permit (MRP 2.0)
! = STLS check in for review and course corrections
!! = SPLWG oversight and review

Background

The San Francisco Bay Hg and PCBs TMDLs call for a reduction in loads by 50 and 90% by 2028 and 2030, respectively. In response, the first Municipal Regional Permit for Stormwater (MRP) Provision C.8.f. (SFRWQCB, 2009) called for a range of actions including gaining a better understanding of which Bay tributaries contribute the most loading to sensitive areas of biological interest on the Bay margin, better quantification of loads of sediments and trace contaminants on a watershed basis and at a regional scale, a better understanding of how and where trends might best be measured, and an improved understanding of which management measures may be most effective in reducing water quality impairment. These same needs were reflected in the small tributary loading strategy (STLS) (SFEI, 2009). On November 19, 2015, the second MRP was issued and provided an updated set of management questions (provided below) (SFRWQCB, 2015).

The development of the Regional Watershed Spreadsheet Model (RWSM) was recommended in the Strategy to support improved estimates of regional scale loads (primarily), to provide a quantification of the relative concentrations and loads between watersheds to help focus management, and possibly to help identify areas within watersheds for further investigation as part of the weight of evidence approach. Starting in 2010, a multi-year effort was undertaken to systematically develop and calibrate the Model. The development process has been documented through four previous progress reports. The Model was structured to use either a hydrology model or suspended sediment (SS) model as the basis for the

[1] Data were also collected by the Santa Clara and San Mateo Stormwater programs using the watershed characterization reconnaissance study design. This data should be made available in later fall for comparison to the RMP data during the reporting phase of the project.

pollutant models. The modeling effort also included linkages to other efforts by Bay Area Stormwater Management Agencies Association (BASMAA) and the RMP. Milestones achieved to date include:

- Developing and calibrating the hydrology model and the completion of pollutant profiles for PCBs, Hg, SS, Cu, Se, OC pesticides, and PBDEs (Lent and McKee, 2011; Lent et al., 2012),
- Improving GIS data about the sources of PCBs and Hg (McKee et al., 2014; Wu et al., in SPLWG review), and
- Improving the model calibration procedure to include analysis of modeling errors and output of the first reasonable model calibrations for PCBs (Wu et al., in SPLWG review).

Additional improvements to the model are being made during 2016 using the RWSM model development funding ($35,000) that was approved in the 2016 budget. The work plan for the 2016 funding includes:

1. Further refinement of the GIS layers including exploring land use and source area anomalies in watersheds that are currently poorly calibrated,
2. Exploration of improved model parameterization,
3. Exploration of the calibration data to remove outliers and development of a method to estimate variability associated with composite data,
4. Further refinement of the calibration procedures including possible exploration of:
    a. Calibrating to a larger group of watersheds (41 now available rather than 22)
    b. Calibrating to the loads data set rather than to concentrations
    c. Hybrid calibration (iterative auto and manual calibration)
    d. Other recommendations by our advisors

Study Objectives and Applicable RMP Management Questions

The main study objectives are three fold:

1. Determine regional scale loads of PCBs and Hg
2. Determine which individual watersheds may be producing disproportionally high loads per unit watershed area and then rank and separate these from lower yielding watersheds
3. Perform model runs to provide information on loading coefficients or loads at user requests, such as providing updated land use based yields or fine scale GIS information to BASMAA to support their proposed effectiveness evaluation methods for stormwater BMPs and treatment retrofit.

These objectives address management question (MQ) 4 primarily but also supports MQ1 by providing a quantified load rankings by watershed, MQ2 by its use for estimating loading to priority margin units, and MQ 3 by providing a maps of concentrations and loads Bay Area wide as a basis to support effectiveness evaluation methods for stormwater BMPs. While the STLS Trends Strategy has a management question that includes forecast modeling, it has not yet been determined which modeling platform would be most suitable. During the model calibration process, watersheds that do not calibrate well are further investigated virtually to try to understand land use or source area anomalies - a part of the calibration process that directly links to MQ1.

MRP 2.0 Q1: Source Identification / Leverage: Which sources or source areas provide greatest opportunity for load reductions?
MRP 2.0 Q2: Impairment: Which source areas contribute most to impairment of Bay?
MRP 2.0 Q3: Management effectiveness: Provide support for planning future management actions or evaluate existing actions.
MRP 2.0 Q4: Loads: Assess POC loads, concentrations, or presence/absence.
MRP 2.0 Q5: Trends: What are the spatial and temporal trends in loads or concentrations?

Approach

By mid-2016, it is anticipated that an improved calibration of the PCB and mercury model will be completed based on data from about 41 calibration watersheds. Pending the outcomes of the 2016 work plan, STLS and the SPLWG will be consulted to agree upon and recommend a work plan for 2017. The goal of the additional work will be to get the PCB and Hg models sufficiently calibrated to meet the needs of BASMAA and other partners. The menu of options that will be considered to achieve this goal includes:

1. Recalibration of the hydrology model
2. Further (slight) improvements to the parameterization
3. Recalibration of the PCB and Hg models using data from 60+ watersheds (additional data collected by the RMP during WY 2016 and possibly data collected by the Santa Clara and San Mateo Stormwater programs using the RMP watershed characterization reconnaissance study methodology)
4. Response to user requests; for example in relation to effectiveness evaluation of stormwater BMPs
5. Completion of a user manual and full model documentation

Reporting

A summary of the model updates, the results of the model calibration, and the regional loads will be presented in a technical report (draft in March 2017, final in June 2017).

Linkages to other RMP Workgroups

The RWSM is being used to estimate the loads to the Priority Margin Units (PCB WG).

References

Lent, M.A. and McKee, L.J., 2011. Development of regional suspended sediment and pollutant load estimates for San Francisco Bay Area tributaries using the regional watershed spreadsheet model (RWSM): Year 1 progress report. A technical report for the Regional Monitoring Program for Water Quality, Small Tributaries Loading Strategy (STLS). Contribution No. 666. San Francisco Estuary Institute, Richmond, CA. http://www.sfei.org/sites/default/files/RWSM_EMC_Year1_report_FINAL.pdf

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Special Study Proposal: Small Tributaries Loading POC Trends Strategy and Trends Monitoring

Summary: The goal of the Small Tributaries Loading Strategy (STLS) Program over the next few years is to continue to provide information to RMP Stakeholders and the public that directly supports the identification and management of PCBs and Hg sources, concentrations, and loads, and the determination of trends in relation to management efforts and beneficial uses impacts in San Francisco Bay. To support stormwater concentration and loading trends evaluation, the outcomes of this proposal will be provision of an improved dataset (more samples targeted at improving the description of source, release, and transport processes at selected tributary monitoring sites) following the monitoring design laid out at the conclusion of the 2016 Trends Strategy workplan, data evaluation to prepare refine the monitoring plan for subsequent winter seasons (i.e., 2018 and 2019), and further evaluation of data and information to continue the dialogue on the ultimate design of a long-term monitoring program for trends.

Estimated Cost: Option 1: $100,000; Option 2: $200,000
Oversight Group: STLS/SPLWG
Proposed by: Lester McKee, Alicia Gilbreath, Jennifer Hunt (SFEI)

Background

The San Francisco Bay Hg and PCBs TMDLs call for reductions in loads by 50% and 90% by 2028 and 2030, respectively. In response, the first Municipal Regional Permit for Stormwater (MRP) Provision C.8.f. (SFRWQCB, 2009) called for a range of actions including gaining a better understanding of which Bay tributaries contribute the most loading to sensitive areas of biological interest on the Bay margin, better quantification of loads of sediments and trace contaminants on a watershed basis and regionally, a better understanding of how and where trends might best be measured, and an improved understanding of which management measures may be most effective in reducing impairment. These same needs were reflected in the Small Tributary Loading Strategy (STLS) (SFEI, 2009). On November 19, 2015 the second MRP was issued and provided an updated set of management questions (provided below) (SFRWQCB, 2015). With an increased focus on finding tributaries and sources with disproportionally high concentrations and loads of PCBs and Hg, and the transition from the pilot testing phase of BMP selection to focused implementation, it was recognized that a Strategy for monitoring trends was needed for stormwater concentrations and loads, connecting management effort on land with water quality improvements in the Bay.

During 2015, the RMP funded the first phase of developing the Small Tributaries Loading Strategy-Trends Strategy (STLS-T). Beginning in July 2015 and continuing through April 2016, a series of five STLS-T meetings occurred that resulted in the development of a series of interim products including a refined trends strategy workplan, a mission statement, the development of three key trends strategy management questions, a list of potential stormwater quality indicators, a number of conceptual models including a conceptual model of how those indicators relate to watershed scale, selection of the indicators and scales on which to focus initial power analysis efforts, collation of available data, and development and implementation of a power analysis work plan. In April 2016 the first draft of the STLS-T strategy document was prepared ready for the STLS team review along with the results of the power analysis.

The draft power analysis indicated the following general preliminary results. In relatively “clean” watersheds which exhibit relatively low concentration variability, >80% power to detect a continually declining trend of just 25% over 25 years with 95% confidence is possible with just 2 samples every 4 years or 5 samples every 5 years. However, the interest and focus is more on watersheds that currently exhibit greater leverage for improvement (disproportionally higher concentrations, particle ratios and

pollutant loads relative to their watershed area, usually with a history of older urban and industrial land use). For these types of watersheds, the preliminary results of the power analysis suggest that to obtain 80% power, at least 15 samples every three years (equivalent to 5 annually, or 8 biennially) would be needed to see a continual 90% decline over a 25 year period.

To increase the power to detect trends, a number of data stratification exercises were evaluated including removing base flow samples, stratifying for early versus late season (based on season-to-date rainfall less than or greater than 50% mean annual rainfall for each unique sampling site), and rising and falling stage (before and after peak storm flow for each unique storm at each unique site). The results of this analysis along with graphical inspection of scatter plots of flow versus concentration and particles ratios led to the conclusion that the current baseline data are insufficient to provide high enough sample numbers for some strata and, that overall, for several of the more polluted sites (Sunnyvale East Channel watershed and Pulgas Creek Pump Station watershed), the existing baseline data do not fully describe all the underlying source-release-transport processes.

External peer review of the power analysis and strategy occurred in June 2016. The primary recommendations from the peer reviewers included:

- Additional exploration of the existing dataset to determine if there are other explanatory factors or statistical models that would be helpful in designing a short and long-term trends strategy monitoring program.
- Additional data are needed from long term monitoring sites to augment the existing dataset. The primary recommendation was to "oversample" at one or two long-term monitoring sites.

Study Objectives and Applicable RMP Management Questions

The main study objectives are three fold:

1. Develop and implement a sampling program to provide suitable baseline data to support the final design of a monitoring program to identify trends in concentrations and loads over appropriate spatial and temporal scales, connecting management effort on land with water quality improvements in the Bay
2. Complete further data evaluation to adjust the monitoring plan for subsequent monitoring seasons (i.e., 2018 and 2019), and
3. Further evaluation of data and information to continue the dialogue on the ultimate design of a long term monitoring program for trends.

The proposed Trends Strategy work plan will directly address management question (MQ5), but will also provide improved data for calibration of the Regional Watershed Spreadsheet Model (RWSM) (MQ4), and to a lesser extent, provide information that might help us to continue to evaluate the nature of sources in the watersheds selected for monitoring (MQ1) and the impacts to areas on the Bay Margin downstream (MQ2) especially if the selected watersheds are drain to a priority margin unit (PMU).

MRP 2.0 Q1:	Source Identification / Leverage: Which sources or source areas provide greatest opportunity for load reductions?
MRP 2.0 Q2:	Impairment: Which source areas contribute most to impairment of Bay?
MRP 2.0 Q3:	Management effectiveness: Provide support for planning future management actions or evaluate existing actions.
MRP 2.0 Q4:	Loads: Assess POC loads, concentrations, or presence/absence.
MRP 2.0 Q5:	Trends: What are the spatial and temporal trends in loads or concentrations?

Approach

A draft workplan to implement the recommendations of the peer reviewers was developed subsequent to the peer review meeting. The estimated budget for this workplan is $270,700 (see table below). The likely available funding is $163,500, consisting of $63,500 of remaining RMP 2016 funds and assuming $100,000 of RMP 2017 funds as recommended by the TRC. Since the proposed project budget exceeds available funds, RMP staff will work with the STLS workgroup to review the workplan and prioritize workplan components. The workplan, as currently designed, includes:

1. Additional data exploration.
2. Design the WY 2017 trends monitoring plan.
3. WY 2017 trends monitoring, data management, data analysis, and reporting.
4. A follow-up peer-review meeting to discuss findings and next steps for the trends strategy.
5. Develop a final trends sampling and analysis plan.

Work products	**Budget**
Additional data exploration	$ 55,000
Develop WY17 Sampling Plan	$ 5,000
Monitoring and laboratory analysis-5 storm events, remote sampler deployment at one site for 2 months	$ 90,000
Data management	$ 23,700
Draft field data analysis and interpretation including new power analysis; brief tech memo	$ 50,000
Peer-review meeting	$ 10,000
Travel for peer reviewers (WY17 results)	$ 5,000
Trends strategy update	$ 7,000
Travel for peer reviewers (WY18 sampling plan)	$ 5,000
Final sampling and analysis plan	$ 10,000
Contingency	$ 10,000
Total Cost	$ 270,700
Likely Budget	$ 163,500
Budget Deficit	$ 107,200

Reporting

The reporting deliverable will be determined by the STLS workgroup.

Linkages to Other RMP Strategies

Some of the sampling sites may be selected in the watersheds of the Priority Margin Units (PCBWG) or monitored for emerging contaminants with funding from the ECWG.

References

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Contribution #585. San Francisco Estuary Institute, Oakland, CA. http://www.sfei.org/sites/default/files/biblio_files/Small_Tributary_Loading_Strategy_FINAL.pdf

SFRWQCB, 2009. California Regional Water Quality Control Board San Francisco Bay Region Municipal Regional Stormwater NPDES Permit, Order R2-2009-0074, NPDES Permit No. CAS612008. Adopted October 14, 2009. 279pp. http://www.waterboards.ca.gov/sanfranciscobay/water_issues/programs/stormwater/Municipal/index.shtml

SFRWQCB, 2015. California Regional Water Quality Control Board San Francisco Bay Region Municipal Regional Stormwater NPDES Permit, Order No. R2-2015-0049, NPDES Permit No. CAS612008. November 19, 2015. 350pp. http://www.waterboards.ca.gov/sanfranciscobay/water_issues/programs/stormwater/Municipal/R2-2015-0049.pdf

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RMP 2016 ANNUAL MEETING AGENDA - DRAFT
Theme: Science to Support Decision-Making
October 7, 2016, The David Brower Center, Berkeley, CA

9:00	**Welcome and Introduction** Tom Mumley, San Francisco Bay Regional Water Quality Control Board
	Session 1: Sediment Contaminants, Dynamics, and Management
9:20	Suspended Sediment Monitoring Update, Including El Nino Studies – Maureen Downing-Kunz, US Geological Survey
9:40	Small Tributary Loading Strategy Update (POC Synthesis, etc.) - Lester McKee, San Francisco Estuary Institute
10:00	Science Needs Relating to Dredging - Brian Ross, US Environmental Protection Agency or Alternate Speaker TBD
10:20	Discussion Moderated by TBD
10:40	BREAK
	Session 2: Contaminants of Emerging Concern
11:00	Microplastic Strategy Update – Rebecca Sutton, San Francisco Estuary Institute
11:20	Science Needs Relating to Pesticide Management - Jennifer Teerlink, California Department of Pesticide Regulation
11:40	Science Needs Relating to Green Chemistry - Anne Cooper Doherty, California Department of Toxic Substances Control
12:00	Discussion Moderated by TBD
12:20	LUNCH
	Session 3: General RMP
1:20	Contaminants in Sport Fish, Including Sturgeon Selenium Studies - Jennifer Sun, San Francisco Estuary Institute
1:40	Contaminants in Sediment on the Bay Margins - Don Yee, San Francisco Estuary Institute
2:00	PCB Fate in Priority Margin Areas - Jay Davis, San Francisco Estuary Institute
2:20	BREAK
	Session 4: Nutrients
2:40	Nutrient Management Strategy Overview - Dave Senn, San Francisco Estuary Institute
3:10	Nutrient Modeling and Application to Other RMP Study Areas - Rusty Holleman, San Francisco Estuary Institute
3:30	Moored Sensor Work - Phil Bresnahan, San Francisco Estuary Institute
3:50	Discussion Moderated by TBD
4:10	Adjourn

Things to highlight:

- 25th Anniversary
- Karen Taberski Retirement

Bay RMP Deliverables Scorecard Report

Key to Status Colors:
Green indicates greater than 90 days until the deliverable is due.
Yellow indicates a deliverable due within 90 days.
Red indicates a deliverable that is overdue.

Focus Area	Project	Primary	Deliverable	Assigned To	Due Date	Due Date Extended	Old Due Date	Status	Comments
Annual Reporting	Bay RMP (2014)	Annual Reporting /	Coring Manuscript	Don Yee	07/29/16		10/31/13		Manuscript in process of being submitted.
Annual Reporting	Bay RMP (2016)	4. Annual Reporting >> A. RMP Update Report	2016 RMP Update Report	Philip Trowbridge	09/30/16				Sent draft to TRC by 6/30/16. Final due by 9/30/16.
Annual Reporting	Bay RMP (2016)	4. Annual Reporting >> B. Annual Meeting	2016 Annual Meeting Agenda and Planning	Philip Trowbridge	09/30/16				Sent a "Save the Date" announcement and prepared an Agenda by 6/30/16.
Annual Reporting	Bay RMP (2016)	4. Annual Reporting >> C. Annual Monitoring Report	2016 Annual Monitoring Report	Jennifer Sun	10/31/16				Draft by 10/30/16; Final by 12/31/16.
Annual Reporting	Bay RMP (2014)	Annual Reporting /	2014 Sportfish Monitoring Report	Jay Davis	11/30/16		12/31/15		Data collected. Report will be written after data are received from labs.
Communications	Bay RMP (2016)	5. Communications >> A. Communications Plan Implementation	Q1 RMP eUpdate	Jay Davis	07/31/16		03/31/16		The Q1 eUpdate was skipped due to Workgroup priorities. The Q2 eUpdate will contain double content.
Communications	Bay RMP (2016)	5. Communications >> A. Communications Plan Implementation	Q2 RMP eUpdate	Jay Davis	07/31/16		06/30/16		The Q2 eUpdate will contain double content.
Communications	Bay RMP (2016)	5. Communications >> A. Communications Plan Implementation	Q3 Estuary News Article	Jay Davis	09/30/16				
Communications	Bay RMP (2016)	5. Communications >> A. Communications Plan Implementation	Q3 RMP eUpdate	Jay Davis	09/30/16				
Communications	Bay RMP (2016)	5. Communications >> B. Stakeholder Engagement	RMP Update for BACWA Board	Philip Trowbridge	10/31/16				
Communications	Bay RMP (2016)	5. Communications >> B. Stakeholder Engagement	RMP Update for BASMAA Board	Philip Trowbridge	10/31/16				
Communications	Bay RMP (2016)	5. Communications >> B. Stakeholder Engagement	RMP Update for LTMS Program Managers	Philip Trowbridge	10/31/16				
Communications	Bay RMP (2016)	5. Communications >> B. Stakeholder Engagement	RMP Update for BPC	Philip Trowbridge	10/31/16				
Communications	Bay RMP (2016)	5. Communications >> B. Stakeholder Engagement	RMP Update for WSPA BATS Meeting	Philip Trowbridge	10/31/16				
Communications	Bay RMP (2016)	5. Communications >> B. Stakeholder Engagement	RMP Update for RB2 staff	Philip Trowbridge	10/31/16				Schedule to coincide with regular directors meeting.
Communications	Bay RMP (2016)	5. Communications >> A. Communications Plan Implementation	Q4 Estuary News Article	Jay Davis	12/31/16				
Communications	Bay RMP (2016)	5. Communications >> A. Communications Plan Implementation	Q4 RMP eUpdate	Jay Davis	12/31/16				
Communications	Bay RMP (2016)	5. Communications >> D. Fact Sheets and Outreach Products	2 Fact Sheets (content TBD).	Philip Trowbridge	12/31/16				
Communications	Bay RMP (2016)	5. Communications >> E. Presentations at Conferences and Meetings	Presentation of RMP data at up to 6 conferences or local meetings	Philip Trowbridge	12/31/16				
Communications	Bay RMP (2016)	5. Communications >> E. Presentations at Conferences and Meetings	Up to 6 posters with RMP data for conferences.	Philip Trowbridge	12/31/16				
Data Management	Bay RMP (2016)	3. Data Management >> G. Quality Assurance System	Updated QAPP	Don Yee	06/30/16		03/31/16		QAPP was presented to the TRC on 6/9/16 and distributed to laboratories. Final edits are being made.
Data Management	Bay RMP (2016)	3. Data Management >> B. Data Mgmt for 2016 S&T Bird Egg Samples	EDD templates for 2016 S&T bird egg data	Amy Franz	07/31/16		02/28/16		Work could not start until 7/11/16 when collection information was provided by USGS.

Focus Area	Project	Primary	Deliverable	Assigned To	Due Date	Due Date Extended	Old Due Date	Status	Comments
Data Management	Bay RMP (2015)	Data Management / A. Data Processing, Quality Assurance, and Upload to CEDEN	Upload 2014 Sport fish Data to CEDEN	Amy Franz	08/31/16		12/01/15		Delayed because the TRC added on additional sample collection for Artesian Slough samples which were collected around July 2015. All lab results were not received until May 2016. Upload is in progress.
Data Management	Bay RMP (2016)	3. Data Management >> C. Data Mgmt for 2016 S&T Bivalve Samples	EDD templates for 2016 S&T bivalve data	Amy Franz	09/30/16				
Data Management	Bay RMP (2016)	3. Data Management >> E. Online Data Access: CD3	(1) Enhance Data Download by adding spatial selection functionality	Cristina Grosso	09/30/16		06/30/16		Development work for the next release of CD3 is in progress.
Data Management	Bay RMP (2016)	3. Data Management >> E. Online Data Access: CD3	(2) Integrate the display of data from CEDEN (e.g., visualize other data from the Central Valley)	Cristina Grosso	09/30/16				
Data Management	Bay RMP (2016)	3. Data Management >> A. Data Mgmt for 2015 S&T Water Samples	Processing and upload 2015 S&T water data.	Amy Franz	12/31/16				Notify TRC of upload. 1) Water Chemistry data uploaded 7/11/16. 2) Toxicity data still to be uploaded.
Data Management	Bay RMP (2016)	3. Data Management >> A. Data Mgmt for 2015 S&T Water Samples	QA dataset summaries for 2015 S&T water data.	Amy Franz	12/31/16				
Data Management	Bay RMP (2016)	3. Data Management >> B. Data Mgmt for 2016 S&T Bird Egg Samples	Preparations, processing and upload 2016 S&T bird egg data	Amy Franz	12/31/16				Notify TRC of upload
Data Management	Bay RMP (2016)	3. Data Management >> B. Data Mgmt for 2016 S&T Bird Egg Samples	QA dataset summaries for 2016 S&T bird egg data	Amy Franz	12/31/16				
Data Management	Bay RMP (2016)	3. Data Management >> D. Database Maintenance	(1) Update data results as requested by PIs, data providers and CEDEN.	Amy Franz	12/31/16				Additional: (a) 2002 and 2007 Water Toxicity Data - need control data in order to display on CD3 (CDThree-301); small fish dw/ww results results were converted to ww. Mark all dry weight as not reportable. (CDThree-314)
Data Management	Bay RMP (2016)	3. Data Management >> D. Database Maintenance	(2) Apply updates to servers as needed; create backups of data on a regular basis	Amy Franz	12/31/16				
Data Management	Bay RMP (2016)	3. Data Management >> D. Database Maintenance	(3) CEDEN uploads or updates for past RMP datasets (see list in comments)	Amy Franz	12/31/16				(a) 2005-2012 EBMUD reanalyzed sediment samples (DTSRMP-220), (b) 2005-2007, 2011, 2012, 2014 Revised EBMUD sediment results for Fipronil (DTSRMP-554) (c) 2014 seal serum data, 2014 effluent data for PFC and Fipronil, and 2006-2013 PRC data (DTSRDC-107). (d) 2014 alternative flame retardants data (DTSRMP-45) . Optional: (b) historic Sum of TEQs (DTSRDC-219)
Data Management	Bay RMP (2016)	3. Data Management >> D. Database Maintenance	(4). Additional Data cleanup tasks (see list in comments)	Amy Franz	12/31/16				(a) Update QA Code for PCB coelutions to be CEDEN comparable (DTSRDC-186); (b) investigate records that have a rejected QA Code but do not have a Compliance Code that indicates rejection (DTSRDC-33); (c) Review archive database and identify old archive samples for possible disposal (DTSRMP-658) DONE May 2016.
Data Management	Bay RMP (2016)	3. Data Management >> E. Online Data Access: CD3	(3) Provide access to other types of data that are stored in database (e.g., runoff, benthic)	Cristina Grosso	12/31/16				
Data Management	Bay RMP (2016)	3. Data Management >> E. Online Data Access: CD3	(4) Transition to new Pulse graphic procedures	Cristina Grosso	12/31/16				
Data Management	Bay RMP (2016)	3. Data Management >> E. Online Data Access: CD3	(5) Develop data exchange services so Delta RMP preliminary and final data can be easily shared with the Estuaries Workgroup Portal	Cristina Grosso	12/31/16				
Data Management	Bay RMP (2016)	3. Data Management >> E. Online Data Access: CD3	Provide general tool upkeep and maintenance	Cristina Grosso	12/31/16				In progress. This is an ongoing task.

Focus Area	Project	Primary	Deliverable	Assigned To	Due Date	Due Date Extended	Old Due Date	Status	Comments
Data Management	Bay RMP (2016)	3. Data Management >> F. Online Data Access: Archive Sample Tool	(1) Enhance archive tool based on user feedback (see list in comments)	Michael Weaver	12/31/16				(a) Add handling for import from .xls and . xlsx (currently only csv), (b) Refresh grid after successfully saving transaction, (c) Add better error/success reporting for uploads, (d) Add validation for uploads (on a field by field basis) for field specific data types and business rules; include useful, field specific messages, (e) Change items per page to have an unlimited option, (f) Create standardized upload template, (g) Set-up active fiters to filter select list options, (h) Add in Sample Available Yes/No Field for users; (2) Develop documentation (December); (3) Provide general tool upkeep and maintenance (December)
Data Management	Bay RMP (2016)	3. Data Management >> G. Quality Assurance System	Summary QA memo for 2015 S&T Monitoring	Don Yee	12/31/16				Report covers 2015 Water Cruise and 2015 Bay Margins Sediment Study
Data Management	Bay RMP (2016)	3. Data Management >> H. Updates to SOPs and Templates	(1) Modify QA queries for the tissue template to meet CEDEN's business rules.	Amy Franz	12/31/16				Jan: Updated tissue make table for QA review. Jan-Mar: Updated WQ and TI formatting queries to use CEDEN tables and updated accompanying documentation.
Data Management	Bay RMP (2016)	3. Data Management >> H. Updates to SOPs and Templates	(2) Make any modifications needed to accommodate revisions in CEDEN's business rules and data checker.	Amy Franz	12/31/16				
Data Management	Bay RMP (2016)	3. Data Management >> C. Data Mgmt for 2016 S&T Bivalve Samples	Preparations, processing and upload 2016 S&T bivalve data	Amy Franz	06/30/17				Notify TRC of upload
Data Management	Bay RMP (2016)	3. Data Management >> C. Data Mgmt for 2016 S&T Bivalve Samples	QA dataset summaries for 2016 S&T bivalve data	Amy Franz	06/30/17				
Emerging Contaminants	Bay RMP (2014)	Emerging Contaminants Special Studies / Developing Bioanalytical Tools (Year 2)	Final Report	Nancy Denslow	06/30/16		12/31/15		Report has been drafted and shared with EEWG and TRC. Results were presented at the April 2016 ECWG meeting on 4/30/15. Authors are incorporating final data and edits.
Emerging Contaminants	Bay RMP (2016)	EC Strategy Support	CEC Strategy Document Update	Rebecca Sutton	12/15/16				Draft report for ECWG and TRC by 12/15/16. Final document by 3/31/17. Update will include the latest tiered placement of chemicals, information needs and proposed studies, and 5-year plan for research.
Emerging Contaminants	Bay RMP (2014)	Emerging Contaminants Special Studies /	Alternative Flame Retardants Study - Final Report	Rebecca Sutton	12/31/16		06/30/15		Delayed due to other priorities. This delay will not affect the MYP process, and the data has already been presented to the ECWG. Original due date: 6/30/15
Emerging Contaminants	Bay RMP (2016)	EC Strategy Support	Assist Water Board in preparing Emerging Contaminant Action Plans	Rebecca Sutton	12/31/16				
Emerging Contaminants	Bay RMP (2016)	EC Strategy Support	Coordinate pro-bono study on Pharmaceutical Contaminants in Wastewater Effluent	Rebecca Sutton	12/31/16		03/31/16		Initial conversations to recruit participants and select analytical methods have occurred. A web survey was used for further recruitment and to organize for summer sampling.
Emerging Contaminants	Bay RMP (2016)	EC Non-targeted Analysis	Report on Non-Targeted Analysis of Water-Soluble CEC Compounds	Rebecca Sutton	03/31/17				Draft report for ECWG by 3/31/17. Final report by 6/31/17. Provide final report to EB Parks.
Emerging Contaminants	Bay RMP (2016)	EC Non-targeted Analysis	Fact Sheet on Non-Targeted Analysis of Water-Soluble CEC Compounds	Rebecca Sutton	03/31/17				Draft fact sheet for ECWG by 3/31/17. Final report by 6/31/17. Provide final fact sheet to EB Parks.
Exposure and Effects	Bay RMP (2016)	EE Sediment Toxicity Testing	Technical Report on E. Estuarius Toxicity Experiments with Field Sediments	Brian Anderson (UCD)	09/30/16		03/31/16		Draft report was presented to EEWG on 5/16/16 and distributed to the TRC on 5/30/16. Report will be finalized by 9/30/16 after additional data on sediment chemistry and grain size data are available. The chemistry data will be paid for by another grant.
Exposure and Effects	Bay RMP (2014)	Exposure and Effects Special Studies / Assessing the Impacts of Periodic Dredging on Benthic Habitat Quality	Final Report	Philip Trowbridge	12/01/16				Technical Assistance Agreement has been executed and research is underway.
Governance	Bay RMP (2016)	2. Governance >> A. SC meetings	July 2016 SC Meeting	Philip Trowbridge	07/31/16				
Governance	Bay RMP (2016)	2. Governance >> B. TRC meetings	September 2016 TRC Meeting	Philip Trowbridge	09/30/16				
Governance	Bay RMP (2016)	2. Governance >> A. SC meetings	October 2016 SC Meeting	Philip Trowbridge	10/31/16				
Governance	Bay RMP (2016)	2. Governance >> B. TRC meetings	December 2016 TRC Meeting	Philip Trowbridge	12/31/16				
Governance	Bay RMP (2016)	2. Governance >> D. External Science Advisors	Honoraria Payments for Science Advisors	Philip Trowbridge	12/31/16				

Focus Area	Project	Primary	Deliverable	Assigned To	Due Date	Due Date Extended	Old Due Date	Status	Comments
Nutrients	Bay RMP (2015)	Nutrients Special Studies / Nutrient Modeling Program Development	Progress Report on Phase 1 Modeling	Dave Senn	09/30/16				This will be included in the FY 2016 Nutrients Science Program Update (final due 9/30/16).
Nutrients	Bay RMP (2015)	Nutrients Special Studies / Nutrient Biogeochemical Mapping in Lower South Bay	Biogeochemical Mapping in Lower South Bay: Phase II Report	Dave Senn	09/30/16				Data from all 3 mapping cruises will be included in FY 2016 Nutrients Science Program Update (final due 9/30/16). Conversations are on-going with USGS regarding final technical report and/or manuscript development
Nutrients	Bay RMP (2016)	Nutrients Science Program	FY 2016 Annual Nutrients Science Program Update	Dave Senn	09/30/16				Draft program update for Nutrient Technical Workgroup by 6/30/16. Final program update by 9/30/16. Includes results from moored sensor monitoring, dissolved oxygen monitoring in shallow margin habitats, and monitoring program development.
PCB Strategy	Bay RMP (2015)	PCB Special Studies / PCB Priority Margin Unit Conceptual Model	PCB Priority Margin Unit Conceptual Model Final Report	Jay Davis	09/30/16		02/26/16		Draft report presented in PCB WG and SPLWG in May 2016. Draft presented to the TRC in June 2016. Awaiting comments from all reviewers and then the report will be finalized.
PCB Strategy	Bay RMP (2016)	PCB Margins Conceptual Model	Priority Margin Unit Conceptual Model Report - San Leandro Bay	Jay Davis	04/30/17				Draft report for PCB Strategy Team by 4/30/17. Final report by 7/31/17. Deliverable and due dates contingent on additional funding allocation of $20k.
Program Management	Bay RMP (2016)	1. Program Management >> B. Contract and Financial Management	Q3 RMP Financial Report	Philip Trowbridge	07/15/16				
Program Management	Bay RMP (2016)	1. Program Management >> B. Contract and Financial Management	Q4 RMP Financial Report	Philip Trowbridge	10/15/16				
Program Management	Bay RMP (2016)	1. Program Management >> A. Program Planning	2017 Multi-Year Plan	Philip Trowbridge	10/31/16				Draft in October '16, final in January '17.
Program Management	Bay RMP (2016)	1. Program Management >> A. Program Planning	2016 Detailed Workplan	Philip Trowbridge	10/31/16				Draft in October '16, final in January '17.
Selenium Strategy	Bay RMP (2015)	Selenium Special Studies / Selenium Delta Fish Derby Monitoring	2015 Sturgeon Derby Final Report	Jennifer Sun	07/31/16		02/26/16		Report was sent to Selenium WG as part of the WG agenda package. Report will be finalized after the Se WG meeting on 5/4/16.
Selenium Strategy	Bay RMP (2015)	Selenium Special Studies / Selenium Sturgeon Tissue Plug Monitoring	2015 Sturgeon Muscle Plug Final Report	Jennifer Sun	09/30/16		05/31/16		Report delayed because USGS lab data are not expected until 4/30/16. Initial report will not include isotope data.
Selenium Strategy	Bay RMP (2016)	Selenium 2016 Derby Monitoring	Technical Report on 2016 Derby Monitoring	Jennifer Sun	12/31/16				Draft report for Selenium Strategy Team by 12/31/16. Final report by 2/28/17.
Sources Pathways and Loadings	Bay RMP (2016)	STLS Trends Strategy Support	STLS Trends Strategy Quality Assurance Project Plan	Lester McKee	08/30/16				Draft QAPP for SPLWG and STLS by 8/30/16. Final QAPP by 10/31/16.
Sources Pathways and Loadings	Bay RMP (2016)	STLS Trends Strategy Support	STLS Trends Strategy Site Selection Spreadsheet	Lester McKee	08/30/16				Compile outcomes of site selection and reconnaissance at 15+ sites in master spreadsheet. Draft for SPLWG and STLS by 8/30/16. Final by 10/31/16.
Sources Pathways and Loadings	Bay RMP (2015)	STLS Special Studies / STLS Regional Watershed Model	Update Regional Watershed Model for PCB and Mercury	Lester McKee	09/30/16		09/30/14		RWSM report prepared and sent to STLS for review. Next it will be reviewed by SPLWG in May 2016. The final report should be complete by 9/30/16.
Sources Pathways and Loadings	Bay RMP (2015)	STLS Special Studies / STLS Trends Strategy	Stormwater Trends Strategy White Paper	Lester McKee	09/30/16		10/30/15		Trends Stategy document and Technical Appendix (including power analysis) were sent as drafts reports to STLS, SPLWG, and Bob Hirsch/Lori Sprague (by 6/30/16). Nearly all comments have been addressed. Report will be finalized in the early fall.
Sources Pathways and Loadings	Bay RMP (2016)	STLS Spreadsheet Model	Updated Report on RWSM calibration, sensitivity analysis, and documentation	Lester McKee	09/30/16				Draft report for SPLWG and STLS by 9/30/16. Final report by 12/31/16.
Sources Pathways and Loadings	Bay RMP (2016)	STLS Stormwater Characterization	Report on WY 2016 Pollutants of Concern monitoring	Lester McKee	12/31/16				Draft report for SPLWG and STLS by 12/31/16. Final report by 3/31/17.
Sources Pathways and Loadings	Bay RMP (2016)	STLS Coordination	5 - 8 STLS meetings	Lester McKee	12/31/16				
Sources Pathways and Loadings	Bay RMP (2016)	STLS Trends Strategy Support	STLS Trends Strategy Sampling and Analysis Plan	Lester McKee	12/31/17				Draft SAP for SPLWG and STLS by 12/31/16. Final SAP by 2/28/17. Peer reviewers have asked for additional data exploration which will push out subsequent deliverables.
Sport Fish	Bay RMP (2016)	2. Governance >> C. WG meetings	Sport Fish WG Meeting	Jay Davis	07/31/16				
Status and Trends	Bay RMP (2015)	Status and Trends / K. CTR Monitoring Report	Summary Report of Water Cruise Monitoring for CTR Parameters	Don Yee	06/30/16				Draft report completed on 6/30/16 and sent to Tom Hall for review. Final report due by 9/30/16.

Focus Area	Project	Primary	Deliverable	Assigned To	Due Date	Due Date Extended	Old Due Date	Status	Comments
Status and Trends	Bay RMP (2016)	6. Status and Trends Monitoring >> Bay Margins Study	Margins Sediment Sampling: Data Analysis and Reporting	Don Yee	09/30/16				Preliminary presentation to TRC, March 2016 (done); Draft report, September 2016; Final report, December 2016
Status and Trends	Bay RMP (2016)	6. Status and Trends Monitoring >> Analysis of RMP Data	Analysis of S&T Data	Jennifer Sun	12/31/16				Measured concentrations compared to site-specific objectives triggers for copper and cyanide. The results of this analysis will be posted on the RMP website by December 2016. Additional funds will be used to support other analyses of S&T data, as requested and in support of development and publication of RMP manuscripts

Bay RMP Action Items

Key to Status Colors:
Green indicates greater than 90 days until the deliverable is due.
Yellow indicates a deliverable is due within 90 days.
Red indicates a deliverable that is overdue.

Primary	Deliverable	Assigned To	Due Date	Status	Comments	Meeting Date
Technical Review Committee Action Items from 3/29/16	Revise March 29, 2016 TRC meeting summary and post it on the Bay RMP website.	Jennifer Sun	06/23/16	Complete		06/09/16
Technical Review Committee Action Items from 3/29/16	Schedule the fourth quarter TRC meeting for December 8, 2016	Jennfier Sun	06/23/16	Complete		06/09/16
Technical Review Committee Action Items from 3/29/16	Send full Water Quality Improvement Fund proposal to the Technical Review Committee	Philip Trowbridge	06/23/16	Complete		06/09/16
Technical Review Committee Action Items from 3/29/16	Add an agenda item to a future TRC meeting to discuss how PCB margins studies and STLS trends strategy will inform changes to the PCB TMDL.	Jay Davis	12/31/16	Complete		06/09/16
Technical Review Committee Action Items from 3/29/16	Add the discussion of 2017-2018 Status and Trends sampling to the September 2016 TRC meeting agenda	Philip Trowbridge	09/01/16	Complete		06/09/16
Technical Review Committee Action Items from 3/29/16	Find out what laboratory the NOAA Status & Trends program uses to analyze sediment PCB	Don Yee	07/31/16	Complete	NOAA uses TDI-Brooks (GC-ECD, which is nearly the same sensitivity as HRMS but not as specific).	06/09/16
Technical Review Committee Action Items from 3/29/16	Add an agenda item to the September TRC meeting for a bacteria in Bay beaches talk from Amy Chastain and Rod Mille	Philip Trowbridge	09/01/16	Complete		06/09/16
Steering Committee Action Items from 4/19/16	Follow up with Rob Lawrence to find a new USACE representative or, if necessary, send a formal request to the USACE senior management	Philip Trowbridge	07/12/16	Complete		04/19/16
Steering Committee Action Items from 4/19/16	Develop procedures for using RMP funds as grant matching funds and report back to the SC	Philip Trowbridge	10/31/16		Action item delayed. Will be ready for 11/1/16 MYP meeting.	04/19/16
Steering Committee Action Items from 4/19/16	Discuss with Tom Mumley the possibility of using RMP funds as match for a Resilient Landscapes Water Quality Improvement Fund proposal. Bring the proposal back to the SC for approval if it is justified.	Philip Trowbridge	04/29/16	Complete		04/19/16
Steering Committee Action Items from 4/19/16	Distribute more information on the Resilient Landscape's Water Quality Improvement Fund proposal to the Steering Committee, if RMP funds will be used as match.	Philip Trowbridge	05/06/16	Complete		04/19/16
Steering Committee Action Items from 4/19/16	Send invoices for the AMR supplemental RMP contribution to all wastewater participants by mid May to give agencies the option of using left-over money in their budgets for this fiscal year.	Lawrence Leung	06/01/16	Complete		04/19/16
Steering Committee Action Items from 4/19/16	Revise guidance to workgroups to indicate that ranking of proposals is mandatory and that all workgroups should have extra projects scoped out to be ready for SEP settlements.	Phil Trowbridge	05/01/16	Complete		04/19/16
Steering Committee Action Items from 4/19/16	Modify the list of "new focus areas" based on SC feedback and continue to refine the concepts for the November SC meeting.	Philip Trowbridge	10/31/16		Action item delayed. Will be ready for 11/1/16 MYP meeting.	04/19/16
Steering Committee Action Items from 4/19/16	Add agenda item to the July 2016 SC meeting to consider a maximum undesignated reserve fund cap and plans for fee increases for the next three years	Philip Trowbridge	07/12/16	Complete	Added to list of agenda items.	04/19/16

Primary	Deliverable	Assigned To	Due Date	Status	Comments	Meeting Date
Steering Committee Action Items from 4/19/16	Update and finalize the Internal Review report.	Philip Trowbridge	10/31/16		Action item delayed. Will be ready for 11/1/16 MYP meeting. Add the lead staff for each area.	04/19/16
Steering Committee Action Items from 4/19/16	In the internal review document, include IEP as an external partner with whom to develop a stronger working relationship. Attend IEP meetings for the next year.	Philip Trowbridge	10/31/16		Action item delayed. Will be ready for 11/1/16 MYP meeting.	04/19/16
Steering Committee Action Items from 4/19/16	Post 1/19/16 meeting summary to website	Jennifer Sun	05/01/16	Complete		04/19/16
Steering Committee Action Items from 4/19/16	Schedule the next Steering Committee meeting for 1/17/17	Jennifer Sun	05/01/16	Complete		04/19/16
Technical Review Committee Action Items from 3/29/16	Post December 15, 2016 TRC meeting summary to the Bay RMP website	Jennifer Sun	04/15/16	Complete		03/29/16
Technical Review Committee Action Items from 3/29/16	Convene the New Focus Areas subcommittee to futher refine potential new focus areas to prepare for the Multi-Year Planning workshop in November	Philip Trowbridge	10/31/16		Action item delayed. Will be ready for 11/1/16 MYP meeting.	03/29/16
Technical Review Committee Action Items from 3/29/16	Include link to the 2002-2003 CTR report and appendix in the 2015 report on CTR analytes	Don Yee	09/30/16			03/29/16
Technical Review Committee Action Items from 3/29/16	Talk to the Water Board regarding the potential policy implications for the six analytes with MDLs greater than criteria	Don Yee	06/30/16	Complete	Received feedback at SC meeting that the six non-detected compounds are not a priority for follow-up work.	03/29/16
Technical Review Committee Action Items from 3/29/16	Find out if individual white sturgeon samples were archived and are available for mercury analysis, and if so, request the analysis	Jennifer Sun	04/22/16	Complete	Only composite samples were archived	03/29/16
Technical Review Committee Action Items from 3/29/16	Analyze PBDE trends in the Guadalupe River from 2005-2014 and report results to the TRC	Lester McKee	12/31/16		To be completed in manuscript funded SFEP (project 1106)	03/29/16
Technical Review Committee Action Items from 3/29/16	Update 2016 RMP Annual Meeting agenda with TRC suggestions	Jay Davis	04/15/16	Complete		03/29/16
Technical Review Committee Action Items from 3/29/16	Send an email to the TRC and other reviewers to mark their calendars for the RMP Update first draft review period of 5/15/-5/31	Jay Davis	04/22/16	Complete	RMP Update will be presented at the 6/9/16 TRC meeting.	03/29/16
Technical Review Committee Action Items from 3/29/16	Review short term archive sample list (> 5 years old) and create an optimized sample set for external distribution	Jennifer Sun	06/30/16	Complete	Whole bivalve archives from 2004-2008 have been delivered to DPH, and fish archives have been shipped to SIU. Archive sample lots were consolidated (7 lots closed).	03/29/16
Technical Review Committee Action Items from 3/29/16	Schedule the next TRC meeting date for September 21	Jennifer Sun	04/15/16	Complete		03/29/16
Technical Review Committee Action Items from 3/29/16	Send the powerpoint presentations on draft RMP monitoring results to the TRC	Jennifer Sun	04/15/16	Complete		03/29/16
Steering Committee Action Items from 1/19/16	Post November 10, 2015 Multi-Year Planning Meeting Summary and Steering Committee Meeting Summary, and 2016 Multi-Year Plan to the Bay RMP and SFEI websites.	Jennifer Sun	01/31/16	Complete		01/19/16
Steering Committee Action Items from 1/19/16	Discuss options for the RMP to serve as a mitigation project for 401 Water Quality Certifications with Peter Carroll and Regional Board staff	Tom Mumley	04/30/16	Complete	This funding source was not deemed viable by RB2. No further action.	01/19/16
Steering Committee Action Items from 1/19/16	Discuss options to develop Alternative Monitoring and Reporting Requirements for refinery dischargers in exchange for increased RMP fee payments with Peter Carroll and Regional Board staff	Tom Mumley	04/30/16	Complete	This funding source was not deemed viable by RB2. No further action.	01/19/16
Steering Committee Action Items from 1/19/16	Schedule a meeting with dredgers and Bay Planning Coalition in March	Philip Trowbridge	01/31/16	Complete		01/19/16
Steering Committee Action Items from 1/19/16	Send comment letter on the Tentative Order for Alternative Monitoring and Reporting Requirements to the Water Board	Philip Trowbridge	01/31/16	Complete		01/19/16

Primary	Deliverable	Assigned To	Due Date	Status	Comments	Meeting Date
Steering Committee Action Items from 1/19/16	Prepare a specific proposal for RMP matching funds for the Flood Control 2.0 grant	Lester McKee	02/28/16	Complete	Will be on SC agenda for 4/19/16.	01/19/16
Steering Committee Action Items from 1/19/16	Allocate up to $189,330 in funds from Undesignated Funds for the three approved wet weather monitoring projects. Include a note that the Steering Committee approved the use of up to the total requested amount, with the understanding that RMP staff should pursue other funding sources to reduce the cost to the RMP (e.g. SFEP funding for Guadalupe River monitoring)	Philip Trowbridge	01/31/16	Complete		01/19/16
Steering Committee Action Items from 1/19/16	Set up the new Guadalupe River Hg and SSC monitoring project in Deltek and prepare contracts	Philip Trowbridge	02/15/16	Complete	Check Google Sheet and Deltek. Be prepared for TAA with USGS.	01/19/16
Steering Committee Action Items from 1/19/16	Prepare to implement the Guadalupe River Hg Study	Lester McKee	03/31/16	Complete		01/19/16
Steering Committee Action Items from 1/19/16	Include the development of long-term Guadalupe River mercury and Bay sediment study plans, stakeholders and funding sources in RMP external coordination efforts.	Lester McKee	06/30/16	Complete	Proposed the development of a 100 year monitoring plan for Hg in the Guadalupe River in a proposal to SFEP.	01/19/16
Steering Committee Action Items from 1/19/16	Have discussions with potential Delta stakeholders and funders. Coordinate discussions with Tom Mumley and the Water Board.	Philip Trowbridge	06/30/16	Complete	Held discussions with the Delta RMP stakeholders. Attended a meeting with the IEP Program Manager in July.	01/19/16
Steering Committee Action Items from 1/19/16	Send a notification to the NMS planning committee that the RMP Steering Committee has approved $31,000 from RMP allocated funds in 2016 for wet weather and spring bloom nutrients monitoring, and ask for any objections. The Steering Committee includes three members of the NMS planning committee, who all voted in favor of the proposal.	Dave Senn	01/31/16	Complete		01/19/16
Steering Committee Action Items from 1/19/16	Work with USGS and RTC collaborators to refine the approved proposal and ensure that the approved funds will provide the maximum benefit possible.	Dave Senn	01/31/16	Complete		01/19/16
Steering Committee Action Items from 1/19/16	Set up contracts with RTC to implement the wet-weather nutrient monitoring.	Jennifer Hunt	02/29/16	Complete		01/19/16
Steering Committee Action Items from 1/19/16	Allocate funds from Undesignated Funds for up to $25,000 to fund the development of a Microplastics Strategy in 2016	Lawrence Leung	01/31/16	Complete		01/19/16
Steering Committee Action Items from 1/19/16	Set up a Microplastics Strategy project in Deltek	Philip Trowbridge	01/31/16	Complete		01/19/16
Steering Committee Action Items from 1/19/16	Include Karin, Jim, Tom, and Adam on a planning group to guide the development of the Microplastics Strategy	Rebecca Sutton	02/15/16	Complete		01/19/16
Steering Committee Action Items from 1/19/16	Add a yearly update on modeling to the list of science updates for the Steering Committee	Jay Davis	02/28/16	Complete	Added to agenda list.	01/19/16
Steering Committee Action Items from 1/19/16	Consider a revision to the report name, or change it to “Regional Monitoring Program Update.” Revise the column on the Program Impact page that currently reads “Decisions Informed by the RMP” to reflect the fact that decisions are actively being informed (not past tense) and the RMP is not the only source of information for these decisions	Jay Davis	05/15/16	Complete		01/19/16
Steering Committee Action Items from 1/19/16	Reserve Friday, October 7th as the Annual Meeting date at the Brower Center	Jennifer Sun	02/15/16	Complete		01/19/16
Steering Committee Action Items from 1/19/16	Implement workplan for the RMP Internal Review and prepare a summary of outcomes for the April Steering Committee meeting	Philip Trowbridge	04/19/16	Complete	Will be on SC agenda for 4/19/16.	01/19/16
Steering Committee Action Items from 1/19/16	Review overdue deliverables in smartsheets and make sure all have revised deadlines in their comments	Philip Trowbridge	01/31/16	Complete		01/19/16
Steering Committee Action Items from 1/19/16	Schedule the Multi-Year Planning Meeting and fall Steering Committee meeting for November 1, 2016	Jennifer Sun	01/31/16	Complete		01/19/16
Technical Review Committee Action Items from 12/15/15	Follow-up with Tom Hall regarding the schedule for finalizing data from the 2016 water cruise	Philip Trowbridge	01/31/16	Complete		12/15/15

Primary	Deliverable	Assigned To	Due Date	Status	Comments	Meeting Date
Technical Review Committee Action Items from 12/15/15	Provide information to the TRC on how CEC Action Plans will be produced and rolled out for public comment	Naomi Feger	04/15/16	Complete	This information will be presented at the ECWG meeting in April 2016.	12/15/15
Technical Review Committee Action Items from 12/15/15	Prepare a slide that explains how the data from all the different PCB studies will be used to inform the other studies and the broader management questions about PCBs	Jay Davis	05/20/16	Complete	This information will be presented at the PCB WG meeting.	12/15/15
Technical Review Committee Action Items from 12/15/15	Convene meetings of interested stakeholders about potential new focus areas for the RMP to better define the RMP's role/niche. Put this issue back on the TRC agenda for the March 2016 meeting	Philip Trowbridge	03/31/16	Complete		12/15/15
Technical Review Committee Action Items from 12/15/15	Send the TRC the slides from the meeting showing the schedule for data release from the 2016 workplan in order to solicit comments on datasets of high priority	Philip Trowbridge	01/15/16	Complete		12/15/15
Technical Review Committee Action Items from 12/15/15	Send notifications to the TRC when RMP datasets are available on CD3	Amy Franz	03/31/16	Complete	This is an ongoing action item	12/15/15
Technical Review Committee Action Items from 12/15/15	Dispose of the archived whole mussel samples as well as the duplicate sediment samples from 1992-2002. Add a discussion to the March TRC agenda about possible uses of other archive materials, including the Risebrough samples	Philip Trowbridge	03/31/16	Complete	Plan is to only dispose of the whole tissue mussel samples for now. Will discuss the rest of the possible samples to discard with the TRC.	12/15/15
Technical Review Committee Action Items from 12/15/15	Set up a webinar to present a demo of CD3 enhancements and the archive tool	Cristina Grosso	09/30/16		Action Item delayed due to other priorities. Presentation will be on CD3 only. Archive tool is just for internal use. The tool will be presented in December to the TRC.	12/15/15
Technical Review Committee Action Items from 12/15/15	Contact EBMUD and AXYS regarding next steps for PCB interlab study	Don Yee	01/15/16	Complete		12/15/15
Technical Review Committee Action Items from 12/15/15	Find out which labs currently hold the NOAA and EPA contracts and get information on their methods for PCBs	Don Yee	01/15/16	Complete		12/15/15
Technical Review Committee Action Items from 12/15/15	Schedule a conference call with the TRC in late February or early March to present new information and a decision on the laboratory	Philip Trowbridge	03/15/16	Complete	A subcommittee of the TRC was formed. The group met by teleconference in February.	12/15/15
Technical Review Committee Action Items from 12/15/15	Get a cost estimate for the USGS to perform high frequency mapping in South Bay and Suisun Bay during El Nino conditions	Philip Trowbridge	01/15/16	Complete		12/15/15
Technical Review Committee Action Items from 12/15/15	Develop a list of the pros/cons and utility of the data for all of the possible options for El Nino nutrient monitoring (high frequency mapping cruises, RTC proposal, nutrient flux measurements)	Philip Trowbridge	01/31/16	Complete		12/15/15
Technical Review Committee Action Items from 12/15/15	Update microplastics strategy proposal by adding: (1) more emphasis on analytical methods and quality assurance; (2) pre-workshop engagement with stakeholders to refine the management questions; and (3) a full day workshop (instead of a half day)	Rebecca Sutton	01/11/16	Complete		12/15/15
Technical Review Committee Action Items from 12/15/15	Take the microplastics proposal to the Steering Committee for approval in January	Philip Trowbridge	01/18/16	Complete		12/15/15
Technical Review Committee Action Items from 12/15/15	Provide Nirmela with the SEM results for the wastewater effluent samples from Bay Area POTWs	Rebecca Sutton	01/11/16	Complete	Initial comments from Dr. Mason have been provided to Nirmela, and a conference call is advised for further questions.	12/15/15
Technical Review Committee Action Items from 12/15/15	Explicitly list the TRC as reviewers for all items on in the Upcoming Bay RMP Reports and Technical Products table	Philip Trowbridge	01/31/16	Complete		12/15/15
Technical Review Committee Action Items from 12/15/15	Share product review procedures with RMP staff	Philip Trowbridge	01/31/16	Complete		12/15/15

Primary	Deliverable	Assigned To	Due Date	Status	Comments	Meeting Date
Technical Review Committee Action Items from 12/15/15	Check in with Naomi Feger and WB staff to make sure that the RMP and the Water Board are on the same page with the CEC Action Plan and CEC Strategy	Rebecca Sutton	03/31/16	Complete	Water Board staff were consulted as to potential new CEC management questions and revised strategy scope. Our understanding is that one of the four CEC Action Plans is still in progress, and when it's done, all four will be released.	12/15/15
Technical Review Committee Action Items from 12/15/15	Call Tom Hall to determine a potentially accelerated schedule for the processing of the CTR data from the 2015 Bay RMP Water Cruise	Philip Trowbridge	01/31/16	Complete		12/15/15
Technical Review Committee Action Items from 12/15/15	Talk with partners (BACWA, SCVWRD, SCCWRP) regarding management questions about RO concentrate	Philip Trowbridge	03/31/16	Complete		12/15/15
Technical Review Committee Action Items from 12/15/15	Confirm and then schedule a TRC meeting date of June 14	Philip Trowbridge	01/31/16	Complete	Meeting date was changed to June 9.	12/15/15
Steering Committee Action Items from 11/10/15	Contact SCVWD regarding funding for the Guadalupe mercury monitoring	Tom Mumley	11/30/15	Complete		11/10/15
Steering Committee Action Items from 11/10/15	Revise the study proposals based on feedback and report back to the SC in January	Philip Trowbridge	01/19/16	Complete	Proposals have been revised. On agenda for 12/15 TRC meeting.	11/10/15
Steering Committee Action Items from 11/10/15	Update Detailed Workplan and Budget with the approved change and add final budgets and deliverables to accounting software	Philip Trowbridge	11/30/15	Complete		11/10/15
Steering Committee Action Items from 11/10/15	Follow up with Tom Mumley, Naomi Feger, and John Coleman regarding the development of a new dredger fee formula	Philip Trowbridge	11/30/15	Complete		11/10/15
Steering Committee Action Items from 11/10/15	Create agenda item on the Stormwater Science Updates. Schedule Rusty Holleman to give a science update at the January 2016 Steering Committee meeting.	Philip Trowbridge	11/14/15	Complete	Items on agenda.	11/10/15
Steering Committee Action Items from 11/10/15	Discuss and potentially develop a crowdfunding page for microplastics monitoring	Philip Trowbridge	11/30/15	Complete	Discussed option internally within SFEI. The option was deemed unlikely to raise significant funds and could be problematic.	11/10/15
Steering Committee Action Items from 11/10/15	Prepare outline of the 2016 RMP Update to present at the January 2016 Steering Committee Meeting	Jay Davis	01/19/16	Complete		11/10/15
Steering Committee Action Items from 11/10/15	Continue discussions with John Coleman regarding potential funding from legacy contaminated sites	Philip Trowbridge	11/30/15	Complete	This funding source was not deemed viable by RB2. No further action.	11/10/15
Steering Committee Action Items from 11/10/15	Talk to Tom Mumley about a strategy for pursuing new revenue through non-MS4 Phase II stormwater permittees	Adam Olivieri	11/30/15	Complete	This funding source was not deemed viable by RB2. No further action.	11/10/15
Steering Committee Action Items from 11/10/15	Update deliverables smartsheet to reflect that the Selenium Information Synthesis report will be a summary powerpoint	Philip Trowbridge	11/30/15	Complete		11/10/15
Steering Committee Action Items from 11/10/15	Send email to stakeholders containing PDF of the Multi-Year Plan, including a reminder of the December 4th review deadline	Philip Trowbridge	11/14/15	Complete		11/10/15
Steering Committee Action Items from 11/10/15	Add a discussion item to the next Steering Committee meeting about using RMP monies as matching funds for grant applications.	Philip Trowbridge	01/19/16	Complete	Add to list of upcoming agenda items	11/10/15
Steering Committee Action Items from 11/10/15	Develop a plan for an internal retreat	Philip Trowbridge	01/19/16	Complete		11/10/15
Steering Committee Action Items from 11/10/15	Look into adding Selenium to stormwater monitoring, particular in South Bay	Lester McKee	12/01/15	Complete	Selenium was added	11/10/15
Steering Committee Action Items from 11/10/15	Prepare an explanation for how STLS, PCB, and margins S&T studies are related.	Philip Trowbridge	01/19/16	Complete	A synthesis slide for the RMP presentations was created.	11/10/15
Technical Review Committee Action Items from 9/22/15	Post June 30, 2015 TRC meeting summary to the website	Jennifer Sun	10/22/15	Complete		09/22/15

Primary	Deliverable	Assigned To	Due Date	Status	Comments	Meeting Date
Technical Review Committee Action Items from 9/22/15	Inform RMP participants in the next RMP eUpdate that copies of previous year's Pulse publications are available upon request	Jay Davis	10/31/15	Complete		09/22/15
Technical Review Committee Action Items from 9/22/15	Prepare proposals and monitoring budgets for (1) Golden Gate sediment flux monitoring, and (2) Lower South Bay sediment flux monitoring. The proposals will include monitoring, data review, and data analysis as separate tasks that may be funded separately	David Schoelhamer	10/16/15	Complete	The proposal and budget for Golden Gate sediment flux monitoring has been received.	09/22/15
Technical Review Committee Action Items from 9/22/15	Send Karen Taberski a summary of the Guadalupe River sampling design and criteria for triggering a sampling event	Lester McKee	10/16/15	Complete		09/22/15
Technical Review Committee Action Items from 9/22/15	Discuss Priorities for monitoring Guadalupe River, Mallard Island, and mercury wet deposition during extreme wet weather monitoring with Carrie Austin and other TMDL staff. Report back to Lester McKee with monitoring priorities, for which he will prepare monitoring proposals	Karen Taberski	10/16/15	Complete		09/22/15
Technical Review Committee Action Items from 9/22/15	Prepare proposals and monitoring budgets for (1) Guadalupe River monitoring, (2) Mallard Island monitoring, and (3) mercury wet deposition monitoring if recommended by Water Board staff	Lester McKee	10/30/15	Complete		09/22/15
Technical Review Committee Action Items from 9/22/15	Send STLS meeting agendas to Luisa Valiela and other interested parties	Lester McKee	10/22/15	Complete	Luisa Valiela was added to the STLS mailing list.	09/22/15
Steering Committee Action Items from 7/21/15	Post April 21, 2015 SC meeting summary to the website	Jennifer Sun	07/31/15	Complete		07/21/15
Steering Committee Action Items from 7/21/15	Post prior and future TRC and SC meeting agenda packages on the main SFEI website calendar and program pages, including separate files for each agenda item	Jennifer Sun	08/15/15	Complete		07/21/15
Steering Committee Action Items from 7/21/15	Update the 2012, 2013, and 2014 Nutrients modeling budgets to reflect the consolidation of remaining funds into the 2014 budget year	Lawrence Leung	08/15/15	Complete		07/21/15
Steering Committee Action Items from 7/21/15	Schedule a presentation by Rusty Holleman at a future SC meeting, to provide an update on the nutrient modeling workplan and the potential use of these models to provide insight into other RMP program areas (e.g, emerging contaminants, PCBs, margins)	Philip Trowbridge	09/30/15	Complete	Presentation scheduled for January 2016 SC meeting	07/21/15
Steering Committee Action Items from 7/21/15	Develop a proposal for transitioning the RMP to a fiscal year without disrupting the RMP's planning and governance process to present at the November SC meeting	Philip Trowbridge	01/30/16	Complete	Presented at 4/19/16 SC meeting. SC agreed to stop planning for a fiscal year transition.	07/21/15
Steering Committee Action Items from 7/21/15	Provide Karin North with a summary table of loads reported and invoices paid by each POTW over the past few years	Lawrence Leung	08/15/15	Complete		07/21/15
Steering Committee Action Items from 7/21/15	Respond to Novato's question regarding load calculations for RMP fees, allow them to remove recycled water from their load calculation	Lawrence Leung	08/15/15	Complete		07/21/15
Steering Committee Action Items from 7/21/15	Lead a conversation with BACWA to determine whether BACWA can pay RMP fees for all POTWs	Karin North	10/31/15	Complete		07/21/15
Steering Committee Action Items from 7/21/15	Revise budget for the 2015 Sturgeon Muscle Plug Study and Undesignated Funds balance to reflect a $12,000 increase. Update the deliverables for the study to reflect the expanded scope.	Jennifer Sun	08/07/15	Complete		07/21/15
Steering Committee Action Items from 7/21/15	Set up budgets and deliverables for the approved 2016 Special Studies	Philip Trowbridge	08/07/15	Complete	Budgets have been created in Deltek. Need to add deliverables to smartsheet for 3016.00.	07/21/15
Steering Committee Action Items from 7/21/15	Organize discussions with the Water Board and PCB workgroup regarding the short- and long-term implications of special studies budget cuts for implementing the PCB strategy	Jay Davis	09/30/15	Complete		07/21/15
Steering Committee Action Items from 7/21/15	Update the charge to the New Revenue Subcommittee and schedule the first subcommittee meeting	Philip Trowbridge	08/07/15	Complete		07/21/15

Primary	Deliverable	Assigned To	Due Date	Status	Comments	Meeting Date
Steering Committee Action Items from 7/21/15	Invite John Coleman to participate in the subcommittee	Philip Trowbridge	08/07/15	Complete		07/21/15
Steering Committee Action Items from 7/21/15	Communicate with the Delta RMP and Contra Costa County Stormwater Program that all of CCC should continue to pay fees to the Bay RMP	Philip Trowbridge	08/07/15	Complete		07/21/15
Steering Committee Action Items from 7/21/15	Prepare a list of actions that will be taken to coordinate with the Delta RMP. This list will be vetted with the Delta RMP co-Chairs and included in the 2016 Bay RMP Detailed Workplan	Philip Trowbridge	11/02/15	Complete		07/21/15
Steering Committee Action Items from 7/21/15	Update the budget and deliverables for the 2015 Water Cruise to reflect the additional $26,000 approved for CTR monitoring	Jennifer Sun	08/07/15	Complete		07/21/15
Steering Committee Action Items from 7/21/15	Create calendar events on the SFEI website for the SC meetings on January 19 and April 19, 2016, and send meeting invites to the SC	Jennifer Sun	07/31/15	Complete		07/21/15
Steering Committee Action Items from 7/21/15	Update the meeting summaries and agendas that are available on the RMP Google Site and redistribute the link to the SC and TRC	Jennifer Sun	07/31/15	Complete		07/21/15
Steering Committee Action Items from 7/21/15	Send slides for Selenium Science Update to Peter Carroll	Jennifer Sun	07/31/15	Complete		07/21/15