REGIONAL MONITORING PROGRAM FOR WATER QUALITY IN SAN FRANCISCO BAY
sfei.org/rmp

RMP Steering Committee Meeting

January 25, 2023
9:00 AM – 2:15 PM

REMOTE ACCESS ONLY
https://us06web.zoom.us/j/92590225613

Meeting ID: 925 9022 5613

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AGENDA

1.	**Introductions and Review Goals for the Meeting** Including an introduction and welcome to Amy Kleckner, the new RMP Manager.	9:00 (15 min) Tom Mumley
2.	**Decision: Approve Meeting Summaries from MYP Workshop and SC Meeting on November 2, 2022; Confirm Dates for Future Meetings** Scheduled SC meetings: April 26, 2023 Other scheduled meetings: TRC meeting: June 20 2023 Annual Meeting: October 12 Materials: MYP Meeting Summary, pages 6-12; SC Meeting Summary, pages 13-18 Desired outcomes: ● Approve meeting summaries ● Confirm future SC meeting and Annual Meeting dates	9:15 (10 min) Tom Mumley, Group

3.	**Information: TRC Meeting Summary** Topics discussed at the most recent TRC meeting included: ● Bay Margins survey - North Bay and overall summary ● Status and Trends monitoring update ● Algae bloom update from Dave Senn ● Communications update Materials: TRC Meeting Summary, pages 19-27 Desired Outcome: ● Informed committee	9:25 (10 min) Jay Davis
4.	**Information: RMP Financial Update for 2022 Quarter 4** The RMP Financial Update summarizes the balance of budgeted and reserved RMP funds as well as its cash position. Materials: ● Financial Update Memo, pages 28-56 ● Memo Documenting $108K Funding Request from the November Meeting, page 57 Desired outcomes: ● Informed Committee	9:35 (20 min) Jen Hunt
5.	**Information: Review the Status of Incomplete Projects from 2022 and Prior Years** Review incomplete projects from 2022 and prior years and provide a timeline for completion. Materials: Ongoing projects table, presented at the meeting Desired Outcome: ● Decisions on continuing incomplete projects.	9:55 (20 min) Amy Kleckner
6.	**Decision: Approve Final Multi-Year Plan for 2023** Revisions made to the draft presented at the November meeting will be highlighted. Materials: Final Multi-Year Plan for 2023, pages 58-116 Desired Outcome: ● Approve the Multi-Year Plan	10:15 (20 min) Jay Davis

7.	**Information/Decision: Update on SEPs and MMP Funds** It would be helpful to the Water Board to affirm the list of SEP proposals on a quarterly basis. The latest developments with SEP and MMP funds will be reviewed. Two proposals for MMP funds are included in the package. Sediment non-targeted CEC analysis was discussed at the November meeting as part of the financial update. A second proposal on PFAS reporting is also included for consideration. Materials: Current SEP Proposal List, pages 117-126; MMP proposals, pages 127-131 Desired Outcome: ● Informed Committee regarding SEPs ● Decisions on whether to fund the two MMP proposals	10:35 (20 min) Jay Davis
8.	**Decision: Funding Request for Sampling Additional Storms** Given the unusually wet weather recently, the stormwater sampling team has used up the funding allotted for this year and is requesting authorization to sample additional storms. A proposal sent via email was vetted and approved by the Small Tributary Loading Strategy Team, and is currently in review by the TRC. The proposal and a summary of TRC feedback will be presented at the meeting. Materials: Slides presented at the meeting Desired Outcome: ● Decision on the funding request and source of funds	10:55 (20 min) Alicia Gilbreath
9.	**Information: Progress on Workgroup Strategy Updates** Update the Committee on the status of updating workgroup strategies and coordination among them, leading to a major update of the Multi-Year Plan for 2024. Materials: Slides presented at the meeting Desired Outcome: ● Informed Committee	11:15 (15 min) Jay Davis

10.	**Discussion: Factors to Consider in Activating or Deactivating Workgroups** Outline factors to consider in deciding whether to activate or deactivate workgroups. Materials: Slides presented at the meeting Desired Outcome: ● Informed Committee	11:30 (20 min) Jay Davis
11.	**Discussion: Adding an Advisor for the Microplastic Workgroup** Staff are proposing adding a second advisor for the Microplastic Workgroup. Materials: Slides presented at the meeting Desired Outcome: ● Decision on adding an advisor	11:50 (20 min) Jay Davis
12.	**Lunch Break**	12:10 (20 min)
13.	**Discussion: Funding Additional Items as Part of Status and Trends** Consideration of funding long-term items such as model maintenance and pathways monitoring in Status and Trends. Questions include whether this should be done and, if so, what the funding levels and technical review processes should be. Materials: Slides presented at the meeting Desired Outcome: ● Decisions on including these items, or a process for reaching these decisions	12:30 (20 min) Jay Davis
14.	**Information: Successful Water Quality Improvement Fund Proposal - Destination Clean Bay** An overview of the project to be conducted over the next 4 years with $3 million of USEPA funds, including a discussion of plans for implementation. Materials: Proposal narrative, pages 132-146 Desired Outcome: ● Informed Committee	12:50 (20 min) Jay Davis

15.	**Discussion: Communications** Debrief on RMP Annual Meeting, Pulse, and Estuary News topics. Review communication product types for the RMP. Materials: Slides presented at the meeting Desired outcomes: ● Feedback on the 2022 Annual Meeting and Pulse ● Identify priority communication product types	1:10 (45 min) Jay Davis
16.	**Discussion: Status of RMP Deliverables and Action Items** Materials: Action Items & Deliverables Stoplight Reports, pages 147-151 Desired outcomes: ● Informed committee ● Feedback on progress and due dates	1:55 (10 min) Amy Kleckner
17.	**Discussion: Plan Agenda Items for Future Meetings** Desired outcome: ● Identify future agenda items, including science updates	2:05 (5 min) Tom Mumley
18.	**Discussion: Plus/Delta**	2:10 (5 min) Tom Mumley
19.	**Adjourn**	2:15

Recently Completed RMP Reports/Products

Applied Marine Sciences. 2022. **2021 RMP Water Cruise Report**. SFEI Contribution No. 1098. Applied Marine Sciences: Livermore, CA.

Lin, D.; Hamilton, C.; Hobbs, J.; Miller, E.; Sutton, R. 2023. Triclosan and Methyl Triclosan in Prey Fish in a Wastewater-influenced Estuary. Environmental Toxicology and Chemistry. SFEI Contribution No. 1112.

Zi, T.; Braud, A.; McKee, L. J.; Foley, M. 2022. San Francisco Bay Watershed Dynamic Model (WDM) Progress Report, Phase 2. SFEI Contribution No. 1091. San Francisco Estuary Institute: Richmond, California

REGIONAL MONITORING PROGRAM FOR WATER QUALITY IN SAN FRANCISCO BAY
sfei.org/rmp

Bay RMP Multi-Year Planning Meeting
November 2, 2022

Meeting Summary

Attendees

Member	Affiliation	Representing	Present
Yuyun Shang	EBMUD	POTW	**Remote**
Eric Dunlavey	City of San Jose	POTW	**Yes**
Amanda Roa	Delta Diablo	POTW	**Yes**
Karin North	City of Palo Alto	POTW	**Yes**
Tom Hall	EOA, Inc.	POTW	**Remote**
Mary Lou Esparza	Central Contra Costa Sanitary District	POTW	**Remote**
Xavier Fernandez	San Francisco Bay Water Board	Water Board	**Remote**
Tom Mumley*	SF Bay Regional WQCB	Water Board	**Yes**
Richard Looker	SF Bay Regional WQCB	Water Board	**Yes**
Bridgette DeShields	Integral Consulting	Refineries	**Yes**
Maureen Dunn	Chevron	Refineries	**Yes**
Adam Olivieri	BASMAA (EOA, Inc.)	Stormwater	**Remote**
Chris Sommers	EOA, Inc.	Stormwater	**Remote**
Luisa Valiela	US EPA	US EPA-IX	**Yes**
Ian Wren	Baykeeper	NGOs	**Yes**
Tessa Beach	US Army Corps of Engineers	USACE	**Remote**
John Coleman	Bay Planning Coalition	Dredgers	**Yes**

*Chair; alternates in gray and italicized

Staff and Others

- Jay Davis - SFEI
- Melissa Foley - SFEI
- Rebecca Sutton - SFEI
- Don Yee - SFEI
- Martin Trinh - SFEI
- Scott Dusterhoff - SFEI
- Alicia Gilbreath - SFEI
- Tan Zi - SFEI
- Diana Lin - SFEI (Remote)
- Adam Wong - SFEI (Remote)

1. Introductions and Review Goals for the Meeting

Melissa Foley began the meeting by welcoming everyone to the Multi-Year Planning (MYP) Workshop and the first RMP meeting held in a hybrid format in two and a half years. Following a brief introduction to the technology and hybrid meeting etiquette, Tom Mumley oversaw a round of introductions. Tom then reviewed the agenda items, including Special Study funding for 2024, workgroup direction, and implementation of the revised Status & Trends (S&T) program. Tom concluded the item by reminding the group that a substantial update to the MYP will be made by next year, focusing on strategy and multi-year plan updates at the workgroup level.

2. Discussion: Setting the Scene – Planning for 2023 and Beyond

Melissa opened this agenda item by highlighting the work recently completed by the RMP. The first major work was the ongoing Status & Trends review, beginning with the wet season pilot that started last year in 2021. The In-Bay modeling effort has begun, a cross workgroup collaboration headed by Jay Davis within SFEI and Craig Jones of Integral Consulting providing technical expertise. This effort is supported with RMP Special Study funds, a Supplemental Environmental Project (SEP), and potentially WQIF funding. Melissa highlighted the increased collaboration between workgroups as the work of the RMP continues to integrate across projects to inform management in the region and beyond. Melissa also highlighted the ongoing high demand for RMP studies, particularly for microplastics and tires. Tom cautioned the group that there is an increased reliance on the RMP in this field by other entities as an outgrowth of the RMP's success. This could increase demand and stress on staff and affect budget decisions in the future. Review and possible revision of the PCB TMDL is planned for 2028 with the RMP providing key data.

Melissa provided an overview of the budget for 2023. Core fees for the RMP total $4 million with supplemental CEC monitoring funds providing an additional $430k. SEPs contribute between $300-$600k per year. If the WQIF proposal is awarded by the EPA, there will be an additional $2.9m to fund projects over the next four years. Awardees will be notified in mid-December; if approved funds would be available in spring of 2023.

Melissa proceeded to outline the design modifications to the S&T program. A wet weather pilot will be implemented in WY2023, with one storm sampled in WY2022. Sediment, prey fish, and marine mammal studies will be piloted in 2023, with the marine mammal study beginning as a

special study through the ECWG. This redesign has a strong connection to the Emerging Contaminant strategy update. Tom cautioned that there should be increased scrutiny on determining how much effort should go into monitoring different contaminants. Temporally and spatially, there should be distinct designations for brief screens as opposed to continued monitoring. Melissa noted that this redesign was not static and could change as it is continually reviewed.

Melissa noted that the update to the 2023 MYP is relatively light. Most workgroups have plans developed for 2024 and 2025, but not much beyond that. All workgroups will be reviewing and updating management questions and strategies this upcoming year, including devoting attention to cross-workgroup linkages for management questions and studies. The MYP for 2024 will include more robust multi-year plans for 2025 through 2027.

3. Discussion: Information Priorities for 2023 and Beyond

For this item, Melissa reviewed the RMP management driver table, which includes categories for high priority, low priority, and potential future drivers. High priority management drivers include the municipal regional stormwater permit, the nutrient watershed permit for municipal wastewater, the ongoing 303(d) list and 305(b) report, and TMDLs for PCBs and mercury. Melissa provided an update from recent stakeholder meetings. There is a universal demand for data on PFAS and, after this summer's event, nutrients and harmful algal blooms. PCBs, beneficial use of dredged sediment, and other large events were also identified as key priorities by stakeholders.The refinery stakeholders inquired about expected changes in selenium loadings to the North Bay from the Delta based on the new design for the tunnel project. Past projections from Tetra Tech were based on a two-tunnel system, but the project has been reduced to one tunnel. There is currently no updated analysis of the new configuration. Luisa suggested the analysis and tracking of selenium concentrations in the Delta should be handled by the Delta RMP. Tom noted that the Bay RMP should also stay on top of this. Selenium concentration data will need to be submitted to the State Board for the North Bay selenium TMDL review. Ian Wren noted that communities were surprised by ongoing developments, referencing USGS papers that found deformities in close-proximity communities and acute impacts near refineries.

Tom emphasized that a management priority for the Water Board is tribal and subsistence uses as beneficial uses. At some point in the near future, the Water Board will consider a standards action which designates these uses and accompanying water quality objectives. PCBs will be a major focus in order to protect people who consume fish from the Bay. Chris suggested adding tribal and subsistence uses to the management driver table as a potential future driver. Xavier Fernandez stated that the Water Board has begun the process of reaching out to tribes.

For the 303(d) and 305(b) list updates in March 2023, the Water Board is no longer incorporating new data and is reviewing potential water quality impairment decisions. Richard Looker offered to present a review of the potential decisions to the TRC in March if recommendations are public at that point. Richard informed the group that the data solicitation

for the 2030 update will be in 2026. RMP data are typically uploaded to CEDEN, especially Status and Trends data. This practice may need to be reviewed as more CECs are monitored. The data may be taken out of context, particularly due to the evolving methods and detection limits for contaminants over time.

Action Item:

- Update the RMP Management Decision Table (Melissa Foley, January 1, 2023).

4. Discussion: Status & Trends Monitoring Design

For this agenda item, Melissa updated the group on the Status & Trends redesign and the need for an ongoing review process, particularly for CEC monitoring and pilot activities. Currently, CECs identified as moderate concern in the Tiered Risk-Based Framework may be added to the S&T design if there is a management need and methods are available for analyzing samples. Melissa reviewed the CEC information matrix (expected pathways, existing data/modeling, chemical properties, and toxicity thresholds) that was used during the S&T review to identify which CECs should be included in S&T monitoring, as well as sampling design details for matrix, season, location, frequency, and site type. Tom suggested that sources should be included in S&T monitoring as an early indicator and not for regulatory purposes. Karin cautioned that data such as these should be screened and approved before being uploaded into CEDEN because the context of the data could be lost when data are being used for 303(d)/305(b) updates. Becky reminded the group that data uploads to CEDEN for special studies are approved on a case by case basis by the workgroup. Each special study proposal notes whether data will be uploaded to CEDEN. Eric noted that as more experimental analytical techniques are developed, for PFAS in particular, the data may be difficult to compare. The group understands that, as a public database, CEDEN should be used with caution.

Melissa proceeded to suggest an updated process for reviewing pilot studies, CEC additions to core sampling (sites and analytes), tiered risk-based framework changes, and sampling frequency for legacy contaminants. The suggested process starts with the S&T Review subcommittee (formerly known as the “Council of Wisdom”) reviewing data and logistics and developing questions for ECWG advisors, who will then review S&T data and questions. Their recommendations will be reviewed by the Subcommittee, who will make recommendations to the TRC for approval or refinement. The SC will vote on suggested changes. This review structure follows the process used for the S&T Review and incorporates advisors who can give technical input on design. Tom suggesting discussions of on-ramping new efforts should also be part of the review discussion. The group agreed it would be beneficial to have the stakeholder subgroup convene before advisors. Tom suggested recommendations for additional monitoring outlined in technical reports should be specific and detailed so that a sampling design can be developed. The three-year wet season pilot is a project example that will need review after the three year pilot is finished in spring 2024. Jay recommended reviewing the project sooner, if data are available so that adjustments can be made iteratively. In addition, he highlighted that the ECWG might need to add additional meetings for S&T review, particularly because the

meeting schedule may not align with review timing and the workgroup meeting agenda is already very full.

The group discussed moving model maintenance tasks out of the special studies budget and into the S&T budget or other long-term pot of funding. Tan explained that maintenance priorities include minor improvements and calibrations, hosting the model, and overhead costs amongst others to help support pathway monitoring in the watersheds and Bay. Tan estimated $50k per year for the watershed model, a similar amount for the in-Bay model, and $200k per year for PCB and Hg monitoring and modeling. Tom supports these costs being included in long-term planning, acknowledging that models must be maintained adequately to help inform S&T monitoring and other management needs. The group agreed that this was an important priority. The group will discuss this in more detail in January; model maintenance funding is needed beginning in 2024.

5. Discussion: Multi-Year Plan and Strategy Updates for Workgroups

Melissa reviewed the MYP and workgroup strategy update plan with the group. The SC previously agreed to this update by 2024. The goal for this agenda item was for the group to provide initial guidance on workgroup priorities ahead of the strategy subgroup meetings. The Sediment Workgroup is currently developing a workplan focused on management questions 3-5 (sediment transport monitoring and modeling), and the update for management questions 1-2 (dredging and beneficial use) will commence in 2023. The Emerging Contaminants Workgroup (ECWG) will continue its ongoing strategy update that started in 2022 through 2023. The Microplastics Workgroup (MPWG) will conduct a strategy and management question update in 2023 in concert with statewide efforts. The Sources, Pathways, and Loadings (SPL) Workgroup will conduct a strategy and management question update in 2023. Finally, the PCB Workgroup has been updating its strategy at each workgroup meeting, but Jay noted that a thorough review will be done at the 2023 PCBWG meeting to support the TMDL review. Currently, all workgroups except the PCBWG plan to hold subgroup meetings at the beginning of 2023 to get input on management questions and study priorities, and then produce drafts that will be reviewed by the workgroups in advance of the spring meeting. Workgroup feedback will be further discussed by subgroups, after which final updated management questions, strategies, and MYPs will be completed by October 2023.

RMP workgroup leads outlined their specific plans for their individual workgroup updates. Becky informed the group that the ECWG had formed their subgroup and finished reviewing the management questions. A draft strategy will be released before the workgroup meeting in April, with two additional subgroup meetings planned. Luisa inquired about the workgroup's current workload with Becky assuring the group that as monitoring and modeling work matures and expands, the workgroup will be able to meet information demands. Becky increased strategy funds in the 2023 MYP to account for ongoing stakeholder input and coordination on the strategy revision. Richard Looker reminded the group that as workgroups continued to integrate, governance costs will likely increase. Alicia Gilbreath and Tan Zi followed by explaining their

timeline for the SPL update. Modeling their process on ECWG, they are in the process of forming their core workgroup that will meet in March, followed by their workgroup meeting in April/May. The last SPL strategy update was in 2009, so the group will spend time defining how they relate to and support other workgroups, including connecting across management questions and study priorities. The SPL workgroup has also increased their request for budget allocations from $30k to $40k for 2023. Diana Lin outlined the timeline for the MPWG. They are currently forming a subgroup that will guide this process. With no special studies funding for 2023, the workgroup will be focused on identifying possible future directions. This strategy update will be done in parallel with a statewide effort being funded by the Ocean Protection Council (OPC). Chris Sommers stressed the importance of including RMP stakeholders in the process early on and not at the end. Diana's workplan includes RMP engagement from the onset. Scott Dusterhoff gave an update on the upcoming Sediment workgroup monitoring and modeling workplan, which focuses on management questions 3-5. Management questions 1-2 address dredging impacts, and have been a lower priority for the group in recent years. The strategy update in 2023 will focus on these questions and determine if they remain a low priority for the RMP. There are studies being conducted by the USACE and other regional partners that may satisfy the information needs for questions 1-2. Scott inquired if sediment transport continued to be the priority or if the RMP could conduct dredging related special studies in the near term. These management questions can stay on the table for the moment, but the RMP should set expectations for the future. If the questions are maintained, a strategy workplan will be developed for those questions as well. Tom noted that, similarly to the MPWG, the scope of these efforts requires external non-RMP funding. It is in the RMP's best interest to be a leader in this field, but it will be important to acquire more matching funds in the future.

Opening up discussion, Melissa polled the committees to see if they had any feedback on the process or questions regarding any timing. The group also identified TRC and SC members who could attend the subgroup meetings for each workgroup. Melissa and Tom agreed that these plans are ambitious and requested that workgroups provide updates at SC and TRC meetings. Improved MYPs will have to be realistic about what can be done this year, adjusting their breadth and depth as necessary. If the WQIF funds are awarded, then even more work will be necessary. More time and resources may be required in the future to update plans accordingly. Luisa inquired as to how dependent workgroups are on the RMP Manager, with Melissa clarifying that individual workgroup processes are largely independent. Jay will also help ease this transition to a new RMP Manager.

Melissa proceeded to review identified workgroup priorities for 2024. The in-Bay modeling project, funded by a SEP, crosses the Sed, PCB, and CEC workgroups. The SedWG will likely focus proposals on additional sediment monitoring and modeling studies. The PCB workgroup will propose additional studies on sport fish and sediment in priority margin units. The ECWG is proposing a PFAS synthesis, PFAS TOP assay, ongoing tire contaminants monitoring, OPEs in wastewater, and non-targeted analysis in fish, as well as a tires strategy and stormwater CEC monitoring and modeling along with SPL. The SPL will focus proposals on PCB/Hg monitoring, model maintenance, and developing remote samplers in addition to working with the MPWG on stormwater microplastics monitoring. Karin inquired if there was a methodology for creating new

workgroups if there is an issue that is growing and needs more focused attention. Jay suggested that the TRC and SC decide which workgroups should be meeting based on management priorities. Karin requested a flow chart of what triggers the RMP to make new/spinoff workgroups. This should be documented as well as any external funding, increased needs, and changing workloads and prioritizations. Chris agreed with the need to reflect on the current workgroup structure and suggested reviewing the workgroup list in this meeting annually. The strategy updates in 2023 are likely to inform future workgroup structure.

Finally, the group considered dedicating funding towards event-based monitoring. The RMP already has a generic fire response plan. Richard suggested that response plans could be more agile if the RMP takes the time to develop protocols and plans before events. The group agreed to discuss this in more detail starting in late 2024 after the workgroup strategy updates are done. Staff do not have the bandwidth to focus on this at the moment.

Action Item:

- Document the process for starting a new workgroup (Jay Davis, January 25, 2023)

6. Discussion: Workgroup Scheduling and Agendas

For this action item, Melissa reviewed the priority workgroup agenda items and scheduling plans. With the ECWG and SPLWG continuing to collaborate on CECs, a joint meeting will be held in mid April to discuss monitoring related updates and special study proposals for CECs in stormwater. There will be a SPLWG meeting focused on legacy contaminants in late May. Other workgroup meetings are planned to be spaced out more evenly to prevent staff burnout. Priority agenda items for workgroups include management questions and strategy process updates, MYP development, reviewing 2024 proposals, reviewing relevant related proposals from other workgroups, and project updates.

Luisa inquired about the staffing at SFEI. Melissa assured her that SFEI would be hiring more personnel in the event that WQIF funding was secured, although the number of hires and at what level is still being determined.

7. Summary and Action Items

Melissa reviewed the action items to be completed. The group collectively thanked Melissa Foley for her tenure as RMP Manager, expressing deep appreciation for her excellent work and expertise and tireless efforts managing the RMP.

Adjourn

Bay RMP Steering Committee Meeting
November 2, 2022
San Francisco Estuary Institute

Meeting Summary

Attendees

SC Member	Affiliation	Representing	Present
Eric Dunlavey	City of San Jose	POTW-Large	**Y**
Amanda Roa	Delta Diablo	POTW-Small	**Y**
Karin North**	City of Palo Alto	POTW-Medium	**Y**
Adam Olivieri	BAMSC / EOA, Inc.	Stormwater	**R**
John Coleman	Bay Planning Coalition	Dredgers	**N**
Tessa Beach	US Army Corps of Engineers	USACE	**R**
Tom Mumley*	SF Bay Regional WQCB	Water Board	**Y**
Maureen Dunn	Chevron	Refineries	**Y**

* Chair, ** Vice Chair, alternates in gray and italicized

Staff and Others:

- Melissa Foley, SFEI
- Jay Davis, SFEI
- Martin Trinh, SFEI
- Luisa Valiela, EPA
- Jen Hunt, SFEI

1. Introductions and Review Goals for the Meeting

Tom Mumley began the meeting by giving an overview of the day's agenda and goals. Following the MYP workshop, the agenda items of interest for this meeting include discussion on event-based monitoring and funding, a Q3 financial update, and review of the 2023 detailed workplan and budget.

2. Decision: Approve Meeting Summary from July 20, 2022, and Confirm Dates for Future Meetings

Tom Mumley asked the group for any final comments on the previous meeting's summary. Receiving no comments, he continued to confirm the dates for upcoming meetings. The RMP Steering Committee (SC) meeting was confirmed for January 25, 2023, and the proposed date of April 26, 2023, was approved. There will be an RMP Technical Review Committee (TRC) meeting on December 8, 2022. Melissa asked the group to choose between October 5 and October 12, 2023, for the 2023 RMP Annual Meeting. The group chose October 12, 2023, for the Annual Meeting.

Action Items:

- Send out calendar invitations for the April 26, 2023, SC meeting (Martin Trinh, November 7, 2022).
- Send out calendar invitations to active SC and TRC members for October 12, 2023, Annual Meeting (Martin Trinh, November 7, 2022)
- Book October 12, 2023, for RMP Annual Meeting with David Brower Center (Melissa Foley, November 7, 2022).

Decision:

- Adam Olivieri motioned to approve the meeting summary. Eric Dunlavey seconded the motion. The motion was carried by all present members.

3. Decision: Confirm Chair and Review the Charter

Melissa provided a review of the RMP Charter and brought forth a list of proposed changes, including updating the general structure figure, adding a remote attendance option for SC and TRC meetings, replacing BASMAA with BAMS, editing SFEI accounting for nutrient studies, adding new AMR order and MRP 3.0, and updating participant names. These changes were approved. The group agreed to adjust Science Advisor term lengths from five years to three years, giving workgroups more flexibility to add advisors to suit their needs. The SC strongly advocated that the SFEI Board should be giving final approval to the annual RMP workplan. Jay will work with Warner Chabot to ensure this happens. Adam suggested some changes to legacy language, Tom will recommend text changes as well.

Tom Mumley and Karin North were unanimously voted to continue as Chair and Vice Chair of the Steering Committee, respectively.

Decisions:

- Adam Olivieri motioned to approve Tom and Karin as Chair and Vice Chair. Maureen Dunn seconded the motion. The motion was carried by all present members.
- Changes to the Charter were approved and the SC clarified that the SFEI Board should give final approval to the Annual RMP Workplan.

4. Information: TRC Meeting Summary

Melissa Foley provided the SC with a summary of the September TRC meeting. Status & Trends studies for 2023 were reviewed. Additional discussion on sampling plans and interlab comparison studies focused on CECs will be held at the December meeting. This interlab comparison will likely focus on the transition from academic labs to commercial labs for CEC monitoring. A plan for prey fish and margins sediment studies will be presented in December as well. The last portion of the TRC meeting was spent reviewing talks for the Annual Meeting.

5. Information: RMP Financial Update for 2022 Quarter 3

Jen Trudeau (formerly Hunt) provided the regular financial update for Q3 of 2022 to the SC. Thus far, 46% of the 2022 budget has been expended, with 83% of invoiced fees collected. There is a surplus of $138k in unallocated funds and $350k transferred to set aside funds. For 2021, 75% of funds have been expended on the year with 98% of fees being invoiced. There was a surplus of $3.5k, although not all tasks have been closed. All fees in 2019 and 2020 have been collected. For 2018, there is one remaining task, but all fees have been collected and the year should be unencumbered soon. The undesignated funds balance has increased slightly due to LAIF interest, with a Q1 payment of $6k. The SC discussed the issues with participant invoicing and provided input for accelerating the timeline of invoice requests. Possible options include issuing notes of violation if entities do not respond in a timely fashion. Jen will highlight how long bills are outstanding in the future as a guide.

Melissa reviewed a future budget request for the non-targeted analysis sediment project from 2018. Lee Ferguson no longer has the bandwidth to produce a final report following completion of lab analysis. Rebecca Sutton will assume responsibility for this report but will need additional time and budget to complete it. A formal request for additional funds will be made in January. Tom expressed that this would be a good opportunity to demonstrate the RMP's capability in non-targeted analysis.

At the most recent Small Tributary Loading Strategy Meeting, stakeholders expressed interest in additional engagement with Tan throughout the process of developing the contaminants module of the Watershed Dynamic Model rather than just at the end. This will require additional stakeholder meetings. The Water Board has also expressed interest in additional training on using the model. In addition, Tan will need to update the land use layer being used in the Watershed Dynamic Model when it becomes available. He is requesting $35.5k to facilitate this work. Tom noted that model development needs to be done in a manner that is consistent with and collaborates with other modeling programs. Three workgroups requested additional budget for updating strategies. The Emerging Contaminants Workgroup requested $35k; Sources,

Pathways, and Loadings Workgroup requested $10.5k, and the Microplastics Workgroup requested $27k for a full strategy update. Jay noted that good strategy development is an investment in the future. These additional funding requests constitute a total request of $108k. Melissa recommended using unallocated 2022 funds ($138k available) to support these efforts. Tom confirmed there are no other projected needs at the moment for the unallocated 2022 funds. The group also discussed the creation of a special fund for event-based monitoring, with Karin noting that the purpose of the reserve set-aside funds (of which there is a $200k minimum) was to support this eventuality. The SC asked for a summary of the additional funding needs in a memo.

Action Items:

- Highlight how long bills are outstanding in the future (Jen Hunt, January 25, 2023).
- Memo outlining additional funding requests and what funds will be used for (Melissa Foley, January 25, 2023)

Decision:

- Adam Olivieri motioned to approve the use of unallocated funding to support the additional funding requests totalling $108k. Karin North seconded the motion. The motion was carried by all present members.

6. Decision: 2023 Detailed Workplan and Budget

Melissa began her review of the 2023 workplan and budget by outlining expected financial contributions to the RMP by sector. Core RMP fee revenue for the 2023 year is $4,565,174, including the assumed dredger shortfall of $200k. This total includes $3,835,574 in core fees, $329,600 in AMR, $100,000 of MRP and $300,000 of S&T set aside funds. With expenses projected to total $4,585,400, there is a current negative balance of $20,226. However, this does not include $120K SEP tied to a sediment project that is projected to be funded. If this goes through as planned, there will be an overage of $100,000 in the budget with an additional $93k of unallocated SEP funds.

The three buckets of funding for 2023 include program implementation ($1.385m), special studies ($1.553m), and Status and Trends ($1.667m). This is a similar distribution between these activities as in previous years.

Decision:

- Karin North motioned to approve the 2023 workplan and budget. Adam Olivieri seconded the motion. The motion was carried by all present members.

7. Discussion: Event-based monitoring and funding

The group continued the discussion from the morning MYP Workshop on event-based monitoring, focusing on funding and identifying the RMP's role in the Bay to support this work. Tom noted there was money in the reserve and this discussion should center around setting

criteria on how to respond. Maureen suggested surveying other entities and their draft sampling plans and equipment needs. Jay noted that this year was not ideal to plan this, given the focus on updating strategy, incorporating the WQIF, and finding a new RMP Manager. Karin proposed an interim solution of reviewing past RMP documents concerning wildfires and other related events. If the opportunity arises, new documents will be written. Tom cautioned that the RMP should not be the default fund for these events, for example there are existing regulatory bodies designed to deal with oil spills. Karin suggested that the RMP could be instrumental in conducting post-event work and get reimbursed later. She wanted confirmation that the RMP was staffed enough to handle this. Adam suggested the group later identify what events the RMP should be interested in and carve out a role from that discussion.

Action Items:

- Discuss event-based monitoring planning at the December 2023 TRC meeting and January 2024 meeting (Jay Davis).

8. Information: Website Update

Martin Trinh of SFEI provided an update on the RMP website redesign. Following feedback from the SC and TRC, Martin and Tony Hale created a beta version for SC members to review. Martin invited committee members to provide feedback on text and structural components of the website. Once final feedback has been provided, the new website design will go live. Committee members recommended small tweaks to the current iteration of the design at the meeting.

Action Item:

- Provide text and structural feedback on Website Beta to Martin (SC/TRC, December 31, 2022).

9. Discussion: Communications

Due to time constraints, Jay will provide updates about the 2022 Pulse and 2022 RMP Annual Meeting at the upcoming January 2023 SC meeting. Tom informed the group that Estuary News would sunset after its final upcoming issue due to costs. Jay expressed appreciation for the impact Estuary News had in communicating RMP work to a broader audience.

10. Discussion: Status of RMP Deliverables and Action Items

Melissa provided an update on the status of RMP deliverables and action items. Just completed items included the bisphenols in water and sediment report, PCB bioaccumulation thresholds in dredged sediment report, and non-targeted fire monitoring summary for managers (and journal article). The non-targeted analysis in sediment has been delayed as Lee Ferguson is no longer able to provide a report; Rebecca Sutton will take on that responsibility going forward. The

selenium data report for 2019-2020 will be completed by the end of the year. Deliverables due before the next meeting include the South Bay settling velocity report, Benicia Bridge sediment flux report, sediment regional watershed dynamic model, interim updated land-use layer, sediment conceptual model, floating percentile sediment guidelines, and PFAS in Bay water final report. Delayed deliverables include the bird egg effort as SGS AXYS sorts through import permit issues, San Leandro Bay PCB report (lab delays), and the stormwater monitoring approach as the groundwork project has been prioritized. The sunscreen in wastewater report has also been delayed as Diana Lin has assumed responsibility for that report from Stanford. It will be completed in spring 2023. Don Yee will present on the North Bay margins at the December TRC meeting.

11. Discussion: Plan Agenda Items for Future Meetings

Proposed agenda items for the January SC meeting include the status of the new RMP Manager hire, adjustment to the workplan based on WQIF, communications update, and consideration of 2024 funding for model maintenance or pathway monitoring.

12. Plus/Delta

The group unanimously agreed that the meeting was highly productive, especially after the MYP Workshop. Both in person and virtual attendees appreciated the functionality of the OWL camera provided by Karin North. In person attendees reiterated that they enjoyed the opportunity to meet in person again.

Adjourn

Bay RMP Technical Review Committee Meeting

December 8, 2022

Meeting Summary

Attendees (all participants remotely attending)

TRC Member	Affiliation	Representing	Present
Yuyun Shang	EBMUD	POTW	**No**
Mary Lou Esparza	Central Contra Costa Sanitary District	POTW	**Yes**
Tom Hall	EOA, Inc.	POTW	**Yes**
Heather Peterson	City and County of SF	CCSF	**No**
Anne Hansen Balis	City of San Jose	POTW	**Yes**
Bridgette DeShields*	Integral Consulting	Refineries	**Yes**
Chris Sommers	BASMAA (EOA, Inc.)	Stormwater	**Yes**
Shannon Alford	Port of San Francisco	Dredgers	**No**
Richard Looker	SF Bay Regional WQCB	Water Board	**Yes**
Luisa Valiela	US EPA	US EPA-IX	**Yes**
Ian Wren	Baykeeper	NGOs	**Yes**
Tessa Beach	US Army Corps of Engineers	USACE	**No**

Staff and Others

- Jay Davis - SFEI
- Melissa Foley - SFEI
- Warner Chabot - SFEI
- Miguel Mendez - SFEI
- Bryan Frueh - City of San Jose
- John Coleman -
- Don Yee - SFEI
- Martin Trinh - SFEI

1. Introductions and Review Agenda

Bridgette opened the meeting with a round of introductions and previewed the upcoming agenda. Of note are discussion of the draft final report on the Bay margins study, a science update on the algal bloom, and an update on the Status and Trends (S&T) redesign. Jay Davis stated that with the dynamic nature of the new S&T, discussion on the S&T will become a standing item at TRC meetings this year. Melissa Foley noted this will be her last Technical Review Committee (TRC) meeting as she transitions from the RMP manager role to the SFEI Resilient Landscapes team.

2. Decision: Approve Meeting Summary from September 21, 2022, and Confirm/Set Dates for Future Meetings

Bridgette DeShields asked the group for any final comments on the previous meeting's summary. Receiving no comments, Bridgette confirmed the dates for upcoming meetings. The next TRC meeting was confirmed for March 29, 2023. The TRC scheduled the following meeting to be held on June 20, 2023. Melissa confirmed that the 2023 RMP Annual Meeting will be held on Thursday, October 12, 2023 at the David Brower Center.

Action Item:

- Send out calendar invites for June 20, 2023 TRC meeting (Martin Trinh, December 15, 2022)

Decision:

- Richard Looker motioned to approve the meeting summary. Mary Lou Esparza seconded the motion. The motion was carried by all present members.

3. Information: Update on Search for New RMP Manager and Other Staff

SFEI staff members provided updates on the hiring processes for a few open positions. Jay informed the TRC that he had narrowed down the RMP manager position to three candidates. It is shaping up to be a difficult decision but he hopes to begin the process of extending an offer letter soon. Luisa inquired if there were any difficulties in the search process or with any other logistics. Jay clarified that all of the finalists were local and had extensive knowledge of the area. Melissa provided an update on the watershed modeler position. SFEI is putting together an offer letter for the preferred candidate at the moment. The Emerging Contaminants team has just opened a position for an Associate Environmental Scientist (Master's) or Environmental Scientist (PhD). A job posting and description were made available at SETAC, with over 65 applicants in the initial wave. The search is still open for this position. Luisa inquired if SFEI would

consider hiring if more funding was available, with SFEI members giving a resounding yes. On a potentially related note, Luisa informed the TRC that the WQIF awards will be announced in mid-December.

4. Information: MYP and SC Meeting Summary from October 20, 2021

Jay reviewed the October MYP and SC meetings, noting that this year's MYP meeting was a higher-level overview, rather than the normal more in-depth review of the budget and workgroup special studies. Key decisions and action items from the MYP discussion included the addition of tribal and subsistence beneficial uses as a Potential Future Driver, discussion of the revised S&T design and the need for ongoing review of CECs and pilot studies, and discussion of an updated process for continuing refinements to S&T [subcommittee (former the Council of Wisdom) to ECWG advisors to TRC to SC]. Workgroup strategy meetings are expected to yield major updates to the MYP for 2024, informed by subgroup meetings which will be regularly updated to the TRC and SC. Workgroup plans were reviewed for 2024 as well.

For the SC meeting, Tom Mumley and Karin North were reconfirmed as Chair and Vice-Chair respectively. Minor revisions to the RMP Charter and additional funds for coordination and the land use layer update for the Watershed Dynamic model, as well as funds to support strategy work for the Emerging Contaminants (EC), Microplastics, and Sources, Pathways, and Loadings (SPL) Workgroups were all approved. The 2023 detailed workplan was also approved. Discussions were held on preparing for event-based monitoring. Martin Trinh provided an update on the work done on the RMP website. The highlights of the 2022 Workplan and communications topics, such as the Annual Meeting, Update, Pulse, and Estuary News were also discussed.

5. Discussion: Bay Margins Sediment Survey – North Bay and Overall Summary

Don Yee of SFEI reviewed the 2020 North Bay Margins Sediment results. The North Bay study was the last in the series of margins pilot studies, with Central Bay completed in 2015 and South Bay in 2017. The objectives of the study were to assess contaminant concentrations in the margins and determine whether those levels are of concern and if they are different from concentrations measured in the open Bay. The South Bay margins constitute a much larger proportion of area relative to the North Bay which is in turn larger than the Central Bay. The North Bay margins were expected to be influenced by the heavily industrial land use (e.g., refineries) and Delta inputs, including mercury from historic gold mining in the Sierra. Don explained that a probabilistic design that

gave an equal weighting of the number of stations to area for San Pablo Bay, Carquinez Strait, and Suisun Bay was used to distribute the 40 stations. The margins were a mix of connected and discrete areas, with varied distances to the deepest areas. There were 40 samples in this round, with some add-on studies such as QACs. The target analytes for the study were PCBs, Hg, methyl Hg, and other metals. TN, TOC, and grain size were analyzed by ALS and supported by Eurofins. Archive samples were collected for additional work in the future. Summing 40 PCBs, highest concentrations were found in the Southern sites, especially near Chevron. Luisa inquired as to why Bay concentrations were relatively large, with Don noting the USGS had observed similarly in the past. Bridgette inquired about any correlations to grain size with Don noting that in the context of the rest of the Bay, North Bay concentrations were relatively low. Jay inquired as to why stations were concentrated in the north of Suisun Bay compared to the more industrial sites in the south. Don explained this could be due to the deepwater channel that runs there, resulting in narrow margins.

For Hg, concentrations were generally similar between the Bay and the margins, while PCBs were higher in the open Bay compared to the margins. Chris recommended looking at medians to compare, with Jay noting that 75th percentiles for margins and open Bay were much different in the Central Bay. Chris inquired if hotspot areas are significantly greater driving concentrations compared to ambient water as the Board is also curious about clean up of hotspots in older industrial (superfund) sites that might have brownfield components. PMU work is helping to contextualize this. Jay noted that the graphs support the notion that hot areas are driving concentrations. The drop in concentrations between the Central Bay and North Bay could be due to the Central Bay being a source.

Comparing the North and South Bays, Chris noted that Marin and Sonoma are not historical sources, similar to use in the South Bay, but Contra Costa has had a history of being a source. Heather Peterson also clarified that the North Bay is flushed more than the South Bay, allowing dilution and transport.

Raw mercury levels were lower in the margins than the Bay through much of the range of distributions although the difference is less pronounced after normalization of fines. Methylmercury was also higher in the ambient Bay than the margins although not significantly so. For all analytes, Bay concentrations are higher than in the margins despite the percentage of fine grain sizes being similar between habitats.

In conclusion, the North Bay margins exhibited lower concentrations than Central Bay margins, due to fewer sources and loadings. Dilution patterns also may be attributable to clean Delta loads. North Bay margins concentrations were also lower

than those in the South Bay due to faster hydrodynamic turnover. The North Bay margins concentrations were lower than ambient concentrations in the North Bay as Hg came from the Deltas and Central Bay along with PCBs from the Central Bay. Richard recommended exploring why individual contaminants might be higher in the North Bay, as opposed to comparing to the entire Bay. He noted the current narrative was not about individual contamination but more about mixing as these levels seem like a general phenomenon, not a pollutant-specific story. Melissa clarified that the North Bay margins were assumed to be similar to the deep Bay or even dirtier, in which case sediment thresholds would be conservative. However, these data suggest that this is not the case in the North Bay, with additional sampling being potentially helpful.

Don noted that this study is a good start but suggested that the North Bay could still have unknown hotspots. Chris stated that SFEI should not only be focused on central tendencies and could benefit from learning more about these areas, suggesting that this could be a special study, rather than a S&T topic. Luisa objected to being hung up over past assumptions and warned the group not to go down rabbit holes checking assumptions. Don clarified that this cursory glance is not enough to definitely state there are no hotspots. Jay and Bridgette supported continued sampling, with Melissa confirming for Luisa that PCB data will be collected this water year. In the future, margins sampling will include fixed targeted sites, with some repeat sites to evaluate trends, particularly at the nearfield at known and expected sources. Jay recommended revisiting this discussion about future margins sampling at the next TRC meeting. This will follow the release of a draft report on the margins work to the TRC in mid-January.

6. Discussion: S&T Monitoring Update

In this item, Melissa gave an update on the S&T monitoring occurring in the past year as well as in the upcoming year. Wet season sampling has included one storm in WY 2022, with one storm sampled in WY 2023. This wet season will continue until April. In the summer of 2023, a dry season effort will be conducted with the help of Applied Marine Science (AMS). Nearfield prey fish and sediment will be sampled in August 2023 with Bay sediment sampled from July through September of 2023 with the help of AMS. Marine mammals will be piloted in the upcoming year as a special study.

Elaborating on this year's wet weather water sampling, Melissa informed the TRC that the early November storm had been sampled but the first December storm had been passed on as the storm was considerably smaller and there was no potential to get paired ambient Bay samples on the USGS Peterson (due to the Peterson being in repair). Melissa inquired the group if, with another storm on the horizon, the RMP should collect near field samples only. Jay added some framing, that given the last few years, passing on storms is difficult, but thinking about design and what is lost if there

are no paired open Bay samples. Without open Bay, opportunities to investigate spatial comparisons are lost. Additionally, wet season data will not be able to be compared to the dry season. However, the near field samples allow for higher probability of detections of CECs in the Bay and are useful for developing time series of semi-quantifiable trends. Chris inquired if the data will primarily be analyzed on an event by event basis or assessed across events. Luisa suggested that opportunities are rare and if the Peterson is never fixed, then the RMP would regret passing on this opportunity. The group agreed that the data will be useful, even if not paired. Chris and Richard encouraged the group to consider how data will be assessed in the future, especially over time.

Dry season water sampling will be conducted in July and August of 2023, focusing on CECs along with some legacy contaminants at 22 stations (6 historic).

The nearfield prey fish and sediment pilot will focus on topsmelt and silverside and has been budgeted for 12 stations for fish and sediment. Areas with overlap with nearfield wet season water and sport fish sampling will be emphasized. There will be 10 stations for prey fish and 12 stations for sediment in those priority areas. There are two airport stations of interest for prey fish that are less well connected to overall S&T design; Melissa asked the Committee if they were worth sampling. Miguel explained there was a PFAS connection to the airports, as an ingredient of fire fighting foams used at airports. SFO is also close to a wastewater treatment plant with this site near the outfall. A concurrent analysis of PFAS and chlorinated paraffins in archived sediment, which are both of interest, will also benefit from sampling at this site. Chris expanded on his experience with the Oakland airport and noted the large impervious areas where firefighting foams could have discharged at multiple points. Luisa also mentioned the EPA's sampling of SFO in 2014 and recommended contacting the airport people to notify them of the sampling. If these sites are not sampled, the TRC recommended saving the money and only sampling at the original 10 sites. The TRC is on board with sampling here as it will fill data gaps, with Ian recommending telling the airport people that this is an attempt to monitor the effectiveness of regulation. However, budget constraints must be considered. Chris agreed to help connect Miguel with staff at the airports.

Melissa expanded on the 2023 margins sediment efforts centered on CECs and ancillary analytes in the Central, South, and Lower South Bay. 24 stations were budgeted, with areas weighted (9 CB, 9 SB, 6 LSB). There is interest in resampling near Chevron. Currently, there are no fixed stations established in the margins pilot, with staff suggesting two fixed stations per subembayment, two repeat stations (2nd and 4th event), and the rest as random stations. Don explained to Richard that targeted stations

could be linked to conceptual models. Further discussion on the margins, Bay Sediment, and Marine Mammals will occur at the March meeting.

7. Discussion: Interlaboratory Comparison Studies

Due to lack of time, the discussion on interlaboratory comparison studies was tabled to the March TRC meeting. Don is still developing the workplan and welcomes offline input during this process.

8. Discussion: Algae Bloom Follow-up

Following the break, Dave Senn of SFEI presented a high-level overview of the recent harmful algae bloom event that occurred in August. An unexpected and major monitoring effort was supported by a number of collaborators, including the USGS Biogeochemistry team, SFEI, and Baykeeper who were the first to alert other parties as well as the public. In late July, the organism Heterosigma akashiwo was first observed around the Alameda/Oakland deep channel. This organism has known toxicity to fish and was previously placed on the San Francisco Bay-Nutrient Management Strategy's (NMS) harmful algae "watch-list". In early August, the NMS was able to track the bloom via remote sensing to the Central Bay off of Alameda. By August 20th, the bloom had expanded through the South Bay with Chl-a levels varying from 50 to > 100 ug/L (20x typical values), with its center of mass in the South Bay. Previous blooms usually only lasted for a few days over a small portion of the Bay, but this event was much more long-lasting and pervasive. The bloom abruptly terminated over the course of three days from August 28-31, with levels declining to less than 5 ug/L. Fish mortality rates declined in the South, Central, and San Pablo Bays.

Heterosigma akashiwo was first found in Richardson Bay in 2002, using microscopy methods. The primary method from 1993 to 2013, microscopy was then retired in favor of imaging which has been in use since 2015. Discrepancies in observed concentrations between these time periods may be a function of methodology. Since the switch to this method, Heterosigma akashiwo has been detected at low levels in the Bay around 45% of the time. Dave noted that 12 out of 14 of priority HABs are flagellates. He then reviewed the monitoring and data exploration associated with this event. There were five water quality moorings, with three more sites added in 2022. Seven high speed mapping surveys were conducted along with four cruises with the USGS. Remote sensing was essential to informing numerical models.

Key questions to be addressed in the future are what factors led to this event, what is the likelihood of something similar occurring again in the near term (1-2 years), and

what longer-term management options would be effective at preventing or mitigating impacts if another event were to occur.

Opening the discussion, Luisa noted that although nutrients were a primary contributor to this event, messaging could also be centered on climate change. Luisa also mentioned that other reports cited that the largest fish kills were in the Central Bay in Lake Merritt. Dave noted that there were some discrepancies in the reports of fish kills, with no certain reports on the number of fish kills. The timing of the fish kills preceding DO drop-offs suggests a toxic component to the bloom. Tom Hall suggested monitoring enhancements such as imaging flow cytobots to detect harmful species more promptly. Richard took this opportunity to connect this discussion to the SC discussion on needing procedures for future event-based monitoring. He suggested Dave and other colleagues could get these discussion started by mapping out an event-based approach for future HABS, considering if there should be a surveillance program that could provide timely alerts. Dave agreed that near term recurrence risk would be assessed, with particular attention to the likelihood of low suspended sediment concentration (SSC) especially in dry vs. wet years. As for the suggested surveillance program, Dave questioned what could be done with the information. If the data is only useful for informing the public but not mitigating any effects, Dave questioned if this system would be worth the investment. Additionally, this raises the question of who is responsible for keeping up with HAB events in the future.

9. Discussion: Communications Update

For this agenda item, Jay gave a brief review of various RMP communication products. Jay thanked all involved for their contributions to the 2022 Pulse and announced that physical copies will be shipping soon. There were some issues with the early batches, but they should be resolved soon. Keeping up with the theme of the 50th Anniversary of the Clean Water Act, Jay contributed to an op-ed published in the San Francisco Chronicle reflecting on the Act. This content has also been the basis of recent presentations to the San Mateo County CCAG and Contra Costa Clean Water Program Management Committee.

Jay then gave a quick summary of attendee feedback following the 2022 Annual Meeting. 85 people attended the event in person at the David Brower Center, joined by 245 online participants on Zoom. Survey results indicated favorable reception, with the hybrid format and individual speakers being lauded in particular. The Center has been reserved for October 12, 2023 for the upcoming Annual Meeting. Jay informed the group that the Estuary News will be sunsetting, with its final issue coming in March 2023. Ariel Rubissow Okamoto has expressed interest in a final RMP article related to the issue theme of restoration.

Jay concluded the item by reviewing the communications strategy developed by the Steering Committee in 2014. He noted that many communications elements have changed over the years, particularly noting how the Annual Meeting's new hybrid format has allowed for a wider audience. Richard and Luisa advocated for the distribution of a poll to TRC and SC members to prioritize elements and methods of communication. John suggested moving the Estuary News online or approximating it by sending updates to the RMP newsletter.

10. Information: Status of Deliverables and Action Items

Jay provided an update on the status of RMP deliverables and action items. Just completed items included the bisphenols in water and sediment report, PCB bioaccumulation thresholds in dredged sediment report, and non-targeted fire monitoring summary for managers (and journal article). The non-targeted analysis in sediment has been delayed as Lee Ferguson is no longer able to provide a report; Rebecca Sutton will take on that responsibility going forward. The selenium data report for 2019-2020 will be completed by the end of the year. Deliverables due before the next meeting include the South Bay settling velocity report, Benicia Bridge sediment flux report, regional watershed dynamic model for sediment, interim updated land-use layer, sediment conceptual model, floating percentile sediment guidelines, and PFAS in Bay water final report. Delayed deliverables include the bird egg effort as SGS AXYS sorts through import permit issues, San Leandro Bay PCB report (lab delays), and the stormwater monitoring approach as the groundwork project has been prioritized. The sunscreen in wastewater report has also been delayed as Diana Lin has assumed responsibility for that report from Stanford. It will be completed in spring 2023.

11. Discussion: Plan Agenda Items for Future Meetings

Jay previewed topics of interest to discuss at future meetings. Richard could preview the 303(d) decisions if data are available by March. The S&T update and workgroup strategy development updates will remain standing agenda items throughout the upcoming year. The margins final report and next steps for monitoring will also be featured at the next TRC meeting.

12. Discussion: Plus/Delta

Despite the meeting's lack of eggnog and holiday chocolates, the group especially commended the science presentations from SFEI. Luisa commented that she enjoyed the day's agenda and would be happy to continue many of the discussions had further online afterwards. The group expressed their appreciation for Melissa and the work she has done as RMP manager.

-

DATE: January 17, 2022

TO: RMP Steering Committee

FROM: Jen Trudeau, Melissa Foley and Sarah Lowe

RE: RMP Financial Update – Period Ending 12/31/2022

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 information presented is for job to date labor and expense billing through September 30, 2022, hereafter referred to as the "current period."

RMP 2022 Budget

$3,322,128 of the $3,525,430 (94%) in 2022 invoiced fees have been collected. Notes:

1. The full 2022 revenue is $4,038,513 and includes $400,00 which is a pass through from USACE to USGS.
2. In RMP 2022, we are passing $508,000 in revenue directly through to the NMS to support NMS projects;
3. The full 2022 planned expenses are $3,688,513 (including the $400k in item 1 above and $508k in item 2 above);
4. The total amount invoiced does not include the $400,000 that will go from USACE to USGS directly;
5. RMP 2022 has an overall surplus of $42,248. Note that the previous surplus amount was $137,713. At the November 2022 Steering Committee meeting, the SC authorized usage of $108,000 of surplus funds to support multiple tasks: 1) $35k for the Emerging Contaminants Workgroup Strategy update, 2) $27k for the Microplastics Workgroup Strategy update, 3) $10.5k for the Sources, Pathways, and Loading Workgroup Strategy update 3) $35.5k for the Regional Watershed Dynamic Model,
6. Table 6 showing the outstanding Accounts Receivable for 2022.

The expected fees are the sum of core fees ($3,718,033) and supplemental fees paid by wastewater agencies ($320,480) under Water Board Order R2-2016-0018 and updated Order R2-2021-0028 (hereafter referred to as Alternative Monitoring and Reporting funds or AMR funds).

As of December 31, 2022, we are 62% expended on the total budget.

RMP 2021 Budget

<u>Revenue</u>

$3,669,205 of the $3,675,093 (99%) in 2021 invoiced fees have been collected. Notes:

1. The full 2021 revenue is $4,091,093 and includes $400,00 which is a pass through from USACE to USGS and $16,000 from undesignated funds. $50,000 of RMP 2021 revenue was transferred (deducted from the revenue) from RMP 2021 to Set-Aside Funds for S&T Monitoring and an additional $74,516 was

transferred (deducted from the revenue) to the undesignated reserve.Therefore operating revenue is $3,966,577;
2. The full 2021 planned expenses are $3,963,060;
3. During Q1 2022, the dredger invoice amount was determined. This amount was $5,391 higher than planned. The full revenue amount has been updated in item 1 above.
4. The total amount invoiced does not include the $400,000 that will go from USACE to USGS directly;
5. Due to the higher than planned dredger revenue, RMP 2021 has an overall net surplus of $3,517 (was previously a deficit of $1,800).
6. Table 6 shows the remaining outstanding Accounts Receivable for 2021.

The expected fees are the sum of core fees ($3,795,792) and supplemental AMR funds paid by wastewater agencies ($279,301).

As of December 31, 2022, we are 80% expended on the total budget.

RMP 2020 BUDGET

Revenue

$3,873,720 of the $3,873,721 (100%) in 2020 invoiced fees have been collected. Notes:

7. The full 2020 revenue is $3,991,846 which includes $88,129 from set aside funds for RMP Program Review, $30,000 from undesignated reserve, and deducts $275,000 which was transferred to Set-Aside Funds for S&T Monitoring;
8. The total amount invoiced does include the $400,000 that will go from USACE to USGS directly;
9. The total amount invoiced includes the $93,196 for Caltrans;
10. The total RMP 2020 local dredger revenues have been calculated at $82,814, which is lower than the original estimate of $209,489; and
11. RMP 2020 budgets were adjusted to reflect the lower dredger revenue (reduced multiple budgets by a total of $53,800) and there remains an overall revenue shortfall of $18,168.

The expected fees are the sum of core fees ($3,594,416) and supplemental AMR funds paid by wastewater agencies ($279,301).

As of December 31, 2022, we are 92% expended on the total budget.

The RMP budget is now planned at $3,735,014 which results in a deficit of $18,168. We have closed all of tasks 1-5 and the balance remaining in these tasks is $203k. After accounting for the $18k deficit, there's a remaining balance of $185k in tasks 1-5. We will hold these funds in the RMP 2020 account until we unencmuber the entire year.

RMP 2019 BUDGET

Revenue

$3,459,851 of the $3,460,087 (99%) in 2019 fees have been collected. SFEI has written off the expected revenue from Marina Dredge Neighbors in the amount of $200. After accounting for this write off, all 2019 funds have been received. Notes:

1. The full 2019 revenue is $3,819,850 which includes $109,762 from undesignated reserve funds;

2. The total amount invoiced does not include the $250,000 that went from the USACE to the USGS directly.

The expected fees are the sum of core fees ($3,430,087) and supplemental AMR fees paid by wastewater agencies ($279,301). There is reduced dredger revenue of $262,334 ($150,000 in reduced revenue from USACE and $112,334 reduced revenue from local dredgers). Due to this lower than expected revenue, the planned 2019 RMP expenses exceeded revenue by $36,108. At the August 2019 Steering Committee meeting, a decision was made to move $16,762 from Undesignated Reserve Funds to RMP 2019 and to reduce the RMP 2019 unallocated budget from $19,346 to $0. These two changes balanced the RMP 2019 budget.

Expenses

Overall, 94% of the 2019 funds have been spent through September 30, 2022. To date, we are over budget on some tasks by about $58.7k ($39.7k on workgroup meetings, $10k on the water cruise, and $9k on the Selenium North Bay clam study (these overages were previously approved by the RMP SC)). Through 3/31/2022, we have a positive balance of about $115.7k on tasks-1-5 (program management tasks). This $115.7k balance will be needed to cover previous Steering Committee approved overages. We aim to complete remaining tasks on budget and will wait until we are near 100% complete on projects to unencumber funds.

Unencumbrances this Quarter

- There is no request to unencumber at this meeting.

RMP 2018 BUDGET

Revenue

$3,596,060 of the $3,596,060 (100%) in 2018 fees have been collected. The expected fees are the sum of core fees ($3,326,493) and AMR fees paid by wastewater agencies ($269,575).

Expenses

Overall, 98% of the 2018 funds have been spent. The remaining projects are mostly special studies. For the Status and Trends tasks, most of the remaining expenses are laboratory invoices and data management.

Unencumbrances this Quarter

- There is no request to unencumber at this meeting.

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. In the first quarter of 2022, $350,000 was transferred to the S&T set aside funds from RMP 2022. The current balance of all set-aside funds is **$1,377,975**. The current balance of each set-aside fund is shown in Table 2. The historical and projected balance of the S&T Set-Aside Fund is shown in Figure 3.

Dedicated Dredger Reserve Fund

The balance of the Dredger Reserve Fund was reset to zero on January 1, 2018, when new dredger fees took effect. In 2018, there was a $62,665 credit to the Fund for dredger fees associated with the 6-month “stub year” that was created when the new fee schedule was developed[1]. There was also a debit of $109,060 because the local dredger fee payments were below their target for the year. In 2019, 2020 and 2021, there was a dredger revenue reduction due to dredged materials below targets of $262,334, 209,498, and $196,757, respectively. Therefore, the balance of the Dredger Reserve is currently -**$714,984.** Table 3 tracks the running balance of the Dredger Reserve Fund.

Undesignated Funds

The RMP has a policy to maintain a Reserve of Undesignated Funds of at least $400,000 (this was increased from $200,000 at the October 2018 Steering Committee meeting) to allow for response to unanticipated funding needs or revenue shortfalls.

Going forward, all RMP earned interest will be deposited directly into Undesignated Funds and will be reported each quarter.

Any remaining Undesignated Funds are available for spending at the discretion of the Steering Committee. Figure 2 shows how the balance of Undesignated Funds has changed over time. The balance of Undesignated Funds through the current period is **$1,050,814**. Table 4 shows the withdrawals and deposits in the Undesignated Funds during the last two budget years. Q3 2022 LAIF interest was $14,744 (1.51% interest).

Supplemental Environmental Project (SEP) Funds

The total amount of RMP SEP funds received through the current period is $3,498,520, which includes $11,650 of additional funding for project oversight that supported previously completed and closed projects (no change since last reporting period). There are $137,389 of unallocated SEP (MMP) settlement funds that were previously received and are available. There are $6,000 of MMP (unallocated) funds that are pending payment.

As of the end of the current reporting period, $2,303,949 was spent on current and previous SEP projects, which includes 28 projects to date. The current balance of SEP funds is **$1,194,571** (includes the unallocated funds that have been received and not yet committed to a project). Table 5a summarizes the budget status for current, active SEP projects through this reporting period. Descriptions of the active and approved projects are listed in Table 5b.

FOR STEERING COMMITTEE APPROVAL

- No items for approval.

Figures and Tables

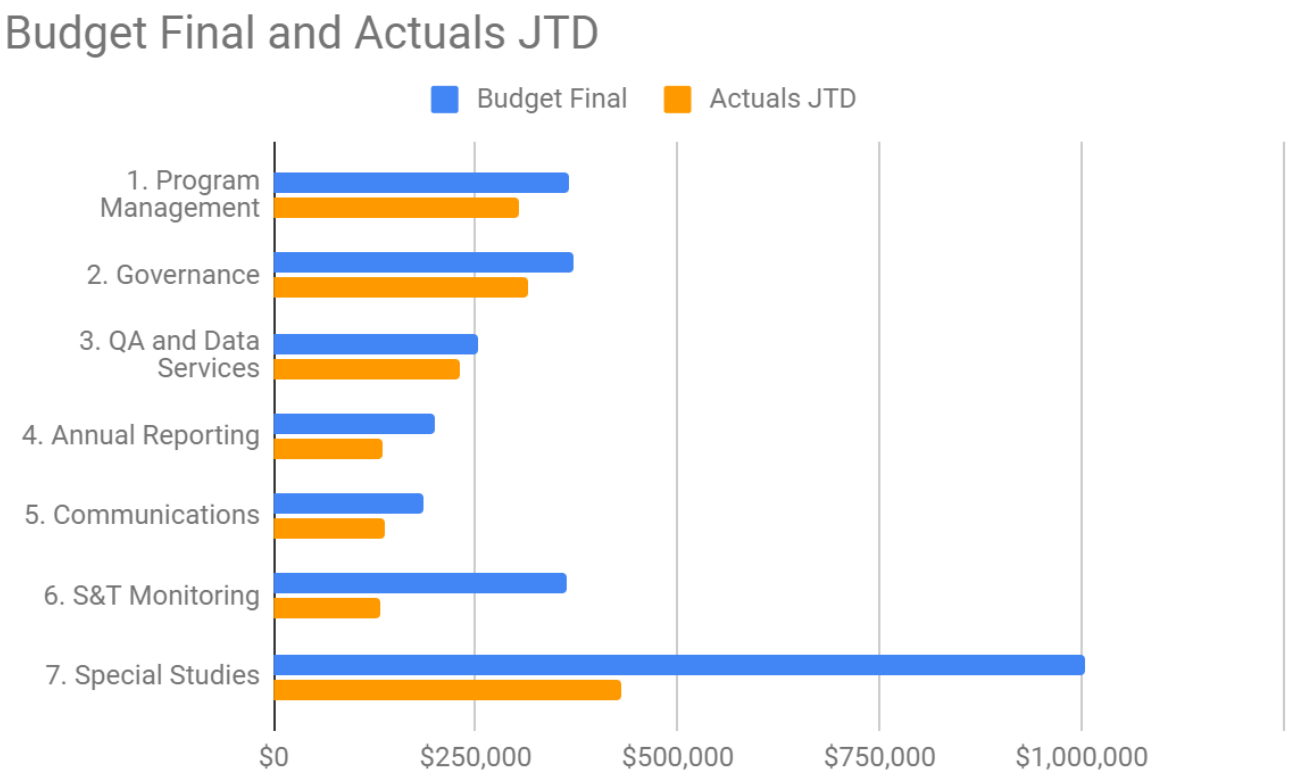


Figure 1 Bay RMP 2022 Budget. Budget and expenses through the current period by category.

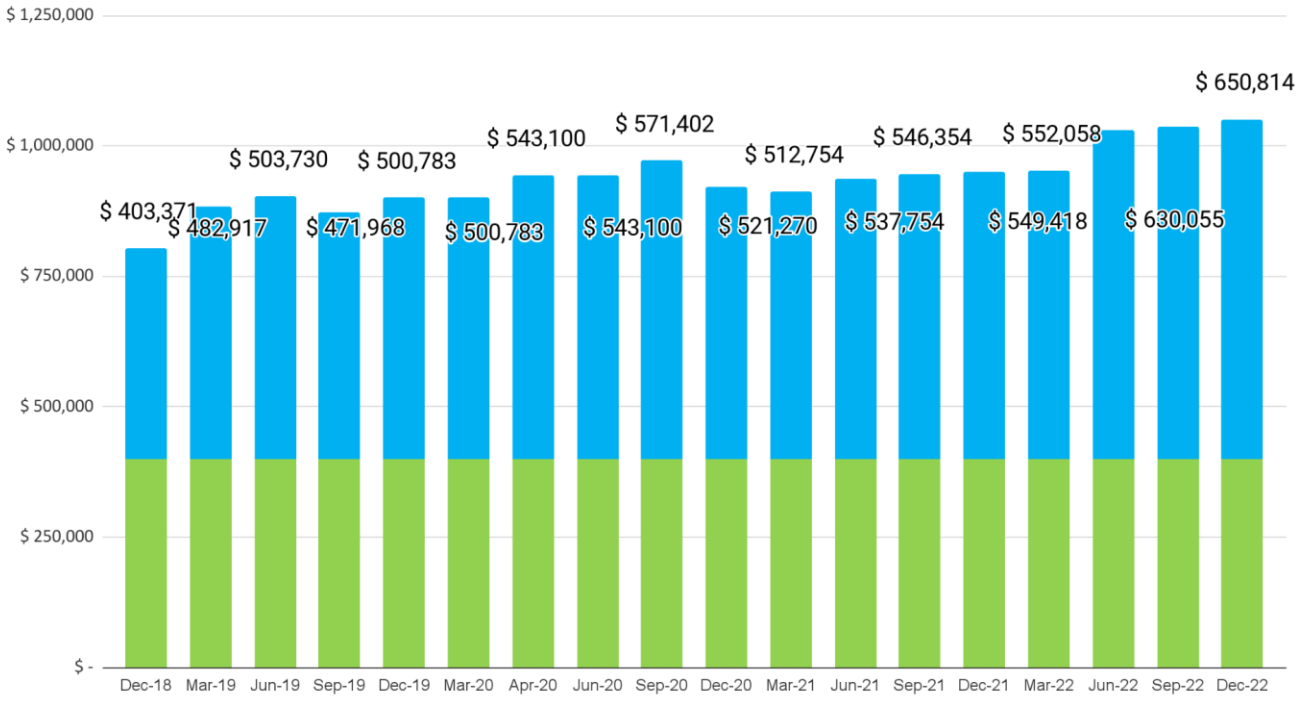


Figure 2: Bay RMP Undesignated Funds Balance over the past three years. The height of the bar shows the total balance of the Undesignated Funds. The bar is color coded to indicate the RMP policy that $400,000 of the Undesignated Funds should not be spent. Note that prior to December 2018, the RMP policy for restricted Undesignated Funds was $200,000. The increase to $400,000 was approved at the October 2018 Steering Committee meeting.

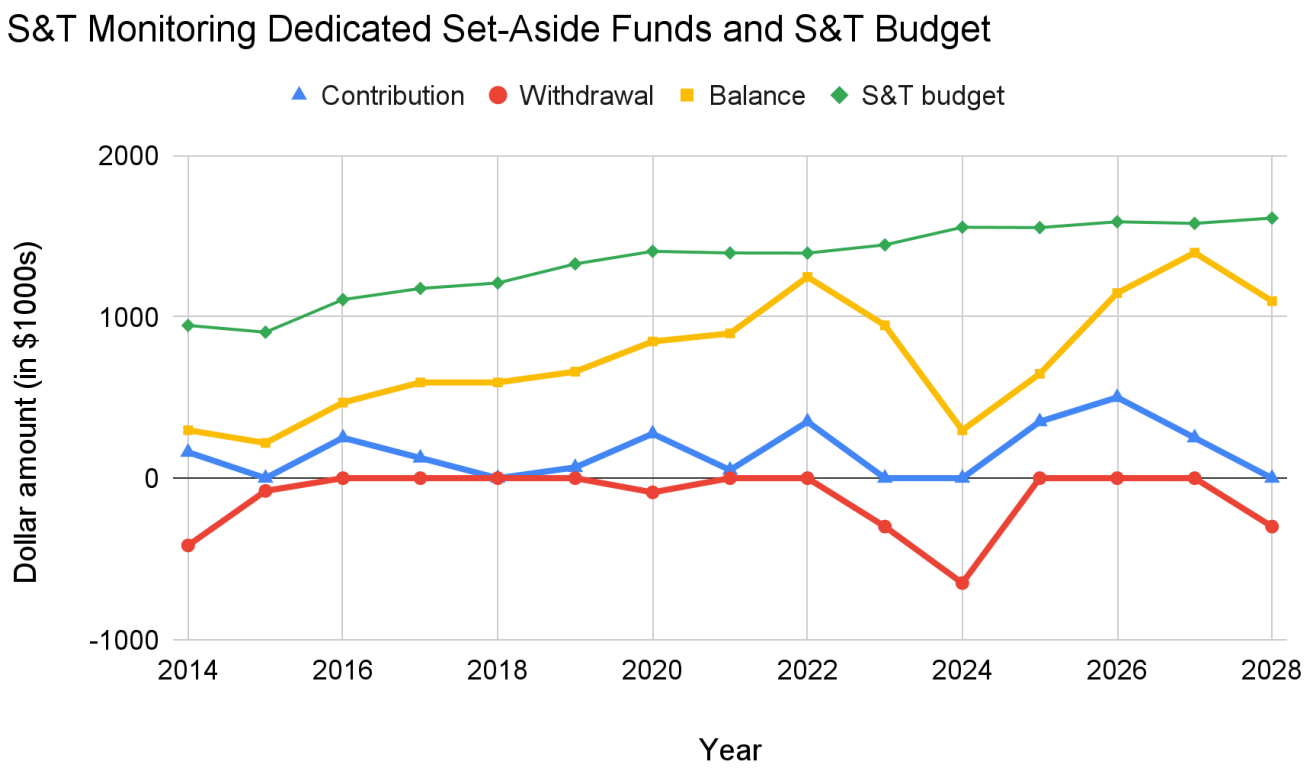


Figure 3. Contributions to and withdrawals from the S&T Set-Aside Fund from 2014 to 2022, anticipated contributions and withdrawals from 2023 to 2028, S&T actual budget for 2014 to 2021, and S&T projected budget for 2023 to 2028.

Table 1a: Bay RMP 2022 Budget: Budget and expenses for active tasks through the current period by line item.

Task	Subtask	Subtask Name	Status	Budget	Expenses JTD	% Complete
Task Number: 001 Program Management	A	Budget and Workplan Development	Active	$44,300	$41,285	93%

Task	Subtask	Subtask Name	Status	Budget	Expenses JTD	% Complete
	B	Contract and Financial Management	Active	$105,200	$65,788	63%
	C	Technical Oversight	Inactive	$66,500	$71,698	108%
	D	Internal Coordination	Active	$98,200	$90,698	92%
	E	External Coordination	Active	$42,800	$33,449	78%
	F	Administration	Active	$7,000	$1,335	19%
Task Number: 002 Governance	A	SC meetings	Active	$54,500	$49,048	90%
	B	TRC meetings	Active	$55,700	$42,507	76%
	C	General WG meetings (MF, E	Inactive	$58,000	$50,425	87%
	D	External Science Advisors	Active	$60,000	$22,094	37%
	E	Emerging Contaminants WG	Inactive	$46,000	$45,938	100%
	F	Microplastic WG	Inactive	$11,500	$11,358	99%
	G	SPLWG	Inactive	$28,800	$34,840	121%
	H	Sediment WG	Inactive	$40,300	$42,040	104%

Task	Subtask	Subtask Name	Status	Budget	Expenses JTD	% Complete
	I	PCB WG	Inactive	$17,300	$17,831	103%
Task Number: 003 QA and Data Services	A	Quality Assurance System	Active	$36,100	$30,949	86%
	B	Online Data Access: CD3	Active	$69,100	$65,221	94%
	C	Database Maintenance	Active	$63,800	$63,511	100%
	D	Updates to SOPs and Templates	Inactive	$36,100	$35,950	100%
	E	DMMO Database Support	Active	$48,989	$33,878	69%
Task Number: 004 Annual Reporting	A	Pulse Report	Active	$129,000	$76,655	59%
	B	Annual Meeting	Inactive	$70,000	$59,344	85%
Task Number: 005 Communications	A	Communications Plan Implementation	Active	$47,100	$24,491	52%
	B	Stakeholder Engagement	Active	$27,000	$20,432	76%
	C	Responses to Information Requests	Active	$20,700	$15,412	74%
	D	Outreach Products	Inactive	$12,700	$13,177	104%

Task	Subtask	Subtask Name	Status	Budget	Expenses JTD	% Complete
	E	Presentations at Conferences and Meeting	Inactive	$59,200	$48,780	82%
	G	RMP Website Maintenance	Active	$17,300	$16,278	94%
Task Number: 006 S&T Monitoring	A	USGS Sacramento Support	Inactive	$0	$0	#DIV/0!
	B	USGS Menlo Park Support	Active	$0	$0	#DIV/0!
	C	Winter StormWater	Active	$94,465	$44,853	47%
	D	Winter StormWater Data Mgmt	Active	$20,000	$14,082	70%
	E	S&T Bivalves	Active	$20,000	$52	0%
	F	N Bay Se Mon DataMgt	Active	$30,000	$2,207	7%
	G	North Bay Selenium Monitoring	Active	$97,000	$27,215	28%
	H	Dry season Bay water cruises	Active	$25,000	$3,212	13%
	I	S&T Laboratory Intercomparison Studies	Active	$22,000	$1,616	7%
	J	Sample archive	Active	$43,000	$37,651	88%

Task	Subtask	Subtask Name	Status	Budget	Expenses JTD	% Complete
	K	S&T Field Sampling Report & Support	Active	$10,000	$1,103	11%
Task Number: 020 Special Study: PCB In-Bay contaminant mo		Special Study: PCB In-Bay contaminant mo	Active	$56,000	$22,937	41%
Task Number: 021 PCBs in sediment and fish SS/RC		PCBs in sediment and fish SS/RC	Active	$52,000	$56,534	109%
Task Number: 022 Special Study: Nutrients Moored sensor h		Special Study: Nutrients Moored sensor h	Active	$0	$424	#DIV/0!
Task Number: 023 Special Study: Microplastic Strategy		Special Study: Microplastic Strategy	Active	$37,000	$9,423	25%
Task Number: 027 Special Study: STLS Strat. Supp. & Coord		Special Study: STLS Strat. Supp. & Coord	Active	$45,500	$35,104	77%
Task Number: 029 Special Study: STLS Reg. Model Devpmt.		Special Study: STLS Reg. Model Devpmt.	Active	$125,500	$81,540	65%
Task Number: 030 Small Tributaries Pollutants of Concern	E	Labs and Subs	Active	$43,000	$9,625	22%
Task Number: 031 PCB monitoring at GE property		PCB monitoring at GE property	Active	$21,200	$1,200	6%

Task	Subtask	Subtask Name	Status	Budget	Expenses JTD	% Complete
Task Number: 032 AQUA-GAPS passive sampler		AQUA-GAPS passive sampler	Active	$10,000	$0	0%
Task Number: 033 Special Study: EC Strategy Support		Special Study: EC Strategy Support	Active	$125,000	$80,580	64%
Task Number: 034 Special Study: EC in Urban Stormwater	A	Stormwater Sampling	Active	$33,000	$0	0%
	B	Data Management	Active	$5,000	$4,992	100%
	C	Analysis and Reporting	Active	$62,000	$2,428	4%
Task Number: 035 CEC modeling exploration		CEC modeling exploration	Active	$25,000	$9,463	
Task Number: 036 Spec Stud: MPEG RMP Tire Strategy		Spec Stud: MPWG RMP Tire Strategy	Active	$25,500	$25,231	99%
Task Number: 037 Spec Stud: EC Tire-related contam in Bay	A	Study Des & Smple Collection	Active	$30,000	$2,510	8%
	B	Data Mgmt	Active	$10,000	$12,007	120%
	C	Data Analysis & Report	Active	$10,000	$15,000	150%
Task Number: 038 Spec Stud: EC Ethoxyl Surfact in Water	A	Project Management	Active	$2,509	$0	0%

Task	Subtask	Subtask Name	Status	Budget	Expenses JTD	% Complete
	B	Data Services	Active	$3,500	$0	0%
	C	Analysis and Reporting	Active	$12,100	$0	0%
	D	Laboratory analysis	Active	$11,891	$9,337	79%
Task Number: 039 Spec Stud: SPL SW monitor strat for CECs		Spec Stud: SPL SW monitor strat for CECs	Active	$50,000	$15,747	
Task Number: 043 Sediment WG Workplan		Sediment WG Workplan	Active	$10,000	$5,983	
Task Number: 044 Special Study: Upload Data to DMMO		Special Study: Upload Data to DMMO	Active	$20,000	$183	1%
Task Number: 045 Special Study: Sedimiment Temp variabili		Special Study: Sediment Temp variabili	Active	$155,000	$24,346	16%
Task Number: 046 PFAS in fish	A	PFAS in fish	Active	$11,500	$950	8%
	B	Data Management	Active	$10,500	$5,112	

Table 1b: Bay RMP 2021 Budget: Budget and expenses for active tasks through the current period by line item.

Task	*Subtask*	*Subtask Name*	Budget	Expenses JTD	% Complete
Task Number: 001 Program Management	C	Technical Oversight	$60,000	$52,432	87%
	E	External Coordination	$35,000	$32,910	94%
Task Number: 002 Governance	B	TRC meetings	$48,600	$37,479	77%
Task Number: 004 Annual Reporting	A	Pulse Report	$95,000	$90,614	95%
Task Number: 005 Communications	A	Communications Plan Implementation	$41,000	$40,347	98%
	C	Responses to Information Requests	$18,000	$15,705	87%
	E	Presentations at Conferences and Meeting	$51,500	$41,141	80%
Task Number: 006 S&T Monitoring	B	USGS Menlo Park Support	$250,000	$250,000	100%
	D	2021 Water Cruise Data Mgmt	$35,000	$27,510	79%
	E	Bird Egg Sampling	$226,000	$58,365	26%
	F	2021 Bird Egg Data Mgmt	$30,000	$624	2%
	I	S&T Laboratory Intercomparison Studies	$28,000	$11,778	42%
	J	Sample Archive	$84,000	$74,542	89%

Task	*Subtask*	*Subtask Name*	Budget	Expenses JTD	% Complete
	K	S&T Field Sampling Report & Support	$12,000	$3,473	29%
Task Number: 021 Special Study: PCB Remediation Monitoring	B	Field Work	$32,666	$33,290	102%
	C	Labs	$39,034	$16,176	41%
	D	Reporting	$12,830	$4,085	32%
Task Number: 024 Special Study: MicroP Conceptual Model		Special Study: MicroP Conceptual Model	$40,000	$34,930	87%
Task Number: 026 Special Study: STLS Integrated Conceptual		Special Study: STLS Integrated Conceptual	$49,640	$31,162	63%
Task Number: 029 Special Study: STLS Reg. Model Devpmt.		Special Study: STLS Reg. Model Devpmt.	$150,000	$150,262	100%
Task Number: 030 Special Study: STLS WY20 POC Recon Monit	C	Data Management	$20,000	$34,563	173%
	D	Reporting	$22,000	$0	0%
	E	Labs and Subs	$23,000	$10,707	47%
Task Number: 031 Special Study: PFAS in Bay water	A	Sampling & Reporting	$44,500	$44,978	101%
	B	Data Mgmt	$5,500	$5,176	94%
Task Number: 034 Special Study: EC in Urban Stormwater	B	Data Management	$40,000	$39,568	99%

Task	*Subtask*	*Subtask Name*	Budget	Expenses JTD	% Complete
	C	Analysis and Reporting	$28,792	$27,391	95%
Task Number: 035 Special Study: Toxicology Strategy		Special Study: Toxicology Strategy	$60,000	$47,020	78%
Task Number: 046 Special Study: DMMO Database Enhancement		Special Study: DMMO Database Enhancement	$40,000	$4,490	11%
Task Number: 047 Special Study: Sediment Delivery to Mars		Special Study: Sediment Delivery to Mars	$80,000	$80,000	100%
Task Number: 048 S&T RMP Prog Rev		S&T RMP Prog Rev	$220,000	$119,794	54%
Task Number: 049 Special Study: Microplastics Sed Core		Special Study: Microplastics Sed Core	$3,500	$0	0%

Table 1c: Bay RMP 2020 Budget: Budget and expenses for active tasks through the current period by line item.

Task	*Subtask*	*Subtask Name*	Budget	Expenses JTD	% Complete
Task Number: 006 S&T Monitoring	E	2020 N Bay Margins Sediment Mon FieldWk	$220,600	$215,075	97%

Task	*Subtask*	*Subtask Name*	Budget	Expenses JTD	% Complete
	F	2020 Margins Sediment Report	$65,400	$60,107	92%
	G	2020 N Bay Margins Sediment Mon DatMgm	$33,000	$33,460	101%
	K	S&T Field Sampling Report & Support	$23,000	$1,284	6%
Task Number: 021 PCB PMU Monitoring with Passive Samplers	A	Sampling	$35,000	$32,638	93%
Task Number: 030 Special Study: STLS WY20 POC Recon Monit	E	Labs and Subs	$9,349	$6,674	71%
Task Number: 031 Special Study: EC Bisphenols in sediment	A	Sampling & Reporting	$16,300	$16,873	104%
Task Number: 034 Special Study: EC in Urban Stormwater	C	Analysis and Reporting	$15,727	$25,727	164%
Task Number: 035 Special Study: EC Bisphenols in effluent	A	Planning & Reporting	$46,100	$45,739	99%

Table 1d: Bay RMP 2019 Budget: Budget and expenses for active tasks through the current period by line item.

Task	*Subtask*	*Subtask Name*	Budget	Expenses JTD	% Complete
Task Number: 006 S&T Monitoring	K	S&T Field Sampling Report & Support	$22,000	$9,552	43%
Task Number: 021 Special Study: PCB Stormwtr Mon. for PMU		Special Study: PCB Stormwtr Mon. for PMU	$30,000	$16,160	54%
Task Number: 030 Special Study: STLS WY19 POC Recon Monit	A	Project Management	$24,756	$21,953	89%
Task Number: 035 Special Study: EC Ethoxylated Surf. Stud	A	Sample Collection and Reporting	$98,300	$65,362	66%
	B	Data Management	$24,700	$6,147	25%
Task Number: 042 Special Study: Selen'm Sturg Muscle Plug		Special Study: Selen'm Sturg Muscle Plug	$22,000	$8,019	36%
Task Number: 047 Special Study: Sed.Benefic.Reuse. Wrkshp		Special Study: Sed.Benefic.Reuse.Wrkshp	$30,000	$31,628	105%

Table 1e: Bay RMP 2018 Budget: Budget and expenses for active tasks through the current period by line item.

Task	*Subtask*	*Subtask Name*	Budget	Expenses JTD	% Complete
Task Number: 036 EC Non-Targeted Analysis of Sed & Water		EC Non-Targeted Analysis of Sed & Water	$101,000	$75,043	74%

Table 2: Bay RMP Dedicated Set-Aside Funds. Balances as of the current period.

Reserve Type	**Purpose**	**Balance**
Dedicated Set-Aside Fund	Monitoring Contingency	$50,000
Dedicated Set-Aside Fund	S&T Monitoring	$1,327,975
	TOTAL	**$1,377,975**

Table 3: Bay RMP Dedicated Dredger Reserve Fund. Yearly surplus (deficit) and total surplus (deficit) as of the current period. Note that the previous running surplus/deficit was reset to $0 in 2018.

Year	**Yearly Surplus/Deficit**	**Balance**
Starting Balance from “Stub Year”		$62,665 (received) $62,665 (total)

Year	Yearly Surplus/Deficit	Balance
2018	-$109,060	-$46,395
2019	-$262,334	-$308,729
2020	-$209,498	-$518,227
2021	-$196,757	-$714,984

Table 4: Bay RMP Undesignated Funds. Withdrawals and deposits during the last two budget years and total balance as of the current period.

Budget Year	Deposit or Withdrawal	Authorization	Date of Authorization	Amount	Comment
2020	Deposit	Program Manager	3/31/2020	$24,936	Deposited LAIF and other interest from CY Q1
2020	Deposit	Program Manager	5/1/2019	$30,000	DWR funds for Hg monitoring at Winter's Island originally deposited to undesignated
2020	Withdrawal	Program Manager	6/15/2020	-$30,000	DWR funds for Hg monitoring at Winter's Island transferred to RMP 2019
2016	Deposit	Steering Committee	7/22/2020	$10,279	Unencumberd the remaining balance in RMP 2016 and moved to undesignated funds
2020	Deposit	Program Manager	6/30/2020	$18,022	Deposited LAIF and other interest from CY Q2
2020	Withdrawal	Steering Committee	10/16/2020	-$15,000	Approved by SC via email for RMP 2020 task 48 rmp review
2020	Withdrawal	Steering Committee	10/22/2020	-$15,000	Approved by SC at 10/21/20 SC meeting - for task RMP 41 clam selenium project (RMP 2020)
2020	Deposit	Program Manager	10/15/2020	$9,778	Deposited LAIF and other interest from CY Q3
2020	Deposit	Program Manager	12/31/2020	$7,484	Deposited LAIF and other interest from CY Q4
2021	Withdrawal	Steering Committee	1/21/2021	-$16,000	Withdraw $16k from UR to RMP 2021 for $6k for MPWG and $10k for tire contaminant conceptual model
2017	Deposit	Steering Committee	4/27/2021	$25,000	unecumbered $25,000 from RMP 2017 to reserve
2021	Deposit	Program Manager	3/31/2021	$5,083	Q1 2021 LAIF interest
2021	Deposit	Program Manager	6/30/2021	$3,697	Q2 2021 LAIF interest
2021	Deposit	Program Manager	9/30/2021	$2,884	Q3 2021 LAIF interest
2021	Deposit	Program	12/31/2021	$2,640	Q4 2021 LAIF interest

Budget Year	Deposit or Withdrawal	Authorization	Date of Authorization	Amount	Comment
		Manager			
2021	Deposit	Program Manager	3/31/2022	$3481	Q1 2022 LAIF interest
2022	Deposit	Steering Committee	4/27/2022	$74,516	new fees from schnitzer steel - from rmp 2021 to undesignated reserve
2022	Deposit	Program Manager	6/30/2022	$6,015	Q2 2022 LAIF interest
2022	Deposit	Program Manager	9/30/2022	$14,744	Q3 2022 LAIF interest

Table 5a: Bay RMP Supplemental Environmental Project (SEP) Settlement Funds budget status for open, current projects or projects that ended within the last quarter. Listed are the amount of funds received and allocated to specific projects, the amount spent through the end of this reporting period, and the amount of unallocated funds available for this reporting period. The RMP maintains records of each settlement payment in their accounting system. * indicates that funding has not yet been received

Active RMP SEP Projects	Amount Funded	Amount Spent	SEP Project Balance
Task 011: PCB Stormwater Monitoring for PMUs (closed this period)	$37,000	$37,000	$0
Task 012: PCB Shiner Surfperch PMU Survey	$59,752	$59,712	$40
Task 013: Lower South Bay Sediment Transport Monitoring Study	$158,000	$149,600	$8,400
Task 014: Quantifying Stormwater Flow and Sediment Flux to the Bay	$385,000	$298,491	$86,509
Task 015: North Bay Selenium Clam and Water Data Management and Reporting	$40,000	$34,587	$5,413
Task 016: Sunscreen in Wastewater	$36,500	$29,902	$6,598
Task 017: Characterizing the settling velocity of suspended sediment across channel and shoals in South San Francisco Estuary	$227,700	$227,700	$0
Task 018: USGS Sediment Flux Study at Benicia Bridge (closed this period)	$36,300	$36,300	$0
Task 019: ECWG Special Study 2020 Q_Ammonium Compounds Survey	$58,200	$20,519	$37,681
Task 020: SPLWG 2020 MTC Bay Area Land Use Update Support	$50,000	$50,000	$0
Task 021: Sediment Dynamics Assessment and Uncertainty Analysis for San Francisco Bay	$142,500	$124,818	$17,682
Task 022: Temporal Variability in Sediment Delivery to a San Francisco Bay Salt Marsh - USGS (Closed this period)	$60,000	$60,000	$0
Task 023: Integrated Watershed-Bay Modeling Strategy and Pilot Implementation	$200,000	$28,760	$171,240
Task 024: Regional Watershed Spreadsheet Model Update	$23,300	$569	$22,731
Task 025: Temporal Variability in Sediment Delivery to a San Francisco Bay Salt Marsh - USGS Closed this period)	$59,511	$56,408	$3,103
Task 026: Characterizing Per- and Polyfluoroalkyl Substances (PFAS) and Chlorinated Paraffins in San Francisco Bay Sediment	$106,150	$833	$105,317
Task 027: High speed mapping of water quality parameters on the eastern shoal of South San Francisco Bay	$184,470	$0	$184,470

Active RMP SEP Projects	Amount Funded	Amount Spent	SEP Project Balance
Task 028: San Francisco Bay Sediment Transport and Fate Modeling	$408,000	$0	$408,000
Unallocated	$14,389	$0	$137,389
Total for above active projects and unallocated funds	**$2,286,772**	**$1,215,201**	**$1,194,571**
Total for all SEP Projects (including closed projects)	**$3,498,520**	**$2,303,949**	**$1,194,571**

Table 5b: Bay RMP Supplemental Environmental Project Descriptions

Study Name	Budget	Description	Status
Task 011 PCB Priority Margin Unit (PMU) Stormwater Study	$67,000 total project cost with $37,000 paid by SEP funding	This study will yield valuable information on PCB concentrations and particle ratios in stormwater in two Priority Margin Unit (PMU) watersheds. The study areas include the major subwatersheds draining into the Emeryville Crescent, and one subwatershed draining into San Leandro Bay. The subwatershed draining into San Leandro Bay is downstream of a recently remediated hotspot, the former General Electric (GE) transformer and electrical equipment facility, where PCB contamination was severe. The goals of the study are to better estimate current PCB loads into these PMUs (a critical component of the PMU mass budgets) and to support tracking of the effectiveness of the major remediation action on the GE property. Sampling will be completed over two years, as storms allow. This project is funded by RMP Core Funds & SEP Funds: $30K in Bay RMP Core Funds (3018-021), $22K in MMP settlement funds, and $15K in an ACL settlement (R2-2018-1021).	Approved (closed this period)
Task 012 PCB Priority Margin Unit (PMU) Surfperch Survey	$59,752	Conceptual site models for PCBs in priority margin units have been developed for the Emeryville Crescent and San Leandro Bay. The San Leandro Bay model was supported by an intensive field study. These conceptual site models identified shiner surfperch as a crucial indicator of impairment in these areas, due to their explicit inclusion as an indicator species in the TMDL, their importance as a sport fish species, their tendency to accumulate high concentrations, their site fidelity, and other factors. The conceptual site models recommend periodic monitoring of shiner surfperch to track trends in the PMUs, and as the ultimate indicator of progress in reduction of impairment. Shiner surfperch and other sport fish species will be monitored in 2019 as part of RMP Status and Trends (S&T) monitoring. A coordinated sampling of PCBs in shiner surfperch in four PMUs is proposed as an add-on to the 2019 S&T sport fish sampling. This coordination will yield significant savings in data management and reporting, because these results can be easily added to the S&T activities with negligible additional cost. In addition, a dataset for shiner surfperch	Approved

Study Name	Budget	Description	Status
		will be obtained that is directly comparable across the four PMUs and the five locations that are sampled in S&T.	
Task 013 Lower South Bay Sediment Transport Monitoring Study (LSB Sediment Flux Study Year 2)	$158,000	For January through September 2019, the San Francisco Bay Regional Monitoring Program (RMP) will continue the observations of suspended-sediment flux obtained in 2018 and will study the effects of flocculation on suspended-sediment flux measurements at the Dumbarton Bridge. The study will provide a monitoring dataset to understand the amount of sediment that is transported into and out of Lower South Bay (the “sediment flux”). An interpretive technical report for RMP’s 2018 – 2019 results will be submitted. This data is critically important for restoring marshes for the South Bay Salt Ponds Restoration Project and for understanding transport of sediment-associated contaminants. At two locations in the water column at Dumbarton Bridge, continuous, 15-minute observations of turbidity, water velocity, and depth will be collected. These datasets will be related to suspended-sediment concentration and channel discharge using periodic boat-based measurements; the product of these two quantities is suspended-sediment flux. This sediment flux monitoring will follow previously established United States Geological Survey (USGS) methods (Shellenbarger et al., 2013). To quantify the effect of flocculation on these sediment flux computations, additional field campaigns will be conducted to observe in situ floc size and particle size distributions through an entire tidal cycle during spring and neap tides of the dry (July – Sept) and wet (Oct – June) seasons.	Approved

Study Name	Budget	Description	Status
Task 014 Quantifying stormwater flow and sediment	$385,000	Information on urban storm water flow, either measured or estimated using modeling, is fundamental to policy development, planning and environmental management and supports drainage engineering, pollutant loading estimates, and models of transport and fate of pollutants. In the Bay Area, the majority of flow data have been collected by the USGS and partner flood control and water supply agencies in less urbanized larger watersheds mainly in support of flood risk analysis, the operation of water supply systems, and riparian flows for fish and wildlife. Presently there are 12 watershed being gauged by USGS and six others being gauged by flood control and water district staff or consultants to support these issues. Flow data are not being collected in the smaller highly urban watersheds that fringe the Bay that have rainfall-runoff characteristics that are distinctly different to larger non-urban watersheds. This project aims to fill these data gaps.	Approved
Task 015 North Bay Selenium Clam and Water Data Management and Reporting	$40,000	The goal of the study is to provide data quality assurance, data management, and preparation of a data report for clam and water selenium monitoring conducted by the Regional Monitoring Program for Water Quality in San Francisco Bay (RMP) in North San Francisco Bay. This monitoring is being conducted by the RMP in support of the North Bay Selenium TMDL. This study will cover clam and water selenium data generated by RMP monitoring in 2019 and 2020.	Approved
Task 016 Sunscreens in Wastewater	$36,500	Recent qualitative work has indicated the presence of one sunscreen active ingredient, oxybenzone, in Bay water and wastewater effluent. Oxybenzone and other sunscreen active ingredients have been shown to cause adverse effects, such as endocrine disruption in fish and bleaching on coral reefs. The City of San Francisco is considering a resolution to examine the occurrence and potential impacts of some of these compounds. This sunscreen screening study will help assess whether they may be a potential concern for the Bay.	Approved
Task 017 USGS Characterizing the settling velocity of suspended sediment across channel and shoals in South San Francisco Estuary	$227,700	The goal of this work is to collect needed data on flocculation and variation in settling velocity of suspended sediment particles simultaneously in the channel and shoals of South San Francisco Estuary. These data will improve our understanding of the processes controlling sediment flocculation and ground-truth parameterizations of settling velocity that can be used to improve models of sediment transport for the San Francisco Estuary. Results will inform management questions regarding the beneficial reuse of dredged sediment, the sediment accretion in tidal marshes, and sources and trajectories of sediment-bound contaminants from watersheds and Bay margins into the Estuary. Informing these management questions is a priority of the San Francisco Bay Regional Monitoring Program for Water Quality.	Approved Started 7/2020

Study Name	Budget	Description	Status
Task 018 USGS Sediment Flux Study at Benicia Bridge	$36,300	The goal of this USGS study is to reanalyze the existing model of sediment flux estimates for Suisun Bay at the Benicia Bridge. The existing model does not account for flocculation, which has been found to be an important component of sediment transport in other locations of San Francisco Bay. Incorporating sediment flocculation into the model will provide robust sediment flux estimates for Suisun Bay, which are of interest because Suisun Bay is the entry point for sediment, nutrients, and contaminants from the Estuary's primary freshwater source, the Sacramento-San Joaquin Delta. The Regional Monitoring Program will re-analyze data from 2002-2019 to include flocculation dynamics and revise sediment flux estimates based on those findings.	Approved (closed this period)
Task 019 ECWG Special Study 2020 Quaternary Ammonium Compounds Survey	$58,200	Quaternary ammonium compounds (QACs) are surfactants widely used in a variety of consumer products, particularly as antimicrobials. The current COVID-19 pandemic is thought to have increased use of products containing QACs, which is expected to continue into the near future. QACs have been detected in San Francisco Bay sediment, and are considered Possible Concern within the RMP tiered risk-based framework for emerging contaminants in the Bay. This ECWG special study will determine the concentrations of at least 22 QACs in Bay Area wastewater influent and effluent and begin to assess the temporal trends related to COVID-19.	Approved Started 7/2020
Task 020 SPLWG 2020 MTC Bay Area Land Use Update Support	$50,000	Geographic information on land use forms the basis of data and information generated to inform many key planning, management, and policy decisions. The first comprehensive information on Bay Area land use was released by the Association of Bay Area Governments (ABAG) in 1995, updated in 2000, and again in 2005 to reflect the (then) latest information about land use on a parcel basis. The goal of this project is to support the Metropolitan Transport Commission (MTC) in generating a one-time regional update of the basic land-use information for the Bay Area to support timely planning and assessment needs within the RMP community. Working with RMP staff, the MTC plans to develop the digital geospatial product in a way that can then be updated regularly on 2-5 year intervals.	Approved Started 7/2020
Task 021 Sediment Dynamics Assessment and Uncertainty Analysis for San Francisco Bay	$142,500	The goal of this project is to produce a detailed conceptual model of sediment dynamics for San Francisco Bay. The model will be linked to key management questions and developed at appropriate spatial and temporal scales, which can be used to inform policy decisions and build frameworks for management, monitoring, and modeling decisions. When coupled with an analysis of the uncertainties for major variables relative to their magnitude within the system, this conceptual model will also be used to prioritize monitoring and modeling studies.	Approved Started 9/2020

Study Name	Budget	Description	Status
Task 022: Temporal Variability in Sediment Delivery to a San Francisco Bay Salt Marsh	$60,000	The goal of this work is to investigate the influence of tides, waves, and water levels on sediment delivery and deposition on a tidal marsh surface in south San Francisco Bay. The project will include measurements of suspended sediment concentration (SSC) and suspended sediment flux (SSF) in the shallows adjacent to a marsh, SSF into the marsh through a tidal creek, deposition and accretion on the marsh, and the variation in deposition with elevation and vegetation density and type. Data will be collected in summer 2021 and data analyzed and reported by summer 2023. USGS subcontract 1515 - These SEP funds partially fund RMP 2021 Task 047.	Approved (closed this period)
Task 023: Integrated Watershed-Bay Modeling Strategy and Pilot Implementation	$200,000	This project will produce and implement a strategy that integrates, links, and advances modeling tools to evaluate transport and loading of pollutants and sediment to San Francisco Bay from its tributary watersheds and other sources and pathways, and to evaluate the fate and transport of the resulting exposure of the pollutants in the Bay. Currently available models include watershed and Bay dynamic simulation models, watershed spreadsheet models, food web models, and mass balance conceptual box models of the Bay and Bay margins. Integrated use of these modeling tools and monitoring data will provide improved understanding of the linkages between ecosystem components and will better answer management questions to inform preventive and corrective actions for pollutants of concern, including contaminants of emerging concern, and management of sediment sources and supply needed for sea level rise resilience and adaptation, and habitat protection and restoration.	Approved
Task 024: Regional Watershed Spreadsheet Model Update	$23,300	The Regional Watershed Spreadsheet Model (RWSM) was developed to estimate average annual regional and sub-regional scale pollutant loads to San Francisco Bay from stormwater runoff. It is part of a class of deterministic empirical models based on the volume-concentration method. In the Bay Area, it has so far been used for providing first approximations of regional (Baywide) and sub-regional (e.g., individual county, Bay segment, or priority margin unit) estimates of PCBs, mercury, copper, nutrients, and microplastics. The model will be recalibrated for flow using a new calibration period (1991-2020) and updated land use data to be published by the Metropolitan Transportation Commission in March 2021. The recalibrated flow model will be used to improve the model calibration and load estimates for mercury and one or more other pollutants.	Approved

Study Name	Budget	Description	Status
Task 025: Additional MMP Funding for Task 022 - Temporal Variability in Sediment Delivery to a San Francisco Bay Salt Marsh	$59,511	The goal of this work is to investigate the influence of tides, waves, and water levels on sediment delivery and deposition on a tidal marsh surface in south San Francisco Bay. The project will include measurements of suspended sediment concentration (SSC) and suspended sediment flux (SSF) in the shallows adjacent to a marsh, SSF into the marsh through a tidal creek, deposition and accretion on the marsh, and the variation in deposition with elevation and vegetation density and type. Data will be collected in summer 2021 and data analyzed and reported by summer 2023. USGS subcontract 1515 - These SEP funds partially fund RMP 2021 Task 047.	Approved
Task 026: Characterizing Per- and Polyfluoroalkyl Substances (PFAS) and Chlorinated Paraffins in San Francisco Bay Sediment	$106,150	This study will assess PFAS concentrations in San Francisco Bay sediment samples to improve our understanding of the occurrence and risks associated with PFAS in the Bay. Sediment samples collected throughout the Bay in 2018 and archived for the Status and Trends (S&T) Program will be analyzed, as well as a subset of samples expected to be collected in 2023 to provide information on current status. PFAS will be analyzed via targeted methods using tandem liquid chromatography/mass spectrometry (LC-MS/MS), and may also include analysis via the total oxidizable precursors (TOP) assay, which allows characterization of the overall presence of precursors rather than individual PFAS.	Approved
Task 027: High speed mapping of water quality parameters on the eastern shoal of South San Francisco Bay	$184,470	This study will conduct high speed mapping of water quality parameters covering the eastern shoals of South San Francisco Bay (monthly) over 4 months. The mapping surveys will include information about water quality, nutrients, phytoplankton, and near-field remote sensing of high spatial resolution on the shoals and into the channels. The results will provide a quantitative understanding of phytoplankton and nutrient dynamics on the shoals and how they link to nutrient cycling processes in the channels of San Francisco Bay.	Approved
Task 28: San Francisco Bay Sediment Transport and Fate Modeling	$408,000	This project will produce a foundational quantitative model of sediment transport and fate in San Francisco Bay that can be used to address management questions for polychlorinated biphenyls (PCBs), nutrients, and sediment. The study will have four major elements: 1. Compilation of existing information on (a) sediment loadings and boundary conditions and (b) sediment properties and parameters in San Francisco Bay; 2. Diagnostic analysis of sediment transport and fate model development; 3. Application of the model to answer management questions for PCBs, nutrients, and sediment supply; and 4. Coordination among the scientists working on the multiple facets of this effort and the stakeholders (including Regional Water Board staff) providing guidance via San Francisco Bay Regional Monitoring Program and Nutrient Management Strategy workgroups.	Approved

Table 6: Steering Committee RMP Budget Summary

as of 12/31/2022

Budget and Current Expenses

Year		Budget	Expended	Balance	Previously Unencumbered	Unencumbered this Period	Balance minus Unencumbered (Remainder)	% Remaining
		$	$	$	$	$		
SEP		**3,060,520**	**2,317,807**	**742,713**	**0**	**0**	**742,713**	**24%**
2022		**2,737,354**	**1,686,853**				**0**	**0%**
2021		**3,564,376**	**2,860,960**	**703,416**	**0**	**0**	**703,416**	**20%**
2020		**3,735,014**	**3,456,921**	**278,093**			**278,093**	**7%**
2019		**3,819,850**	**3,575,501**	**244,349**	**0**	**0**	**244,349**	**6%**
2018		**3,818,427**	**3,733,148**	**85,279**	**0**	**0**	**85,279**	**2%**
	Grand Total	**20,735,541**	**17,631,190**	**2,053,850**	**0**	**0**	**2,053,850**	**10%**

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

	Item	$	Notes
	Cash on Hand	3,994,579	
	< 2018 A/R & Remaining Interest (see below)	0	
	Total Assets	**3,994,579**	
	Total Current Liabilities (figures above)	-2,053,850	
Set Asides	Monitoring Contingency		
	Program Review		
	S&T Monitoring	-1,027,975	
	Total Liabilities	**-3,081,825**	
	Undesignated Funds	**912,754**	RMP SC has set a policy to maintain a minimum balance of $400K of Undesignated Funds (changed from $200k to $400k in Oct 2018).

Year	Accounts Receivables & Remaining Interest:	Amount	Anticipated Collections by	Notes
2022	3022.17 Pinole/Hercules - Municipal	21,255		
	3022.36 C&H Sugar Company - Industrial	18,672		
	3022.41 Martinez Refining Company - Industrial	67,383		
	3022.50 Caltrans - Stormwater	95,992		
2021	3021.65 Marina Dredge Neighbors - Dredger	200	core fees	

	3021.74 San Francisco Marina - Dredger	5,504	core fees					
	3021.80 Marin Co Paradise Cove(SD#5) - AMR	184						

[1] In December 2016, the Fee Schedule was updated to cover the 2017-2019 period. One of the changes was to switch from a fiscal year to a calendar year basis. Specifically, for the last cycle of the old Fee Schedule, the fees were assessed for the period 7/1/15-6/30/16. For the first cycle of the new Fee Schedule, the fees will be assessed using the period 1/1/17-12/31/17. This left a 6-month gap of 7/1/16 to 12/31/16 (the “stub year”). Dredgers with in-Bay dredge disposal in this stub year were charged a fee for this disposal using the old Fee Schedule.

DATE: November 2, 2022

TO: RMP Steering Committee

FROM: Melissa Foley, RMP Manager

RE: Financial Requests to the RMP Steering Committee

The purpose of this memorandum is to provide details of the four financial requests made at the November RMP Steering Committee meeting. The total additional funding requested is $108k. The RMP Manager recommends that this funding be allocated from the 2022 budget, which has $138k of unallocated funds.

The funding requests include:

1. $35k for the Emerging Contaminants Workgroup Strategy update
2. $27k for the Microplastics Workgroup Strategy update
3. $10.5k for the Sources, Pathways, and Loading Workgroup Strategy update
4. $35.5k for the Regional Watershed Dynamic Model

For the Workgroup Strategy requests, additional funding will support additional stakeholder meetings (all), cross-workgroup collaboration, and extensive updates to the workgroup strategy documents.

For the Watershed Dynamic Model, additional funding will support addition of the new ABAG land use layer (30% of hours), gathering and incorporating known source areas into the model (32%), planning and hosting stakeholder subgroup meetings (18%), training Water Board staff on model use (8%), and meeting with the Water Board to coordinate use of the model in the TMDL revision process (12%).

RMP
REGIONAL MONITORING
PROGRAM FOR WATER QUALITY
IN SAN FRANCISCO BAY

sfei.org/rmp

MULTI-YEAR PLAN 2023

ANNUAL UPDATE

DRAFT: JANUARY 2023

Contribution Number: 1096

RMP ORIGIN AND PURPOSE

In 1992 the San Francisco Bay Regional Water Board passed Resolution No. 92-043 directing the Executive Officer to send a letter to regulated dischargers requiring them to implement a regional multi-media pollutant monitoring program for water quality (RMP) in San Francisco Bay. The Water Board's regulatory authority to require such a program comes from California Water Code Sections 13267, 13383, 13268 and 13385. The Water Board offered to suspend some effluent and local receiving water monitoring requirements for individual discharges to provide cost savings to implement baseline portions of the RMP, although they recognized additional resources would be necessary. The Resolution also included a provision that the requirement for a RMP be included in discharger permits. The RMP began in 1993, and over ensuing years has been a successful and effective partnership of regulatory agencies and the regulated community.

The goal of the RMP is to collect data and communicate information about water quality in San Francisco Bay in support of management decisions. This goal is achieved through a cooperative effort from a wide range of regulators, dischargers, scientists, and environmental advocates. This collaboration has fostered the development of a multifaceted, sophisticated, and efficient program that has demonstrated the capacity for considerable adaptation in response to changing management priorities and advances in scientific understanding.

RMP PLANNING

This collaboration and adaptation is achieved through the participation of stakeholders and scientists in frequent committee and workgroup meetings (Figure 1).

The annual planning cycle begins with a workshop in October in which the Steering Committee articulates general priorities among the information needs on water quality topics of concern. In the second quarter of the following year, the workgroups and strategy teams put forward recommendations for special studies to the Technical Review Committee (TRC). At their June meeting, the TRC combines all of this input into a study plan for the following year that is submitted to the Steering Committee who then considers this recommendation and makes the final decision on the annual workplan.

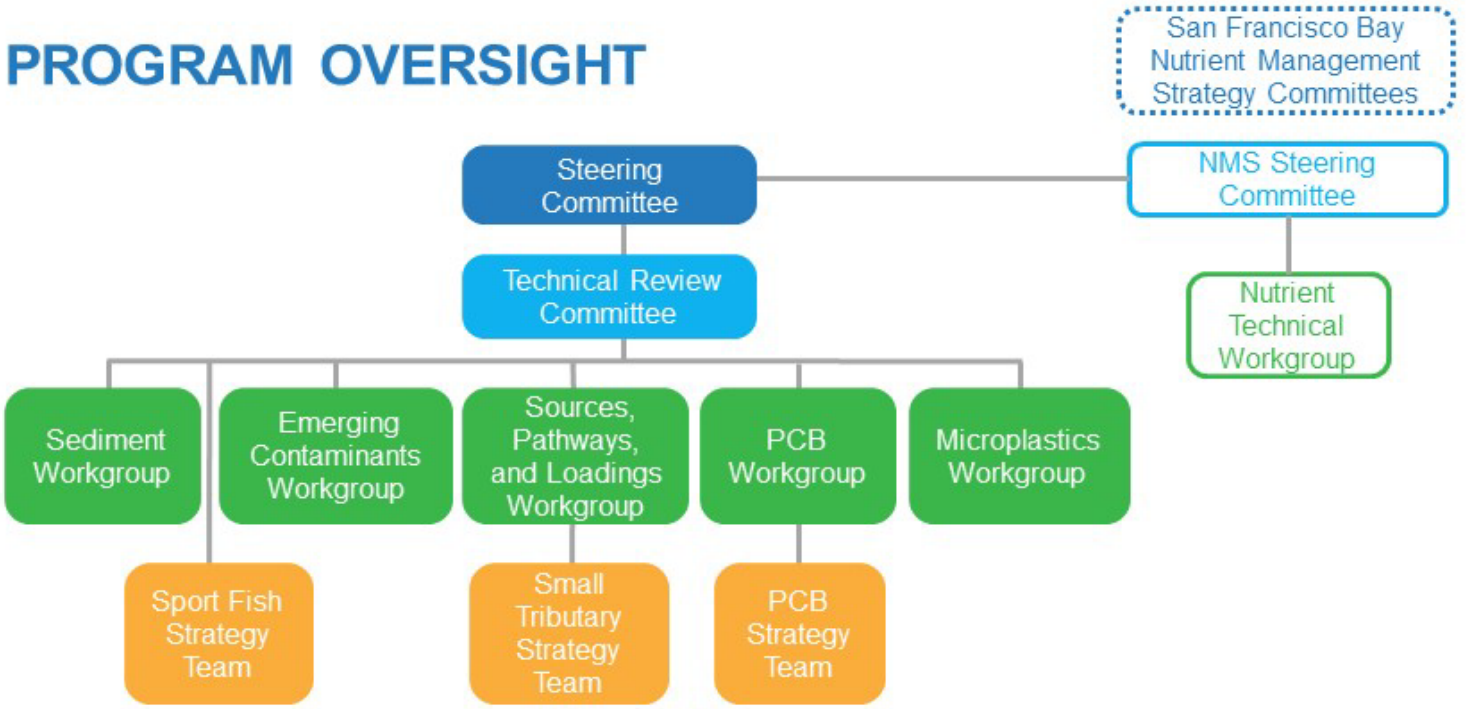
In order to fulfill the overarching goal of the RMP, the Program has to be forward-thinking and anticipate what decisions are on the horizon, so that when their time comes, the scientific knowledge needed to inform the decisions is at hand. Consequently, each of the workgroups and teams develops five-year plans for studies to address the highest priority management questions for their subject area. Collectively, the efforts of all these groups represent a substantial body of deliberation and planning.

PURPOSE AND ORGANIZATION OF THIS DOCUMENT

The purpose of this document is to guide efforts and summarize plans developed within the RMP. The intended audience includes representatives of the many organizations who directly participate in the Program. This document will also be useful for individuals who are not directly involved with the RMP but are interested in an overview of the Program and where it is heading.

The organization of this Multi-Year Plan parallels the RMP planning process (Figure 2). Section 1 presents the long-term management plans of the agencies responsible for managing water quality in the Bay and the overarching management questions that guide the Program. The agencies' long-term management plans provide the foundation for RMP planning (Figure 2). In order to turn the plans into effective actions, the RMP distills prioritized lists of management questions that need to be answered (Page 8). The prioritized management questions then serve as a roadmap for scientists on the Technical Review Committee, workgroups, and strategy teams to plan and implement scientific studies to address the most urgent information needs. This information sharpens the focus on management actions that will most effectively and efficiently improve water quality in the Bay.

Figure 1. Collaboration and adaptation in the RMP is achieved through the engagement of stakeholders and scientists in frequent committee and workgroup meetings.



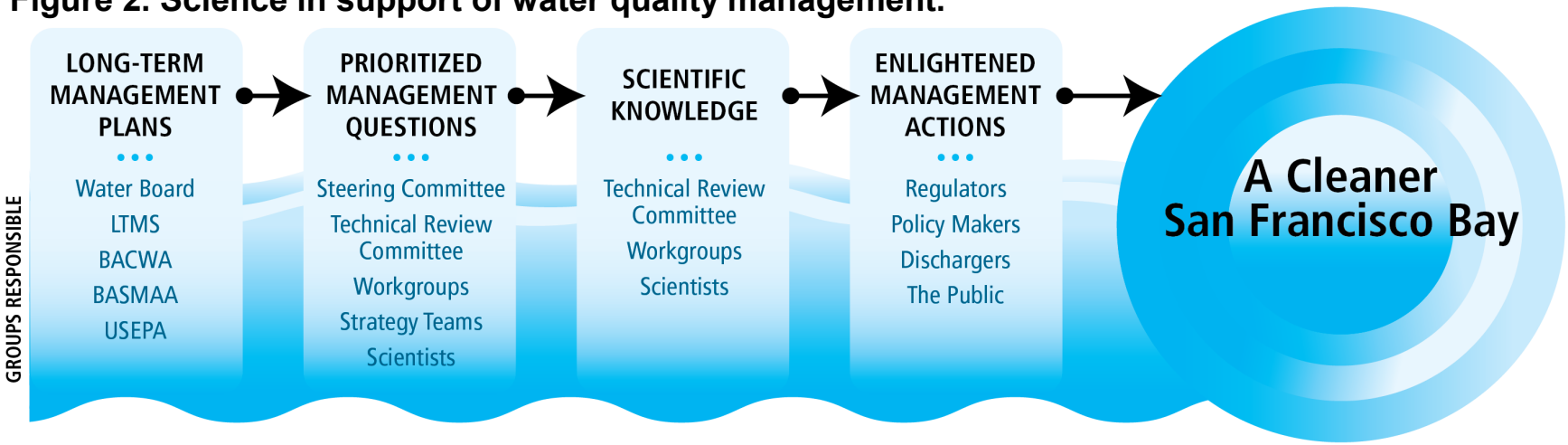
The Steering Committee consists of representatives from discharger groups (wastewater, stormwater, dredging, industrial) and regulatory agencies (Regional Water Board and U.S. Army Corps of Engineers). The Steering Committee determines the overall budget and allocation of program funds, tracks progress, and provides direction to the Program from a manager's perspective.

Workgroups report to the TRC and address the main technical subject areas covered by the RMP. The Nutrient Technical Workgroup was established as part of the committee structure of a separate effort—the Nutrient Management Strategy—and makes recommendations to the RMP committees on the use of the RMP funds that support nutrient studies. The workgroups consist of regional scientists and regulators and invited scientists recognized as authorities in the field. The workgroups directly guide planning and implementation of special studies.

Oversight of the technical content and quality of the RMP is provided by the **Technical Review Committee** (TRC), which provides recommendations to the Steering Committee.

RMP strategy teams constitute one more layer of planning activity. These stakeholder groups meet as needed to develop long-term RMP study plans for addressing high priority topics.

Figure 2. Science in support of water quality management.



Section 2 provides an overview of the RMP budget, including where the funding comes from and how it is allocated among different elements of the Program. This section provides a summary of the priority topics to be addressed by the Program over the next five years.

Section 3 presents the five-year plans developed by the workgroups and strategy teams for the current focus areas: emerging contaminants, microplastics, nutrients, PCBs, sediment, selenium, and small tributary loads. Led by the stakeholder representatives that participate in these groups, each workgroup and strategy team develops a specific list of management questions for each topic that the RMP will strive to answer over the next five years. With guidance from the science advisors on the workgroups, plans are developed to address these questions. These plans include proposed projects and tasks and projected annual budgets. Information synthesis efforts are often conducted to yield recommendations for the next phase of studies. For now, study plans and budget allocations for these strategies are largely labelled as “to be determined”. Other pieces of information are also included to provide context for the multi-year plans. First, for each high priority topic, specific management policies or decisions that are anticipated to occur in the next few years are listed. Second, the latest advances in understanding achieved through the RMP and other programs on Bay water quality topics of greatest concern are summarized. Lastly, additional context is provided by listing studies performed within the last five years and studies that are currently underway.

Section 4 describes five-year plans for other elements that are essential to the mission of the RMP: Status and Trends Monitoring, Program Management, Communications, Data Management, and Quality Assurance.

Section 5 contains lists of RMP studies that are relevant to specific permit conditions for dredging, stormwater discharges, and municipal and industrial wastewater discharges.

A Living Document

The RMP Multi-Year Plan is updated annually to provide an up-to-date description of the priorities and directions of the Program. An annual Planning Workshop is held in conjunction with the October Steering Committee meeting. A draft Multi-Year Plan is prepared before the workshop, and approved by the Steering Committee at the January meeting.

More detailed descriptions of the elements of the RMP are provided in the annual Detailed Workplan (available at www.sfei.org/rmp).

Figure 3. Annual planning calendar for the Regional Monitoring Program.

Annual Steering Committee Calendar

- January
  - Approve Multi-Year Plan
  - Review incomplete projects from the previous year
  - Approve annual report outline
  - Pick date for Annual Meeting
- April
  - Plan for Annual Meeting
  - Provide additional planning guidance to workgroups
- July
  - Multi-year Plan: mid-year check-in, workshop planning
  - Approve special studies recommended by the TRC for the next year and update projects list for SEP funding
  - Plan for Annual Meeting
  - Report on SFEI financial audit
  - Briefly discuss fees for year after next
  - Select annual report theme for next year
- October
  - Multi-Year Planning Workshop
  - Confirm chair(s) and Charter
  - Decision on fees for the year after next
  - Approve workplan and budget for next year
  - Decision on workgroups to be held next year
  - Discuss outcome of the Annual Meeting

Each meeting (except October) includes a Science Program Update from a workgroup or strategy team focus area.

Annual Technical Review Committee Calendar

- March
  - Confirm chair(s)
  - Review special studies to ensure coordination
  - Provide planning guidance to workgroups
- June
  - Recommend special studies for funding
  - Review SEP project list
  - Review S&T target analyte list, CEC tiers
  - Review plans for Annual Meeting and annual report
- September
  - Prepare for Annual Meeting
  - Review Status and Trends Monitoring Design
  - Discuss lab intercomparison studies
- December
  - Review annual report outline for next year
  - Informatics update
  - Present workplan for next year and outcome of Multi-Year Planning Workshop
  - Review intercalibration studies and plans

Each meeting includes feedback on proposed and ongoing studies.

Annual Workgroup Calendar

Workgroups meet annually between April and June to discuss results from prior studies and select proposals to recommend to the TRC and SC for funding the next year.

Multi-Year Calendar: RMP fees are approved in 3-year increments. The most recent approval was for 2023-2025. The dredger fee schedule is reviewed every 3 years. The most recent approval was for 2022-2024. The MOU between SFEI and the Water Board for administering the RMP is amended every two years. The most recent amendment was for 2023-2024.

Current and anticipated management decisions, policies, and actions by the regulatory agencies that manage water quality in San Francisco Bay

Decisions, Policies, and Actions	Timing
BAY WATERSHED PERMITS (NEXT REISSUANCE)	
Municipal Regional Stormwater Permit	2027
Mercury and PCBs Watershed Permit for Municipal and Industrial Wastewater (Implement mercury and PCB TMDLs)	2027
Nutrient Watershed Permit for Municipal Wastewater (Implement Nutrient Management Strategy)	2024
CURRENT HIGH PRIORITY DRIVERS BY TOPIC	
303(d) List and 305(b) Report Current listings and next cycle	March 2023 2026*/2029
Beneficial Reuse of Dredged Sediment Review sediment guidelines+ and testing criteria Evaluate the effectiveness of strategic placement	Ongoing Ongoing
Contaminants of Emerging Concern Updates to CEC Tiered Risk-Based Framework Opportunities to inform regional actions and state and federal regulations	Annual Ongoing
Determination of Wastewater Permit Limits California Toxics Rule	Ongoing
PCBs Review existing TMDL and inform revisions	Complete by 2028
Mercury Review existing TMDL and inform revisions	Complete by 2026
Nutrients Inform the Nutrient Management Strategy	Ongoing
OTHER DRIVERS BY TOPIC	
Beneficial uses Fish exposure (PCBs, Hg, and PFAS) and tribal uses	Ongoing
Current Use Pesticides EPA Registration Review of fipronil and imidacloprid DPR fipronil mitigation measures	Ongoing

Decisions, Policies, and Actions	Timing
OTHER DRIVERS BY TOPIC	
Copper Site specific objectives triggers+	Ongoing
Cyanide Site specific objectives triggers+	Ongoing
Dioxins Review 303(d) listings and establish TMDL development plan or alternative	Ongoing
Dredging Permits Bioaccumulation testing triggers and in-Bay disposal thresholds+	Ongoing
Legacy Pesticides (DDT, Dieldrin, Chlordane) Monitoring recovery (biota)	Ongoing
Sediment Hot Spots Review 303(d) listings and establish TMDL development plan or alternative	2024
POTENTIAL FUTURE DRIVERS	
Effects of reduced wastewater and stormwater inputs to the Bay	TBD
Effects of reverse osmosis concentrate discharge to the Bay	TBD
South Bay standards-related selenium assessment	TBD
Sea level rise adaptation and changes in salinity, pH, temperature, and dissolved oxygen due to climate change	TBD
Trash and Microplastics	2024
Wetland restoration permits and regional monitoring	TBD
Tribal and subsistence use as beneficial uses	TBD

+ Comparisons to triggers updated every 5 years for sediment and every 2 years for water; *Data for 2029 Integrated Report needed by 2026

RMP Outcomes (as of February 2019)

Legislation
- CA Flame Retardants in Consumer Products (2018)
- CA Pharmaceutical Stewardship (2018)
- SF Flame Retardant Ordinance (2017)
- Palo Alto & San Francisco expanded polystyrene ordinances (2015, 2016)
- CA Microbead Ban (2015)
- US Microbead Ban (2015)
- CA Copper in Brake Pads (2010)
- CA PBDE Ban (2003)

NPDES Regional Permits
- *Municipal and industrial wastewater*
  - Mercury and PCBs (2017)
- *Municipal stormwater*
  - MRP 2.0 (2015)
  - MRP 1.0 (2010)

Regulations
- CA Safer Consumer Products Regulations (ongoing)
- CA Fipronil Application (2017)
- CA Flame Retardants in Furniture (2013)
- CA Pyrethroid Application (2012)

TMDLs
- Selenium (2016)
- PCBs (2009)
- Mercury (2008)
- Urban Creeks Diazinon and Pesticide-Related Toxicity (2007)

Water Quality Objectives
- Copper and Nickel (North of Dumbarton) (2010)
- Copper and Nickel (North of Dumbarton) (2002)

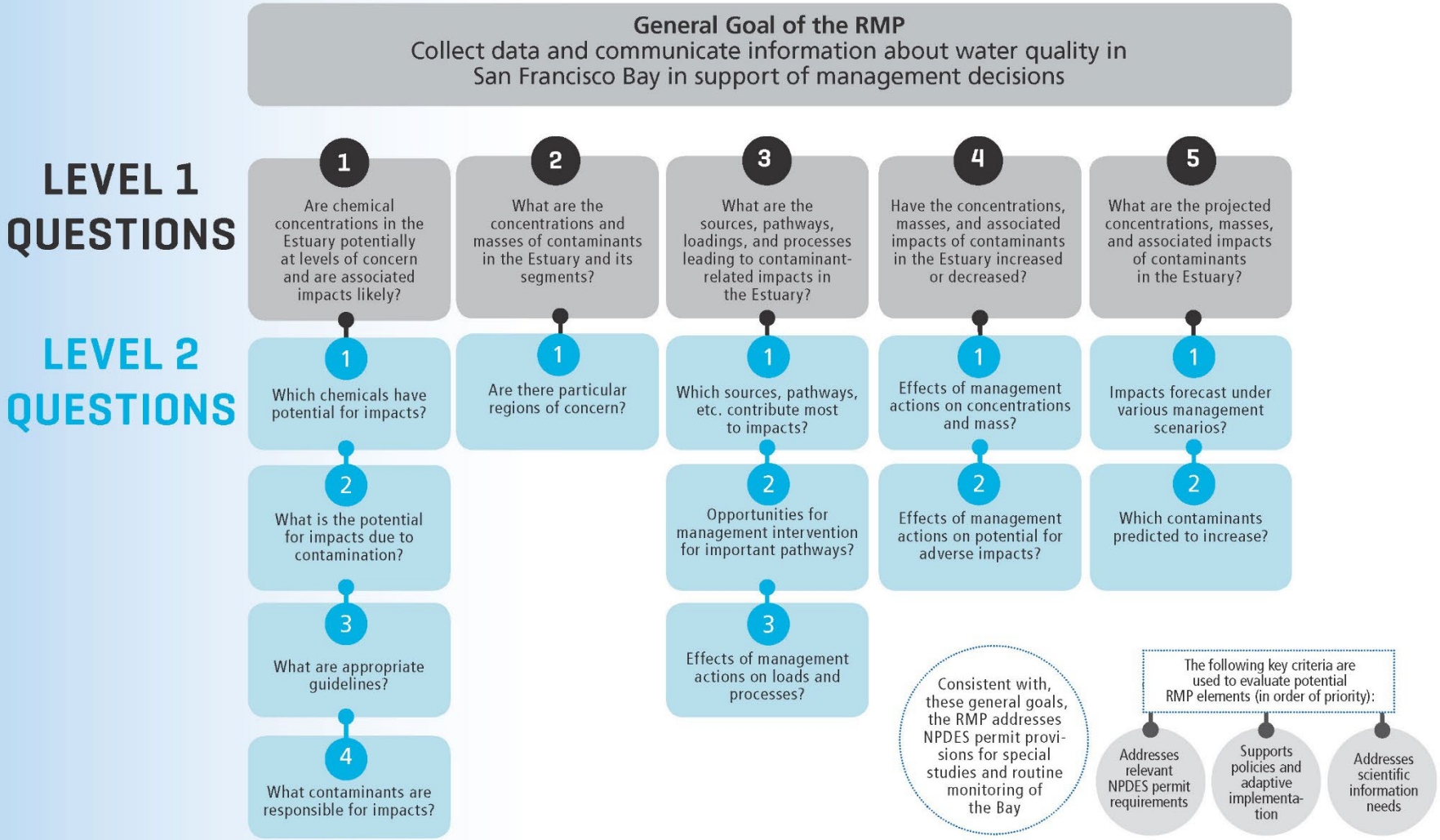
San Francisco Bay 303(d) List Updates
- 2018
- 2010
- 2006
- 2002
- 1998
- 1996

Phase-outs
- US PFOA (2015)
- US Deca-BDE (2013)
- US PFOS (2002)

Fish Advisory
- SF Bay (2011)

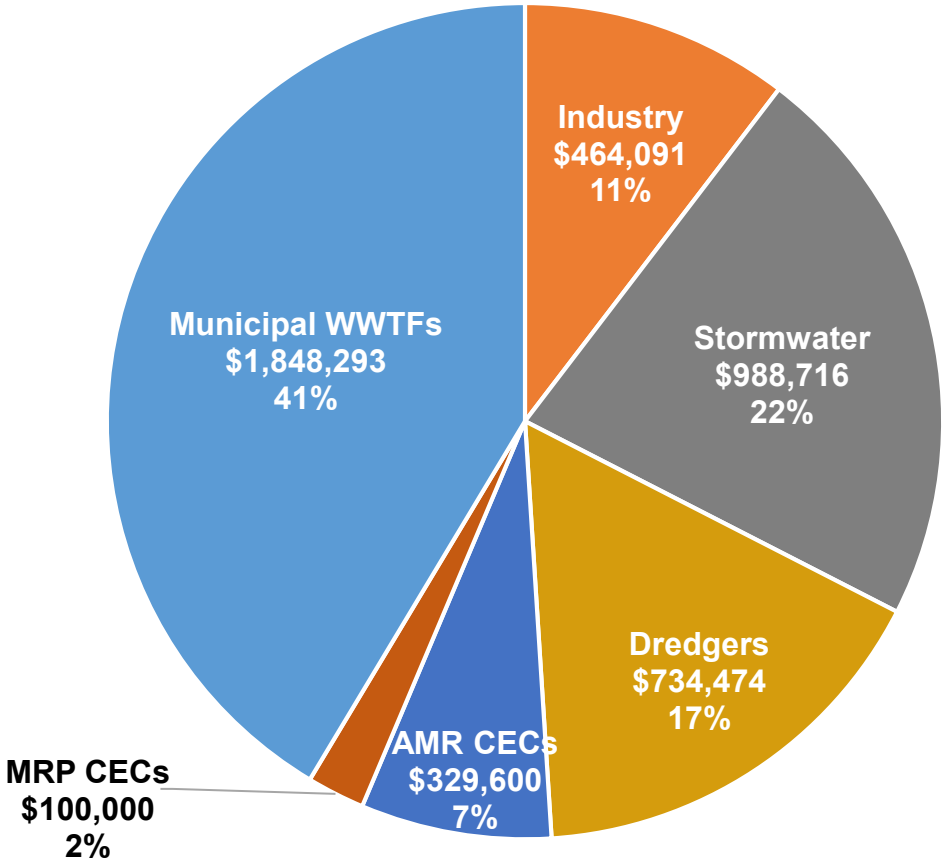
RMP GOAL AND MANAGEMENT QUESTIONS

RMP stakeholders have articulated an overarching goal and a tiered framework of management questions that organize and guide RMP studies. The management questions are closely linked to existing and planned regulations.



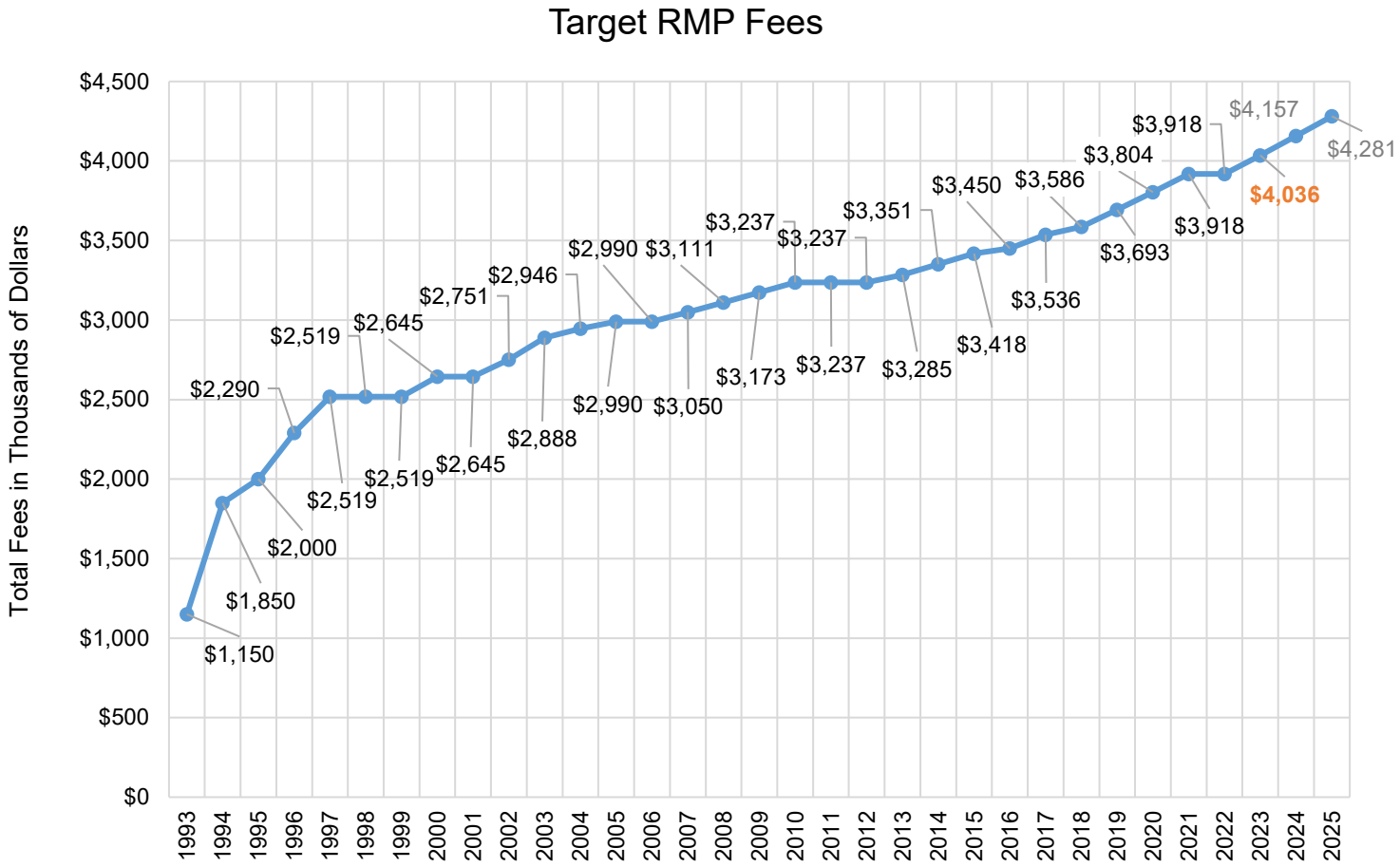
BUDGET: Revenue by Sector 2023

RMP fees are divided among four major discharger groups. Core RMP fees in 2023 are $4.036 million. Municipal wastewater treatment agencies are the largest contributor, followed by stormwater agencies. The contribution from dredgers includes $400,000 from the U.S. Army Corps of Engineers. Refineries constitute the majority of the industrial sector, and also contribute to the Program due to dredging activities at their facilities. In addition to fees, the RMP also receives funding for emerging contaminant-related studies from Alternate Monitoring and Reporting (AMR) Program funds from municipal wastewater agencies ($329.6k) and a supplement from the municipal stormwater dischargers ($100k) as outlined in the Municipal Regional Stormwater Permit.



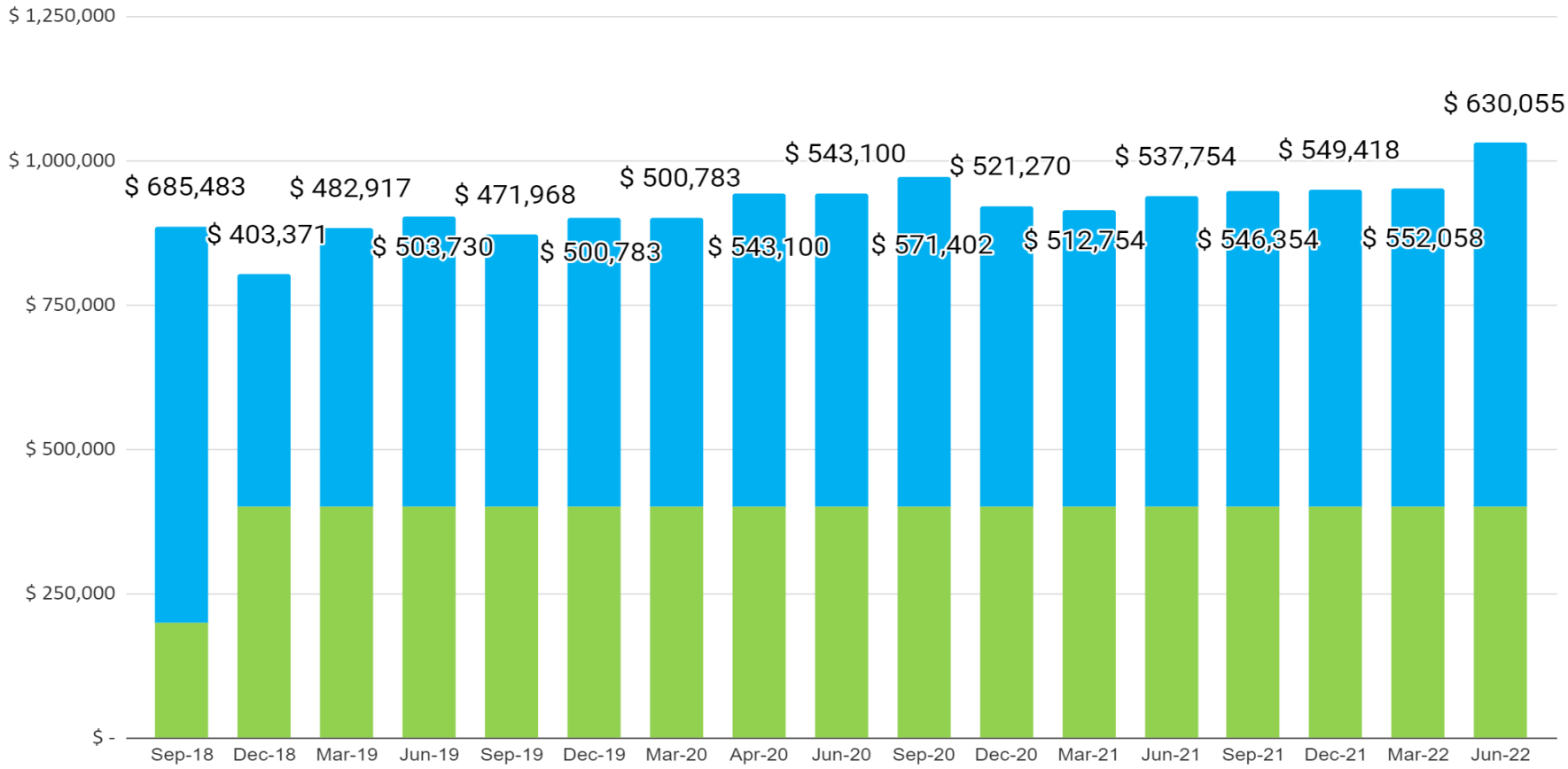
BUDGET: Revenue by Year

Target RMP fees in 2023 are $4.036 million, an increase in 3% from 2022. For 2023-2025, the Steering Committee has approved a 3% increase in fees for each year. Over the past 20 years, RMP fee growth has not kept up with inflation.



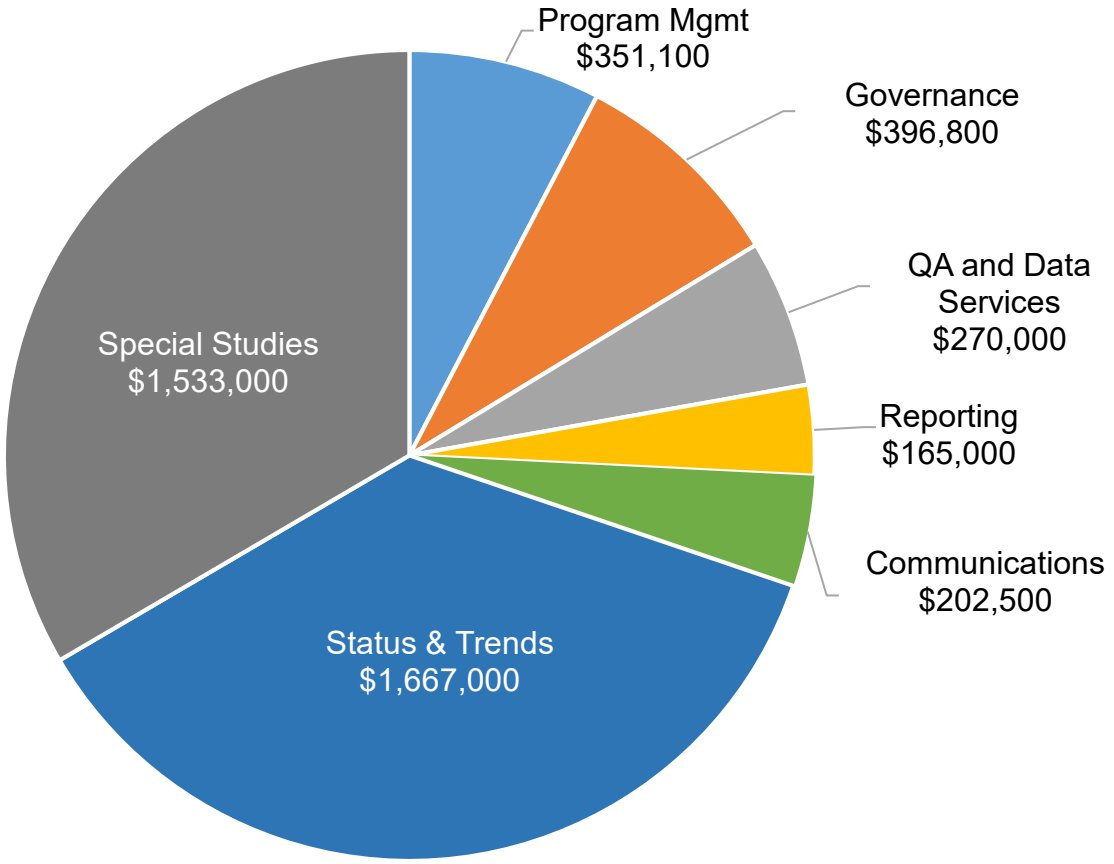
BUDGET: Reserve Funds

The RMP maintains a balance of Undesignated Funds for contingencies. Higher than anticipated revenues and elimination or reduction of lower priority elements sometimes leads to accumulation of funds that can be used for high priority topics at the discretion of the Steering Committee. The Bay RMP Undesignated Funds balance over the past four budget years is shown below. The height of the bar shows the total balance of the Undesignated Funds. The bars are color coded to indicate the RMP policy that $400,000 of the Undesignated Funds should be held as a Reserve. The Steering Committee increased the Reserve amount from $200,000 to $400,000 in 2018 so that the reserve is now approximately 10% of the annual Program budget.



BUDGET: Expenses 2023

In 2023, 75% of the budget is allocated on Status & Trends and Special Studies. Quality assurance and data systems, reporting, and communications are each approximately 5% of the budget. Governance meetings (9%) are critical to ensure that the RMP is addressing stakeholder needs and conducting studies that include peer-review from project planning through report preparation. Finally, 8% of the budget is needed for program management, including fiduciary oversight of contracts and expenditures.



ACTUAL AND FORECAST BUDGETS: Special Studies 2017-2025

RMP actual and planned expenditures on special study topics. Costs for 2016-2023 are based on approved budgets. Costs for 2024 and beyond are estimates for planning based on the most recent input from the Workgroups and Strategy Teams. The funds available for 2024-2025 were estimated based on a 3% RMP revenue increase each year, and subtracting estimated Status and Trends monitoring costs (page 39) and programmatic expenses.

FOCUS AREA	2020	2021	2022	2023	2024	2025
	Budget	*Budget*	*Budget*	*Budget*	*Forecast*	*Forecast*
Emerging Contaminants	$327,900	$338,000	$320,000	$638,000	$657,000	$829,000
Microplastic	$50,000	$61,500	$35,500	$13,000	$116,000	$142,000
Nutrients*	$250,000	$250,000	$250,000	$250,000	$400,000	$400,000
PCBs	$101,000	$131,880	$108,000	$75,000	$90,000	$64,000
Sediment	$180,500	$214,050	$185,000	$267,000	$300,000	$555,000
Selenium‡	$84,000	$0	$0	$0	$0	$0
Sources, Pathways, Loading	$287,000	$265,000	$193,000	$290,000	$492,000	$289,000
SPECIAL STUDIES TOTAL	**$1,280,000**	**$1,260,430**	**$1,091,500**	**$1,533,000**	**$2,055,000**	**$2,279,000**
Predicted RMP Core Budget for Special Studies			$820,699	$1,083,586	$1,188,586	$1,120,907
Predicted AMR Funds			$320,000	$329,600	$339,488	$349,673
Predicted Stormwater CEC Funds				$100,000	$100,000	$100,000
PREDICTED SPECIAL STUDIES BUDGET TOTAL			**$1,140,699**	**$1,513,186**	**$1,628,074**	**$1,570,580**

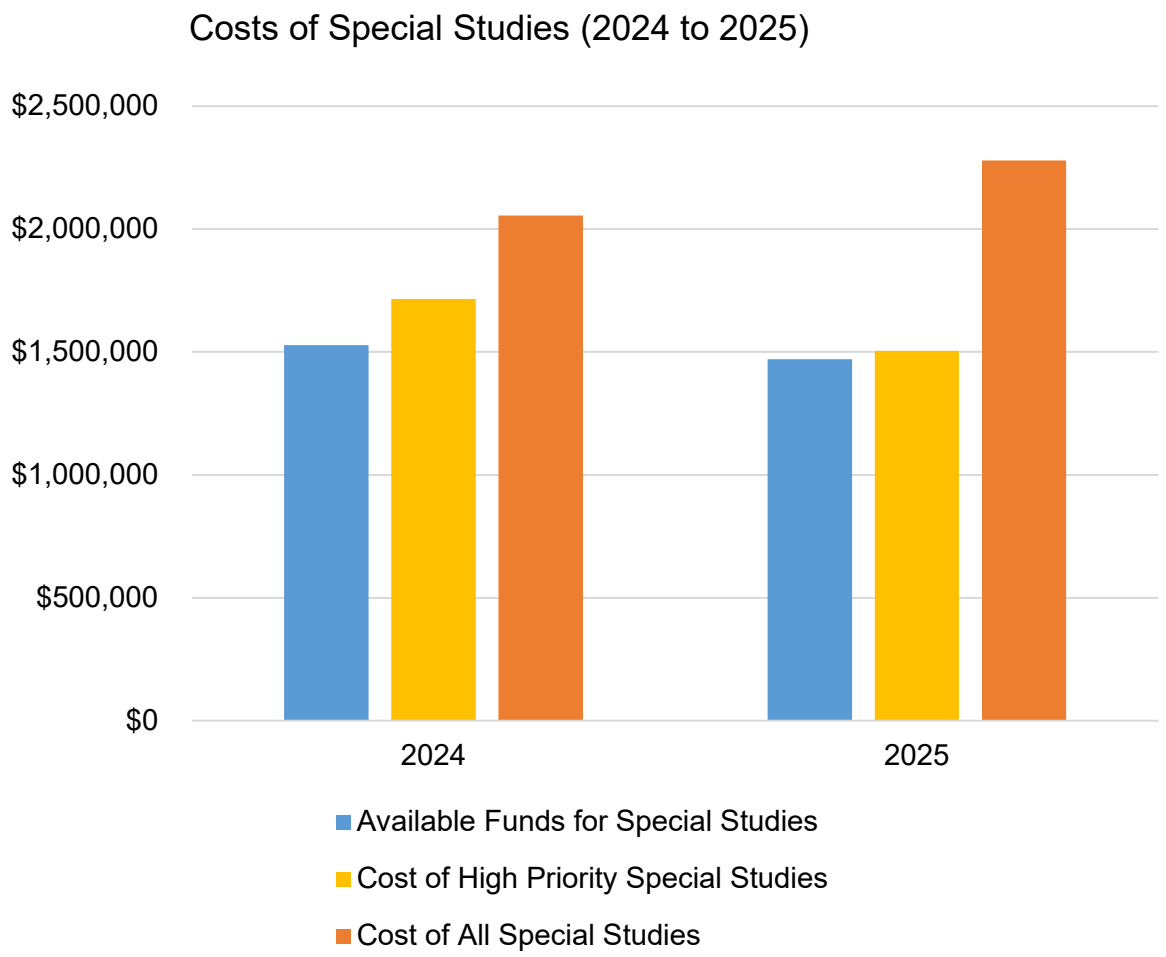
*The estimated RMP budgets on this table do not cover all of the funding needs for the Nutrients Management Strategy. Funding for these strategies is partially provided from other sources.

‡Funding for Selenium studies moved to the Status and Trends Program beginning in 2021.

In 2016, the RMP became eligible to receive penalty funds for Supplemental Environmental Projects. Wastewater agencies also began to provide the RMP with Alternative Monitoring Requirement (AMR) funds for additional emerging contaminants studies. These new funding streams will augment the core RMP budget for special studies. The AMR expired in 2021 but was replaced with a similar permit amendment for CEC monitoring starting in 2022. The MRP issued in 2022 included an opportunity for Municipal Stormwater entities to contribute $100k to the RMP in lieu of individual monitoring for CECs. The SEP funds are not predictable. The AMR and MRP funds have been included in the predicted special studies budget total in the table above because these funds are predictable. AMR funds will increase at the same rate as the core RMP fees.

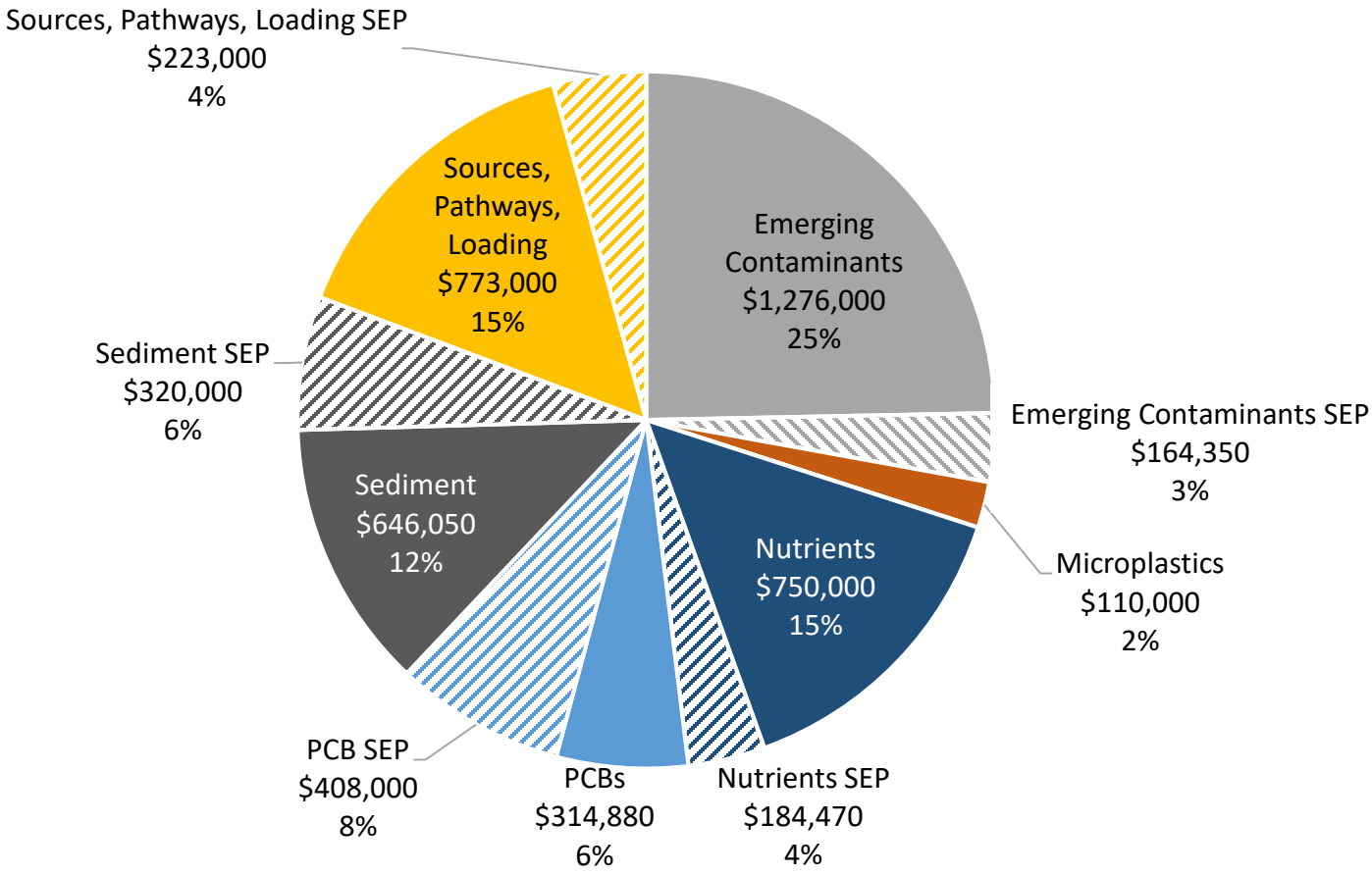
PROJECTED BUDGET: SPECIAL STUDIES 2023 to 2025

Projected funds available for special studies in 2024-2025 (blue), the cost of high priority studies (yellow), and the cost of all special studies based on the multi-year plans for all workgroups (orange). High priority studies for 2025 are estimates because not all workgroups have selected and prioritized studies for those years.



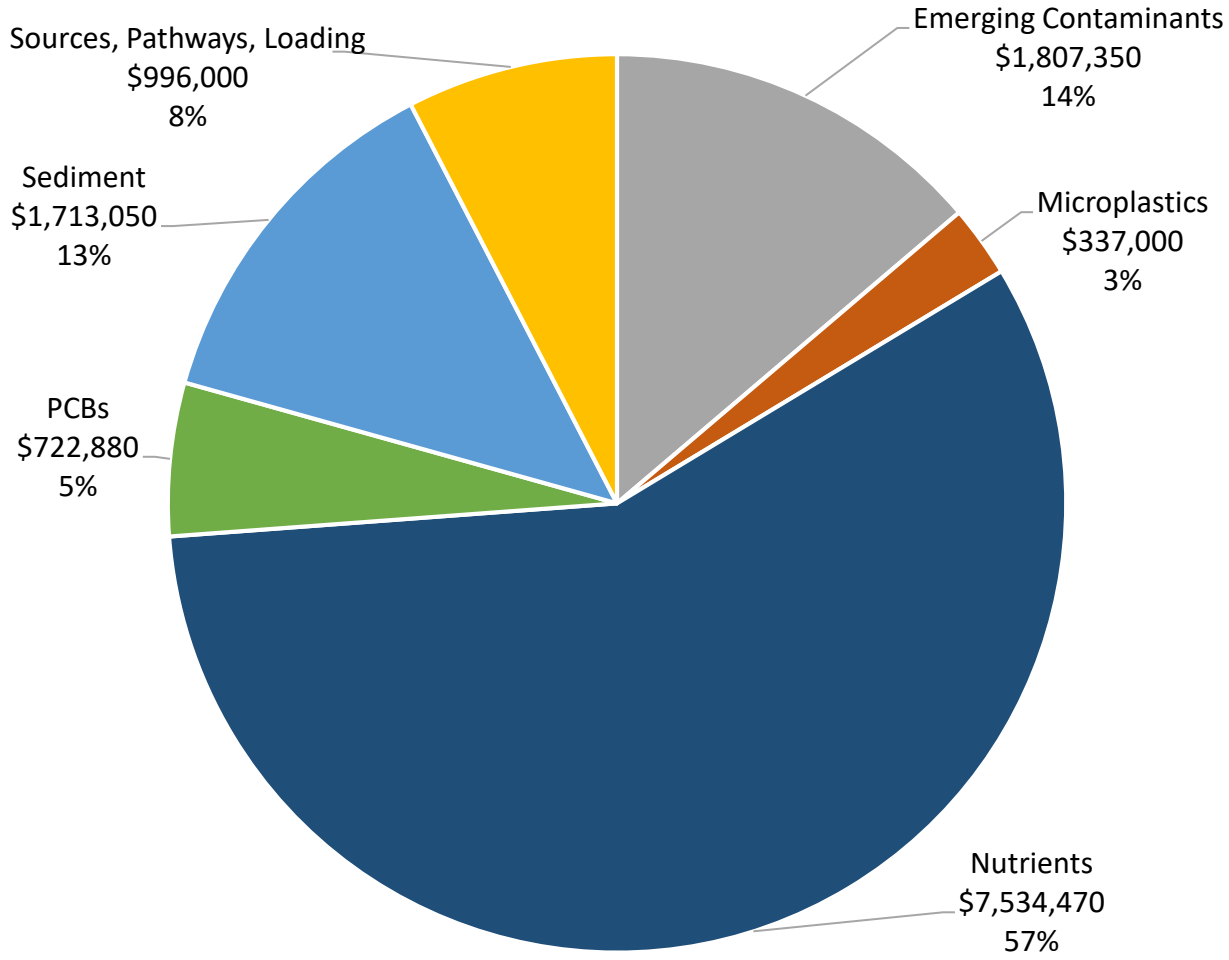
BUDGET: Special Studies and SEP funding 2021-2023

Special Studies (solid pies) and Supplemental Environmental Projects (hashed pies) funded over the past three years. Total funds: $5,169,750



BUDGET: Total Workgroup Funding 2021-2023

Total funding for Special Studies over the past three years, including Supplemental Environmental Projects, Alternative Monitoring Requirements, RMP partner funding, and external funding. Total funding is $13,110,750.



Fishing on the Bay. Photograph by Shira Bezalel.

EMERGING CONTAMINANTS

Relevant Management Policies and Decisions

Regional Action Plans for emerging contaminants

Early management intervention, including green chemistry and pollution prevention

State and federal pesticide regulatory programs

State Water Board CEC Program

DTSC Safer Consumer Products Program

Recent Noteworthy Findings

In 2022, the RMP launched an effort to review and revise the overall CEC Strategy guiding the program. An early outcome of this revision is a proposal to change the tiered risk-based framework for emerging contaminants, increasing the number of tiers to provide greater ability to distinguish relative risks and communicate RMP monitoring priorities. At present, no CECs would fall into the Very High Concern tier outlined in this revised framework. PFAS and organophosphate esters would be listed as High Concern CECs for the Bay. Moderate Concern CECs include alkylphenols and alkylphenol ethoxylates (surfactants), bisphenols (plastic ingredients), the urban-use pesticides fipronil and imidacloprid, and microplastics (a separate focus area, see page 25). The multi-year plan for emerging contaminants on the following pages has been reorganized to reflect the proposed revision to the framework.

The RMP continues a major focus on PFAS, widely used fluorine-rich specialty chemicals that are persistent and of high toxicological concern for humans and wildlife. In 2021, the RMP sport fish report indicated concentrations of PFAS, particularly in South Bay fish, exceed thresholds that have been established by other states for the development of consumption advisories. In 2022, RMP stakeholders and scientists participated in a forum with local community groups and tribes to build consensus on next steps to protect fishing communities. Meanwhile, Bay water samples collected in summer 2021 revealed PFAS contamination remains present, with higher levels found in South Bay and Lower South Bay.

A major RMP effort to screen Bay Area stormwater for CECs is drawing to a close. The fourth and final year of monitoring is now complete, and data analysis and interpretation is underway. In parallel, scientists and stakeholders are developing the RMP strategy for continued work on CECs in stormwater, and designing and testing new remote sampling equipment.

Priority Questions for the Next Five Years

1. Which CECs have the potential to adversely impact beneficial uses in San Francisco?
2. What are the sources, pathways and loadings leading to the presence of individual CECs or groups of CECs in the Bay?
3. What are the physical, chemical, and biological processes that may affect the transport and fate of individual CECs or groups of CECs in the Bay?
4. Have the concentrations of individual CECs or groups of CECs increased or decreased in the Bay?
5. Are the concentrations of individual CECs or groups of CECs predicted to increase or decrease in the future?
6. What are the effects of management actions?

MULTI-YEAR PLAN FOR EMERGING CONTAMINANTS

Special studies and monitoring in the RMP from 2019 to 2026. Numbers indicate budget allocations in $1000s. Budgets in parentheses represent funding or in-kind services from external sources (e.g., SEP funds). Budgets that are starred represent funding that has been allocated within other workgroups. Bold boxes indicate multi-year studies. Items shaded in yellow are considered high priority for 2024 funding and beyond.

Element	Study	Funder	Questions addressed	2019	2020	2021	2022	2023	2024	2025	2026
Strategy	CEC Strategy[1] (no proposal needed after 2020)	RMP	1-6	70	75	60	90	95	62	64	66
	Tires Strategy	RMP	1-6					10	10	10	10
	Stormwater Monitoring Strategy	RMP	1,2				50	55			
STORMWATER MONITORING AND MODELING											
Stormwater	Strategy-driven Stormwater CECs Monitoring and Modeling (multiple contaminant classes)	RMP WQIF‡	1,2					250 (100)	200 (100)	200 (100)	200
HIGH CONCERN CECs											
PFAS	PFAS: Synthesis and Strategy	RMP	1-6						85		
	Stormwater PFAS[2]	RMP	1,2	33	40	29.6	20				
	PFAS in Ambient Bay Water	RMP	1,4,6			50					
	PFAS in Influent, Effluent, Biosolids; Study TBD, est. value	BACWA	1,2,4,6			(135)	(290)				
	PFAS in Archived Sport Fish	RMP Water Brd	1,4				12.5 (20)	42			
	North Bay Margin Sediment PFAS[3]	SEP	1,2,4,6					(53)			
	Marine Mammals (PFAS and Nonpolar NTA)[4]	RMP S&T	1,4,6					57.75	63.25		
	Bay Water TOP Assay	RMP	1						20	40	40
	PFAS Air Monitoring (~$50-150k)	SEP proposal	1,2								
	Agricultural (Biosolids) PFAS in Water & Sediment of North Bay Margins (~$100-200k)	SEP proposal	1,2,3								

Element	Study	Funder	Questions addressed	2019	2020	2021	2022	2023	2024	2025	2026
	RMP Status and Trends[5]	RMP S&T	1,4	F 9*			E, wet 15.5*	W, S, wet 55.5*	E, F, wet ~35*	W 13*	wet, seals ~25*
Organo-phosphate Esters	Organophosphate Ester Flame Retardants in Ambient Bay Water	RMP ECCC	1,4								
	Stormwater Organophosphate Ester Flame Retardants[2]	RMP	1,2	33	40	29.6	20				
	OPE Wastewater Monitoring	RMP	1,2,4,6						40		
	OPE Air Monitoring (~$50-150k)	SEP proposal	1,2,3,6								
	OPEs: Synthesis and Strategy	RMP	1-6								75
	RMP Status and Trends[5]	RMP S&T	1,4			W 17*	wet 11*	W, wet 28*	wet 11*	W 17*	wet 11*
MODERATE CONCERN CECs											
Alkylphenols & Alkylphenol Ethoxylates	Stormwater Ethoxylated Surfactants[2]	RMP	1,2	33	40	29.6	20				
	Ethoxylated Surfactants in Water, Margin Sediment, Wastewater	RMP	1,2,4	123							
	Followup Study	RMP	1,2,4				30	30			
Bisphenols	Bisphenols in Stormwater[2]	RMP	1,2		21	29.6	20				
	Bisphenols in Wastewater, Sediment	RMP	1,2		72						
	Bisphenols in Biota	RMP	1						80		
	RMP Status and Trends[5]	RMP S&T	1,4			W 13*	wet 8.5*	W, S, wet 47.5*	wet 8.5*	W 13*	wet 8.5*
LOW or POSSIBLE CONCERN CECs											
PBDEs	RMP Status and Trends[5]	RMP S&T	1,3,4	F 24*			E 11.5*	S 20.5*	F 24*		
Plastic Additives	Phthalates and Replacements in Water, Archived Sediment	RMP	1,4							100	
Personal Care & Cleaning	Sunscreens in Wastewater	MMP	1,2		(36.5)						
	QACs in Wastewater	MMP NSF	1,2,4			(58.2) (20)					

Element	Study	Funder	Questions addressed	2019	2020	2021	2022	2023	2024	2025	2026
	QACs & New Concerns in Bay Water, Wastewater[6]	RMP								40	
Pesticides	DPR Priorities in Water & Sediment[5]	RMP USGS	1,2,3								
	Ag Pesticides in Water & Sediment of North Bay Margins (~$100k)	SEP proposal	1,2								
	Antimicrobials in Bay Water, Wastewater[6]	RMP	1,2							30	
Brominated Azo Dyes	Archived Sediment (~$60k)	SEP proposal	1								
Building Materials	Isothiazolinone Biocides and Other Contaminants in Stormwater (~$50k)	U Iowa SEP Proposal	1,2	(2)							
	New concerns	RMP	1								50
Chlorinated Paraffins	Chlorinated Paraffins (medium-long) in Sediment[3]	SEP	1					(53)			
	Chlorinated Paraffins in Ambient Bay and Pathways	RMP	1								120
Vehicles, Roadways (studies also listed in Tires MYP)	Tire, Roadway Contaminants Follow-up from NTA, Stormwater[2]	RMP	1,2	33	40	29.6	20				
	Tire Contaminants Wet Season Water Screen	RMP	1,2				50	40	50		50
	Newly Identified Tire Contaminants (Bay or Stormwater)	RMP	1,2							50	50
	Total Tire Rubber/Tire Chemical Indicators (Stormwater, Bay Wet Season Water, Sediment)	RMP	1,2							25	75
NONTARGETED & OTHER STUDIES											
NTA (including followup targeted studies	Marine Mammals (PFAS and Nonpolar NTA)[4]	RMP S&T	1,4,6					57.75	63.25		
	NTA Data Mining of Water & Sediment Findings	RMP	1,2					45			
	Non-targeted Analysis of Bay Fish	RMP	1						50	50	

Element	Study	Funder	Questions addressed	2019	2020	2021	2022	2023	2024	2025	2026
based on NTA findings)	Follow-up Targeted Study (data mining results)	RMP	1							50	
	Microplastic Additives NTA Study[7]	RMP	1							100	
Other	Toxicology	RMP	1	15		60			60	60	60
RELEVANT STUDIES IN OTHER WORKGROUPS											
Modeling (SPLWG)	Integrated Monitoring and Modeling Strategy - CEC Conceptual Model	RMP	1,2,4			50*					
Modeling (SPLWG)	CEC Stormwater Load Modeling Exploration	RMP	2				25*				
Strategy (MPWG)	Tires Strategy, Multi-Year Plan	RMP	1,2,3,6				25.5*				
RMP-funded Special Studies Subtotal - ECWG				**325**	**328**	**318**	**332.5**	**567**	**657**	**819**	**796**
High Priority Special Studies for Future RMP Funding									**517**	**479**	**516**
RMP Status and Trends Analytical Costs for CECs				**33**	**0**	**30**	**46.5**	**267**	**205**	**43**	**44.5**
RMP-funded Special Studies Subtotal – Other Workgroups				**0**	**0**	**50**	**50.5**	**0**			
MMP & Supplemental Environmental Projects Subtotal				**0**	**36.5**	**58.2**	**0**	**106**			
Pro-Bono & Externally Funded Studies Subtotal				**2**	**0**	**155**	**310**	**100‡**	**100‡**	**100‡**	
OVERALL TOTAL				**327**	**364.5**	**531.2**	**642.5**	**773**	**757**	**919**	**796**

1 – The CEC Strategy funds preparation of RMP CEC Strategy Revisions, Updates, and Memos; it also funds literature review, scientific conference attendance, and responses to information requests from RMP stakeholders. A Revision to the CEC Strategy is planned for 2022, resulting in a higher funding request than in the prior years. After 2020, a Special Study proposal is not required for CEC Strategy funding.
2 – The multi-year (2019-2022) stormwater study includes five groups of analytes: PFAS, ethoxylated surfactants, organophosphate esters, bisphenols (added year 2), and targeted stormwater analytes identified via non-targeted analysis. The total projected cost ($586k) is spread across five groups and four years.
3 – A SEP received in 2022 will fund sediment analysis of PFAS and chlorinated paraffins; the $106k budget is split between these classes.
4 – The non-targeted analysis of marine mammal tissues includes investigations of PFAS (targeted and suspect screening) and nonpolar compounds; budgets are split between PFAS and NTA categories.
5 – When a CEC may be included in the the RMP Status and Trends monitoring, there is a code in the cell denoting the matrix for which monitoring is proposed: W = water; S = sediment; B = bivalve; E = eggs; F = fish. Approximate analytical costs are provided to indicate CECs resources provided by Status and Trends monitoring. A review of the Status and Trends design has resulted in expected modifications over future years, with scheduling for some activities uncertain at this time. New codes include “wet,” or pilot wet season water monitoring, and “seals,” indicating potential inclusion of this matrix in future years.
6 – A special study suggested for 2025 could analyze cleaning product ingredients including QACs and other antimicrobials; costs are split among these groups.
7 – A suggested special study that uses non-targeted analysis to identify additives in microplastics is listed as potentially co-funded via both ECWG and MPWG.

‡ The RMP has submitted a proposal to the San Francisco Bay Water Quality Improvement Fund (WQIF) that would support stormwater CECs monitoring at a level of ~$100k per year for three years (2023-2025). This MYP lists these potential funds, and will be updated to reflect the final funding decision relating to this proposal.

TIRES

This short-term multi-year plan (MYP) responds to recent data revealing the magnitude of tire chemical/particle emissions and their toxicity to aquatic organisms. The plan synthesizes the tire-related studies in the ECWG and MPWG multi-year plans; we do not anticipate the need to highlight these studies in a tire-specific plan after 2027. Studies are synthesized here and also included in the MYPs of relevant workgroups.

Relevant Management Policies and Decisions

Department of Toxic Substances Control's Safer Consumer Products Program (tire chemicals, microplastics)

California's Statewide Microplastics Strategy adopted by the Ocean Protection Council (OPC) calls for development of a tires-specific pollution prevention strategy by 2023

Department of Resources Recycling and Recovery Waste Tire Recycling Management Program implementation

State and Regional Water Board decisions on addressing tire-related chemicals or microplastics under the Clean Water Act

Recent Noteworthy Findings

Tires may be the biggest source of microplastic pollution globally. In the US, vehicles release 3-5.5 kg/capita of tire wear particles annually. When it rains, stormwater runoff carries micro and nano-sized tire particles—and the toxic chemicals associated with them—from outdoor surfaces to creeks and the Bay.

Tire particles contain hundreds of chemicals, some of which are known or suspected to be toxic to aquatic organisms or to have toxic transformation products. Examples include N-(1,3-dimethylbutyl)-N'-phenyl-p-phenylenediamine (6PPD), zinc, benzothiazoles, bisphenols, 1,3-diphenylguanidine, polyaromatic hydrocarbons (PAHs), phthalates, hexa(methoxymethyl)melamine, glycols and glycol ethers, and alkylphenol ethoxylates.

RMP monitoring has detected tire particles and tire-related chemicals in Bay Area stormwater and in San Francisco Bay during the wet season. Analysis of these monitoring data and additional Bay wet season monitoring of tire-related chemicals is in progress.

The RMP collaborated in a recent study that found a highly toxic chemical (6PPD-quinone) derived from vehicle tires in Bay Area stormwater at levels that are lethal to coho salmon. New data indicate that steelhead and Chinook, salmon species still migrating through the Bay to surrounding watersheds, experience the same symptoms as coho and some die after laboratory exposure to highway runoff.

Studies exposing standard estuarine and freshwater test organisms (*Menidia beryllina, Americamysis bahia, Daphnia magna*, and others) to tire microparticles, tire nanoparticles, and tire leachate revealed lethal and sublethal effects (e.g., on reproduction, growth, and behavior) at concentrations believed to be environmentally relevant; however, Bay concentrations of tire particles are currently unknown.

At present, risks from tire-related chemicals are largely unknown because tire formulations are proprietary. Furthermore, transformation products and their toxicity are not fully understood.

The OPC and the RMP funded the development of a stormwater conceptual model report that identified scientific information needs and enumerated a broad spectrum of potential measures to address tire pollution. A second RMP report in progress will include Bay Area-specific estimates of tire emissions and tire market information gleaned from a pro-bono UC Berkeley project. This information can be used to focus study designs by non-RMP scientists whose work can inform the RMP.

Priority question for the next five years

Proposed: Do tire particles or chemicals have the potential to adversely impact beneficial uses in San Francisco Bay?

Recommended RMP Special Studies

Conduct additional measurements of known tire contaminants in the Bay. Follow up on Bay wet season detections to obtain additional data to better characterize Bay wet weather concentrations, leveraging the Bay wet season Status and Trends pilot sampling planned in water years 2023 and 2024 and possibly 2026.

Tires Strategy. Participate in scientific meetings to encourage scientific research to address RMP information needs, such as identifying tire chemicals and toxicity. Obtain and analyze new, relevant information about tire particles, chemicals, and their toxicity to support RMP study designs and risk evaluation. Provide scientific information to RMP stakeholders. At present, addressing the high volume of scientific activity in this field and extensive requests for SFEI to interpret and share information with RMP stakeholders cannot be accomplished within routine RMP budgets. Starting in 2028, we anticipate this work can be accommodated within routine RMP budgets.

Measure total tire rubber and tire chemical indicators in stormwater, Bay water, and sediment. Measurements of tire rubber and chemical indicators (various tire additives) provide a means of calculating total tire material in water and sediment. These data would make it possible to determine the relevance of the growing body of tire particle toxicity data indicating potential for adverse effects to diverse aquatic organisms at concentrations that could potentially occur in the Bay ecosystem. Sample collection would leverage RMP Bay water, stormwater, and sediment monitoring activities, minimizing costs. Data on tire chemical indicators could be used for benchmarking purposes (comparison to other studies) and to explore more cost-effective options for future monitoring related to tires. The recommended structure of this multi-year study includes an initial pilot testing year to evaluate sample collection methods, followed by a more significant sample collection phase.

Conduct measurements of additional, newly identified tire contaminants that might adversely impact beneficial uses in San Francisco Bay. In the future, additional tire-related chemicals that have the potential to harm aquatic ecosystems are likely to be identified through ongoing tire chemical characterization and toxicity evaluation by non-RMP scientists. Tires science tracking (under the tires strategy) would identify potential chemicals for monitoring; specific information on proposed study design, including the rationale for selecting analytes of interest, would be reviewed by the RMP via the annual ECWG special study proposal prioritization process. At present, no other surface water monitoring of tire contaminants is known in California. Sample collection would leverage RMP Bay water and stormwater monitoring activities, minimizing costs. If no such contaminants are identified, the study would not be proposed for implementation.

The focus for the next few years will be on the presence of and potential for tire-related particles and chemicals to affect the San Francisco Bay ecosystem, recognizing the unique pathways for transport and release of these chemicals into the ecosystem due to their microplastic particle source.

MULTI-YEAR PLAN FOR SHORT-TERM EFFORT ON TIRE-RELATED CHEMICALS AND PARTICLES

Tire-related studies in the RMP from 2017 to 2027. Numbers indicate budget allocations in $1000s. Budgets in parentheses represent funding or in-kind services from external partners. Budgets that are starred include items beyond tires. Items shaded in yellow are considered high priority for 2024 funding and beyond. Bold boxes indicate multi-year studies. *Studies are synthesized in this short-term MYP and are also included in the MYPs of relevant workgroups (ECWG, MPWG).*

Element	Study	Funder	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
Strategy	Tires strategy	RMP ECWG							10	10	10	10	10
Monitoring	Tire contaminants in Bay wet season	RMP ECWG						50	40	50		50	
	Total tire rubber/tire chemical indicators (stormwater, Bay wet season, sediment)	RMP ECWG									25	75	50
	Tire and road contaminants (stormwater)	RMP ECWG			33	40	29.6	20					
	Newly identified tire contaminants (Bay or stormwater)	RMP ECWG									50	50	
	RMP tires strategy	RMP MPWG						25.5					
	Stormwater conceptual model - all elements	RMP MPWG OPC				30* (30*)	40* (90*)						
	Microplastics regional study - all elements	RMP MPWG Moore/External	75* (518*)	(210*)	(340*)								
	Tire market synthesis to inform science (pro bono)	BEACN (UCB)					(20)						
	Green stormwater infrastructure: Evaluating the efficacy of rain gardens	EPA/External	(10*)					(62*)	(62*)	(62*)			
RMP-funded Special Studies Subtotal – Tires					**33**	**70**	**69.6**	**95.5**	**50**	**60**	**85**	**185**	**60**
High Priority Special Studies for RMP Funding									**50**	**60**	**85**	**135**	**60**
Pro-Bono & Externally Funded Studies Subtotal			**528**	**210**	**340**	**30**	**110**	**62**	**62**	**62**			
OVERALL TOTAL			**603**	**210**	**373**	**100**	**179.6**	**157.5**	**112**	**122**	**85**	**185**	**60**

*Includes items beyond tires

MICROPLASTIC

Relevant Management Policies and Decisions

State-wide microplastics strategy and state-wide drinking water monitoring

Plastic Pollution Prevention and Packaging Producer Responsibility Act (SB 54, Allen, 2022)

State and regional bans and other management actions on single-use plastics, including plastic bags, foam packaging materials, plastic straws

DTSC Safer Consumers Products Program decisions on regulation of chemicals in tires, food packaging, building materials

Federal policy on microplastics and microfiber pollution

State and Federal bans on microbeads

State-wide trash requirements

Municipal pollution prevention strategies including green stormwater infrastructure

Recent Noteworthy Findings

Plastics are among the most ubiquitous materials used in modern society. Microplastics, pieces of plastic under 5 mm in size, have been identified in virtually every environment on Earth. Microplastics are often derived from larger plastic items, such as tiny tire wear particles shed while driving, fibers shed from textiles during washing and drying, and fragments from litter. Tire particles may be the biggest global source of microplastics. Due to our car culture, scientists estimate that the US has the highest tire particle emissions in the world—7 to 12 pounds per person every year.

The San Francisco Bay Microplastics Project was completed in 2019, and found microplastics to be ubiquitous in Bay water, sediment, bivalves, and prey fish. This study quantified for the first time microplastics in urban stormwater runoff, and made the breakthrough discovery that concentrations in urban runoff were significantly higher than wastewater effluent. The vast majority of particles observed in urban stormwater runoff were suspected to be tire wear particles and fibers.

Additionally in 2020, a collaboration with University of Washington identified various tire ingredients present in Bay stormwater runoff, including 6PPD-quinone at concentrations that are lethal to a salmon species that was historically present in the Bay (coho). More recent data indicate that steelhead, a salmon species still migrating through the Bay to surrounding watersheds, are also sensitive to this chemical.

While fibers were the second most common class of microplastics observed in stormwater, there is minimal understanding of the major sources of fibers observed in urban stormwater.

Air transport of microplastics is a key data gap in our understanding of microplastic sources and pathways. Air transport is particularly important for tire wear particles and fibers because both types of particles have characteristics that make them easily suspended in the air and have the potential to be transported long distances. Other important remaining data gaps include exposure of Bay aquatic organisms and risk for adverse impacts, and the effects of current and future solutions implemented to reduce microplastic pollution.

Priority Questions for the Next Five Years

1. How much microplastic pollution is in the Bay?
2. What are the health risks?
3. What are the sources, pathways, loadings, and processes leading to microplastic pollution in the Bay?
4. Have the concentrations of microplastic in the Bay increased or decreased?
5. What management actions could be effective in reducing microplastic pollution?

MULTI-YEAR PLAN FOR MICROPLASTICS

Microplastic studies and monitoring in the RMP from 2020 to 2025. Numbers indicate budget allocations in $1000s. Budgets in parentheses represent funding or in-kind services from external sources (e.g., SEP funds). Budgets that are starred represent funding that has been allocated within other workgroups. Bold boxes indicate multi-year studies. Items shaded in yellow are considered high priority for 2024 funding and beyond.

Element	Study	Funder	Questions Addressed	2020	2021	2022	2023	2024	2025
Strategy	Microplastic Strategy	RMP Patagonia/OPC	1,2,3,4,5	20 (30)	10	10	40 (250)‡	16	17
	Tires Strategy (ECWG)	RMP	1,2,3			25.5	10*	10*	10*
Monitoring biota	Bivalves	RMP	1,2						
	Fish	RMP							
	Assessing Information on Ecological Impacts	RMP NSF/CCCSD/External		(50)	18 (7.5+50)				
Monitoring water and sediment	Open Bay and Margins Sediment	RMP NOAA	1,2,3						25 (50)‡
	Surface Water: Bay and Sanctuaries								
	Limited particle size distribution analysis to refine water measurements	SEP						(25)	
	Sediment core (archive, pro bono analysis)	RMP (U. Rovira I Virgili)			3.5		(10)		
Characterizing sources, pathways, loadings, processes	Wastewater	SCCWRP	1,3,5		(26)				
	Stormwater (method evaluation and monitoring) (SPLWG)	RMP NOAA						25 (200)‡	25 (200)‡
	Stormwater Conceptual Model	RMP OPC		30 (30)	40 (90)				
	Investigate sources and pathways to inform management (e.g., air monitoring)	RMP Patagonia/OPC					(25)	75 (100)	75 (75)
	Tire market synthesis to inform science (pro bono)	UC Berkeley				(20)			
	Green stormwater infrastructure: Evaluating the efficacy of rain gardens	EPA/External				(62)	(62)	(62)	
RMP-funded Special Studies Subtotal – MPWG				**50**	**71.5**	**35.5**	**40**	**116**	**142**
High Priority Special Studies for Future RMP Funding								**41**	**42**
RMP-funded Special Studies Subtotal – Other Workgroups							**10**	**10**	**10**
Externally-funded Special Studies Subtotal				**110**	**173.5**	**82**	**347**	**387**	**325**
OVERALL TOTAL				**160**	**245**	**117.5**	**387**	**503**	**467**

‡ The RMP has submitted proposals for these projects. This MYP lists these potential funds, and will be updated to reflect the final funding decision relating to this proposal.

NUTRIENTS

Relevant Management Policies and Decisions

Developing nutrient numeric endpoints and assessment framework

Evaluating need for revised objectives for dissolved oxygen and other parameters

Assessing water quality impairment status

Implementing NPDES permits for wastewater and stormwater

Recent Noteworthy Findings

High frequency sensors are providing continuous data at nine sites in South Bay and Lower South Bay. These data show that elevated phytoplankton biomass and low dissolved oxygen are frequently observed in Lower South Bay margin habitats and suggest that water from the salt ponds introduces high phytoplankton biomass into Lower South Bay sloughs and increases the potential for low dissolved oxygen events.

Unprecedented fog and smoke coverage from wildfires in 2020 led to the lowest dissolved oxygen concentrations ever observed in Lower South Bay. The absence of light resulted in a shift in the metabolic balance of the system, causing oxygen concentrations to plummet, putting fish and other biota at risk.

Progress continues on model simulations of nutrient transport, phytoplankton blooms, oxygen cycling, biogeochemical processes, and quantifying uncertainty in models.

Priority Questions for the Next Five Years

1. What conditions in different Bay habitats would indicate that beneficial uses are being protected versus experiencing nutrient-related impairment?

2. In which subembayments or habitats are beneficial uses being supported? Which subembayments or habitats are experiencing nutrient-related impairment?

3. To what extent is nutrient over-enrichment, versus other factors, responsible for current impairments?

4. What management actions would be required to mitigate such impairments and protect beneficial uses?

5. Under what future scenarios could nutrient-related impairments occur and which of these scenarios warrant pre-emptive management actions?

6. What management actions would be required to protect beneficial uses under those scenarios?

7. What nutrient sources contribute to elevated nutrient concentrations in subembayments or habitats that are currently impaired, or would be impaired in the future by nutrients?

8. When nutrients exit the Bay through the Golden Gate, where are they transported and how do they influence water quality in coastal areas?

9. What specific management actions, including load reductions, are needed to mitigate or prevent current or future impairment?

The Nutrient Management Strategy (NMS) is a major collaborative regional science program. The RMP funds monitoring and special studies that are complementary to the studies funded by the NMS.

MULTI-YEAR PLAN FOR NUTRIENTS

Special studies and monitoring in the RMP from 2020 to 2025. Numbers indicate budget allocations in $1000s. Budgets in parentheses represent funding or in-kind services from external sources (e.g., SEP funds). Budgets that are starred represent funding that has been allocated within other workgroups. Bold boxes indicate multi-year studies. Items shaded in yellow are considered high priority for 2024 funding and beyond.

Element	Study	Funder	Collaborations with other WGs	Questions Addressed	2020	2021	2022	2023	2024	2025
Strategy	Program coordination	RMP		1-5						
Monitoring	Moored sensors	RMP		1	250	250	250	250	400	400
	HF mapping on the shoal	SEP		1,3			(185)			
	Water quality in the Bay	RMP		1	250	250	258	265	274	283
Modeling	Nutrient Modeling	SEP	PCBWG	4,5				(408)*		
RMP-funded Special Studies Subtotal					**250**	**250**	**250**	**250**	**400**	**400**
High Priority Special Studies for RMP Funding									**400**	**400**
RMP Status and Trends for Nutrients					**250**	**250**	**258**	**265**	**274**	**283**
RMP-funded Special Studies Subtotal – Other Workgroups								**408**		
RMP Supplemental Environmental Projects Subtotal							**185**			
Pro-Bono & Externally-funded Special Studies Subtotal[1]					**2200**	**2200**	**2200**	**2200**	**2200**	**2200**
OVERALL TOTAL					**2450**	**2450**	**2635**	**2450**	**2600**	**2600**

[1] Funding provided by BACWA, CCCSD, DSP, Regional San, City of Palo Alto, City of Sunnyvale, State Water Resources Control Board, and DWR-EMP for a range of studies that support the Nutrient Management Strategy. The descriptions of these projects are not included here for simplicity. More details about the projects being funded by the Nutrient Management Strategy can be found here: http://sfbaynutrients.sfei.org/books/nutrient-strategy-goals-and-work-elements

PCBs

Relevant Management Policies and Decisions

PCBs TMDL – support for appropriate changes to the TMDL

NPDES Municipal Regional Stormwater Permit and wastewater permit requirements

Focusing management actions and/or locations for reducing PCB impairment (upland)

Determining cleanup priorities (in-Bay)

Recent Noteworthy Findings

In 2019, shiner surfperch had a Bay-wide average PCB concentration 18 times higher than the TMDL target. These concentrations have resulted in an advisory from the Office of Environmental Health Hazard Assessment (OEHHA) recommending no consumption for all surfperch in the Bay. PCB concentrations in shiner surfperch and white croaker show limited signs of decline.

Urban stormwater is the pathway carrying the largest PCB loads to the Bay and has the highest load reduction goals. Concentrations of PCBs and mercury on suspended sediment particles from a wide range of watersheds have been measured as an index of the degree of watershed contamination and potential for effective management action. The three sites with the highest estimated particle PCB concentrations as of 2019 were Pulgas Pump Station South (8,220 ng/g), Industrial Rd Ditch in San Carlos (6,139 ng/g), and Line 12H at Coliseum Way in Oakland (2,601 ng/g).

Assessments of three “priority margin units” (Emeryville Crescent, San Leandro Bay [SLB], and the Steinberger Slough/Redwood Creek area [SS/RC]) established conceptual models as a foundation for monitoring response to load reductions and for planning management actions. A key finding was that PCB concentrations in sediment and the food webs in the Crescent and SLB could potentially decline fairly quickly (within 10 years) in response to load reductions from the watershed. In contrast, recovery in SS/RC appears likely to be ultimately limited by the relatively high PCB concentrations that prevail in the South Bay compared to other subembayments.

In spite of the expected responsiveness of SLB, extensive field studies have documented persistent sediment contamination that is likely due to continuing inputs from the watershed.

Priority Questions for the Next Five Years

1. What are the rates of recovery of the Bay, its segments, and in-Bay contaminated sites from PCB contamination?
    a. What would be the impact of focused management of PMU watersheds?
    b. What would be the impact of management of in-Bay contaminated sites (e.g., removing and/or capping hot spots), both within the sites and at a regional scale?

MULTI-YEAR PLAN FOR PCBs

Special studies and monitoring in the RMP from 2019 to 2025. Numbers indicate budget allocations in $1000s. Budgets in parentheses represent funding or in-kind services from external sources (e.g., SEP funds). Budgets that are starred represent funding that has been allocated within other workgroups. Bold boxes indicate multi-year studies. Items shaded in yellow are considered high priority for 2024 funding and beyond. ss – Steinberger Slough; sl – San Leandro Bay

Category	Study	Funder	Questions addressed	2019	2020	2021	2022	2023	2024	2025
General	Develop and update multi-year workplan and continued support of PCB Workgroup meetings	RMP	1a,b	10	10					
	In-Bay Fate Model	RMP SEP WQIF	1a,b			45	75	(408) (350)‡	(340)‡	(235)‡
	Integrated Watershed-Bay Model (SPLWG)	SEP	1a,b			(200)*				
	Margins Ambient	RMP								
PMU	PMU Stormwater	SEP	1a	(40)*						
	PMU Sport Fish Monitoring (3 PMUs)	SEP	1a	(60)[a]					50[a]	
	Passive Samplers	RMP	1a		91ss	87sl				
	PMU Prey Fish Monitoring (4 PMUs)	RMP	1a				26ss[b]	37ss[c]		64sl
	PMU Sediment	RMP	1a,b				26ss[b]	38ss[c]	40	
PMU/General	Food Web Model	WQIF	1a,b					(71)‡	(71)‡	
RMP-funded Special Studies Subtotal – PCBWG				**10**	**101**	**132**	**127**	**75**	**90**	**64**
High Priority Special Studies for Future RMP Funding									**90**	**64**
RMP-funded Special Studies Subtotal – Other Workgroups				**40**	**0**	**200**	**0**			
RMP Supplemental Environmental Projects Subtotal				**60**	**0**	**0**	**0**	**408**		
Pro-Bono & Externally-funded Special Studies Subtotal				**0**	**0**	**0**	**0**	**421‡**	**411‡**	**235‡**
OVERALL TOTAL				**70**	**101**	**132**	**127**	**904**	**501**	**299**

[a] Shiner surfperch; [b] Sample collection; [c] Sample analysis and reporting; [d] WQIF

‡ The RMP has submitted a proposal to the San Francisco Bay Water Quality Improvement Fund (WQIF) that would support stormwater CECs monitoring at a level of ~$100k per year for three years (2023-2025). This MYP lists these potential funds, and will be updated to reflect the final funding decision relating to this proposal.

SEDIMENT

Relevant Management Policies and Decisions

Long-Term Management Strategy for Dredged Material in SF Bay (LTMS) to comply with the Basin Plan

NOAA 2011 Programmatic Essential Fish Habitat Agreement & 2015 LTMS Amended Programmatic Biological Opinion

PCB TMDL

Mercury TMDL

Regional Restoration Plans[1]

Recent Noteworthy Findings

A 2020 RMP special study analyzed PCB data from the DMMO database to determine if the bioaccumulation trigger is a useful criterion for assessing whether sediment chemistry is correlated with the bioaccumulation test results. A similar analysis for mercury resulted in the elimination of the bioaccumulation trigger. The PCB analysis suggested that there was no significant difference in bioaccumulation testing results for sediment chemistry values below the bioaccumulation trigger compared to those above the bioaccumulation trigger but below the TMDL. This results suggests tha the bioaccumulation trigger may not be a useful criterion for determining when the risk of adverse bioaccumulation may increase.

Suspended sediment monitoring by the USGS at Dumbarton Bridge in WY 2016 showed particle flocculation is an important factor when calculating sediment flux. Based on these findings, the RMP funded studies in South Bay and at the Benicia Bridge to investigate the importance of flocculation in sediment flux estimates. In South Bay, the estimate of sediment settling velocity is most strongly tied to the method used. At the Benicia Bridge, cross-sectional variability in suspended sediment and flocculation are both important components needed to accurately estimate suspended sediment concentrations.

In 2023, the Workgroup will complete the development of a Bay sediment conceptual model that will highlight what is known and not known about sediment delivery and deposition dynamics at multiple spatial and temporal scales. These findings will be used in the development of a multi-year Sediment Monitoring and Modeling Workplan that will describe studies aimed at addressing key sediment knowledge gaps.

Priority Questions for the Next Five Years

1. What are acceptable levels of chemicals in sediment for placement in the Bay, baylands, or restoration projects?

2. Are there effects on fish, benthic species, and submerged habitats from dredging or placement of sediment?

3. What are the sources, sinks, pathways and loadings of sediment and sediment-bound contaminants to and within the Bay and subembayments?

4. How much sediment is passively reaching tidal marshes and restoration projects and how could the amounts be increased by management actions?

5. What are the concentrations of suspended sediment in the Estuary and its segments?

[1] San Francisco Bay Restoration Authority Goals, Baylands Goals Update for Climate Change, Subtidal Habitat Goals Project, and Action 13 “Manage sediment on a regional scale and advance beneficial reuse” from the Estuary Blueprint.

MULTI-YEAR PLAN FOR SEDIMENT

Sediment Workgroup special studies for 2020 to 2025. Numbers indicate budget allocations in $1000s. Budgets in parentheses represent funding or in-kind services from external sources (e.g., SEP funds). Budgets that are starred represent funding that has been allocated within other workgroups. Bold boxes indicate multi-year studies. Items shaded in yellow are considered high priority for 2024 funding and beyond.

Element	Study	Funder	Questions addressed	2019	2020	2021	2022	2023	2024	2025
Strategy	Sediment Monitoring Strategy	RMP WQIF/SEP	1,3,4	78			(200)			15
	Workgroup Stategy	RMP	1,2,3,4		10		10	10		
	Sediment Modeling Strategy	RMP	1,2,3,4		26					15
	Sediment Conceptual Model	SEP BCDC/USACE	1,2,3,4		(142)	(747)				
Screening Values	Sediment Bioaccumulation Guidance	RMP	1		23					
	Benthic Index Development	RMP	1							
	Toxicity Reference Value Refinement	RMP	1							
Dredging Impacts on Essential Fish Habitat	Benthic Invertebrate Assessment	RMP LTMS	2							
	Light Attenuation Near Dredging	RMP LTMS	1,2							
Data Mining	DMMO Database and Online Tools	RMP	1	Database maintenance costs covered by core program						
	DMMO Data Synthesis	RMP SEP	1,2							
	DMMO Database Enhancement	RMP	1,2			40	20			
Beneficial Reuse	Beneficial Reuse	RMP	1,2	30		34				
Loading to the Bay	Sediment Supply Synthesis	RMP	3,4							50
	Maintain Stream Gages and Add New Ones	RMP SEP	3,4							
	Monitor Mallard Island Suspended Load and Bedload Flux	RMP	3,4							
	Monitor Tributary Suspended Load and Bedload Flux	RMP			(385)*					
	Model Tributary Suspended Load and Bedload Flux	RMP								75

Element	Study	Funder	Questions addressed	2019	2020	2021	2022	2023	2024	2025
	Monitor Sediment Flux at Key Locations in the Bay (e.g., major creek mouths downstream of head of tide, mudflats/shallows, major bridges, Golden Gate)	RMP SEP	3,4	(158)				52, 70	100	
	Model Current and Future Sediment Flux at Key Locations throughout the Bay	RMP SEP	3,4		45		(408)*		50	75
Sinks & reservoirs	Monitor Sediment Deposition at Key Locations in the Bay (e.g., creek reaches downstream of head of time, mudflats/shallows)	RMP SEP	3,4			140	215	15 (120)	100	100
	Model Current and Future Sediment Deposition Dynamics throughout the Bay	RMP WQIF	3,4					(350)*‡	50 (340)*‡	75 (235)*‡
	Bathymetric Change Studies	RMP USGS	3,4	77 (5)	77 (5)					
	Bathymetric Data Collection	RMP	3,4							75
Sediment characteristics	Bulk Density of Sediment Types	RMP	4	30						
	Mapping Bed Sediment Characteristics for Model Calibration	RMP	3,4							
	Characterizing Impacts of Flocculation on Settling Velocity	RMP SEP	3,4		(264)					
Bay water column characteristics	Using Satellite Imagery to Analyze Turbidity and Suspended Sediment Concentration	RMP	5							75
RMP-funded Special Studies Subtotal – Sediment				**215**	**181**	**214**	**245**	**147**	**300**	**555**
High Priority Special Studies for RMP Funding									**300**	**330**
RMP-funded Special Studies Subtotal – Other Workgroups				**0**	**385**	**0**	**408**	**350**	**340**	**235**
RMP Supplemental Environmental Projects Subtotal				**158**	**406**	**0**	**200**	**120**		
Pro-Bono & Externally Funded Studies Subtotal				**5**	**5**	**747**	**0**			
OVERALL TOTAL				**378**	**592**	**961**	**445**	**267**	**300**	**555**

‡ The RMP has submitted a proposal to the San Francisco Bay Water Quality Improvement Fund (WQIF) that would support contaminant, sediment, and nutrient modeling at a level of ~$235-350k per year for three years (2023-2025). This MYP lists these potential funds, and will be updated to reflect the final funding decision relating to this proposal.

SOURCES, PATHWAYS AND LOADING

Relevant Management Policies and Decisions

Using integrated monitoring and modeling to estimate contaminant loads and trends from local tributaries to the Bay for future TMDL updates

Identifying local tributaries to prioritize for upstream source tracking

Informing decisions on the control measures for reducing contaminant concentrations and loads

Informing provisions of the current and future versions of the Municipal Regional Stormwater Permit (MRP)

Recent Noteworthy Findings and Future Directions

Shifting Focus: The Sources, Pathways and Loadings Workgroup (SPLWG) is continuing to shift its focus to an integrated approach that combines modeling and monitoring to answer management questions. The SPLWG is also shifting away from focusing on legacy pollutants only, including PCBs and Hg, to include contaminants of emerging concern (CECs) as a focus.

Modeling: A suite of models (e.g., RWSM, BAHM) is being developed to simulate hydrology, sediment, and water quality in Bay watersheds. The watershed dynamic model (WDM) for the Bay Area is capable of simulating large, complex regions with mixed land-use types, a wide range of contaminants, upland erosion and sediment transport, and in-stream processes at an hourly scale over multiple years. The sediment module of the WDM was completed in 2022 and is now being expanded to include contaminants load simulation (PCBs and Hg as pilot cases). The ongoing CECs load modeling review project is focusing on investigating and recommending appropriate ways of combining limited monitoring data and modeling to estimate regional scale CEC loads. We have also begun developing a watershed-bay modeling strategy and designing a pilot application of a coupled watershed-bay model to simulate the fate of sediment and contaminants.

Monitoring: Winter storm sampling by the RMP for legacy pollutants has been conducted in 93 watersheds and for CECs in 25 watersheds. PCB concentration results from sampling downstream of Oakland GE led to collaboration this year with the EPA to implement clean-up actions at that site. Additional sampling will be done in 2023 to characterize the current conditions prior to these management actions. Notable drought conditions during the last three years have required us to focus on increasing our remote sampling techniques toolbox and two projects funded for 2023 include remote sampler development for CECs and for deployment in tidal areas. Stormwater sampling goals continue to shift towards supporting the ECWG as well as legacy pollutant modeling. Planned sampling during WY2023 includes suspended sediment, PCBs, and Hg loads co-located with existing flow gauging to support model development, and PCBs concentrations in the watersheds of priority margin units (PMUs).

Integration of Monitoring and Modeling: The advanced data analysis (ADA) method developed in 2019 was the first step in our new integrated watershed monitoring and modeling (IWMM) approach for data interpretation. This approach addresses the weakness that concentration in stormwater or on particles in stormwater is non-conservative and an imperfect indicator of a pollutant source because of variation in dilution by both flow volume and sediment mass between storms and between sites. By accounting for these issues and using a spatial data layer of sources, an IWMM approach to data interpretation provides a direct comparison between sources of interest rather than an indirect comparison at the watersheds scale. With the completion of the WDM and with additional identification of sources for other contaminants of interest, the vision is to continue developing the IWMM approach for supporting PCB management decisions and potentially decisions for other contaminants in the future. An IWMM approach to data interpretation is a much more powerful science tool to support management than comparing concentrations between sites in raw form.

Contaminants of Emerging Concern: Prior RMP studies have identified the presence of emerging contaminants of moderate concern in urban runoff and provided evidence that stormwater is an important pathway for CECs to reach the Bay. A four-year preliminary investigation of CECs in stormwater culminates

in 2023, while two new projects have begun—one to explore potential models to estimate CEC stormwater loads (mentioned above) and another to develop a stormwater CECs monitoring approach that integrates modeling. Another project to develop the groundwork for the RMP's future CECs in stormwater monitoring and modeling program is beginning in fall 2022. These projects will feed into a 2023 SPLWG strategy update to reflect the pivot toward CECs and to re-examine activities addressing legacy pollutants.

Priority Questions for the Next Five Years*

1) What are the loads or concentrations of pollutants of concern from small tributaries to the Bay?

2) Which are the "high-leverage" small tributaries that contribute or potentially contribute most to Bay impairment by pollutants of concern?

3) How are loads or concentrations of pollutants of concern from small tributaries changing on a decadal scale?

4) Which sources or watershed source areas provide the greatest opportunities for reductions of pollutants of concern in urban stormwater runoff?

5) What are the measured and projected impacts of management action(s) on loads or concentrations of pollutants of concern from the small tributaries, and what management action(s) should be implemented in the region to have the greatest impact?

*Recent workgroup discussions pointed to the need for a Strategy update that could include revising the management question in relation to the changing emphases (particularly on CECs) and greater cross-workgroup collaboration.

MULTI-YEAR PLAN FOR SOURCES, PATHWAYS, AND LOADING

Sources, Pathways and Loadings Workgroup studies in the RMP from 2020 to 2025. Numbers indicate budget allocations in $1000s. Budgets in parentheses represent funding or in-kind services from external sources (e.g., SEP funds). Budgets that are starred represent funding that has been allocated for the given study within other workgroups. Bold boxes indicate multi-year studies. Items shaded in yellow are considered high priority for 2024 funding and beyond.

Element	Study	Funder	Collaboration with other Workgroups	Questions addressed	2020	2021	2022	2023	2024	2025
Strategy	SPLWG strategy (formerly STLS coordination)	RMP			40	25	35	35	37	39
	SPLWG strategy report & management questions update	RMP	ECWG	1,2,3,4,5				45		
Monitoring	Monitoring to support regional loads and trends	RMP		1,3				10		
	POC reconnaissance monitoring	RMP		1,2,3,4	110	65	43			
	Tidal area remote sampler development	RMP		1,2,4				85	25	
	Remote sampler purchase	RMP							180	
	Priority margin units (PMU) PCB monitoring	RMP		1,2,4	10					
	Priority margin units (PMU) PCB monitoring	SEP	PCBWG	1,2,4	37*					
Modeling	Modeling to support regional loads and trends (PCB/Hg)	RMP		3,5	100	150	90	130		
	WDM model maintenance	RMP		1					50	50
	CECs stormwater modeling	RMP		1			25			
	Advanced Data Analysis	RMP		1,2,3,4	50					
	Update San Francisco Bay region land-use map	SEP		2,4,5	(50)					
	Regional Watershed Spreadsheet Model update	SEP				(23)				
	Integrated watershed-bay modeling strategy and pilot implementation	SEP				(200)				
Integrated Studies	Integrated watershed monitoring and modeling strategy	RMP				50				
	PCB/Hg monitoring and modeling to support load and trend assessment	RMP		1,3,5					400	

RELEVANT STUDIES IN OTHER WORKGROUPS										
Monitoring	CECs stormwater monitoring and modeling	RMP WQIF‡	ECWG	1,2,4	181*	148*	100*	250* (100) ‡	200* (100) ‡	200* (100) ‡
Monitoring	Stormwater CECs monitoring strategy (approach)	RMP	ECWG				50*	55*		
Monitoring	Stormwater (method evaluation and monitoring)	RMP NOAA‡	MPWG						25* (200)‡‡	25* (200)‡‡
RMP-funded Special Studies Subtotal – STLS					**310**	**290**	**193**	**305**	**492**	**289**
High Priority Special Studies for RMP Funding									**467**	**289**
RMP-funded Special Studies Subtotal – Other Workgroups					**218**	**148**	**150**	**305**	**200**	**200**
RMP Supplemental Environmental Projects					**50**	**223**				
OVERALL TOTAL					**360**	**513**	**193**	**305**	**492**	**289**

‡ The RMP has submitted a proposal to the San Francisco Bay Water Quality Improvement Fund (WQIF) that is expected to support stormwater CECs monitoring at a level of ~$100k per year for three years (2023-2025). This MYP lists these potential funds, and will be updated to reflect the final funding decision relating to this proposal.

‡‡ The RMP has submitted a proposal to NOAA that would support monitoring of microplastics in stormwater at a level of ~$200k per year for two years (2024-2025). This MYP lists these potential funds, and will be updated to reflect the final funding decision relating to this proposal.

Photo by Shira Bezalel

STATUS AND TRENDS MONITORING

Relevant Management Policies and Decisions

Define ambient conditions in the Bay

Water Quality Assessment – 303(d) impairment listings or de-listings

Determination if there is a reasonable potential that a NPDES-permitted discharge may cause violation of a water quality standard

Evaluation of water and sediment quality objectives

Dredged material management

Development and implementation of TMDLs for mercury, PCBs, and selenium

Site-specific objectives and anti-degradation policies for copper and cyanide

Inform CEC tiered risk-based framework and CEC management actions

Recent Noteworthy Findings

In 2021, the RMP started to implement the revised S&T design by adding contaminants of emerging concern (bisphenols and organophosphate esters) to the Bay water sampling. Samples for PFAS were also collected as part of a special study and will be added to the S&T design in 2023.

Pilot monitoring for CECs in Bay water commenced during the wet season in WY2022. Samples were collected following one storm event from three nearfield stations near where stormwater enters the Bay (Redwood Creek, Stevens Creek, San Leandro Bay). Samples were also collected at four stations along the spine of the Bay during the monthly USGS nutrients cruise. Samples were also collected at the ambient stations in the dry season to enable comparison between CEC concentrations in wet and dry seasons to understand how long CECs are present in the Bay and if they are found at levels of concern. Pilot sampling will continue in WYs 2022 and 2023.

Bird eggs were collected in 2022 after a one year delay due to Covid. Sampling was limited to double-crested cormorants at three locations. Forster terns were dropped from the bird egg monitoring design as recommended in the S&T Review.

Priority Questions for the Next Five Years

1. What are concentrations and masses of priority contaminants in the Bay, its compartments, and its segments?

2. Are contaminants at levels of concern?

3. Are there particular regions of concern?

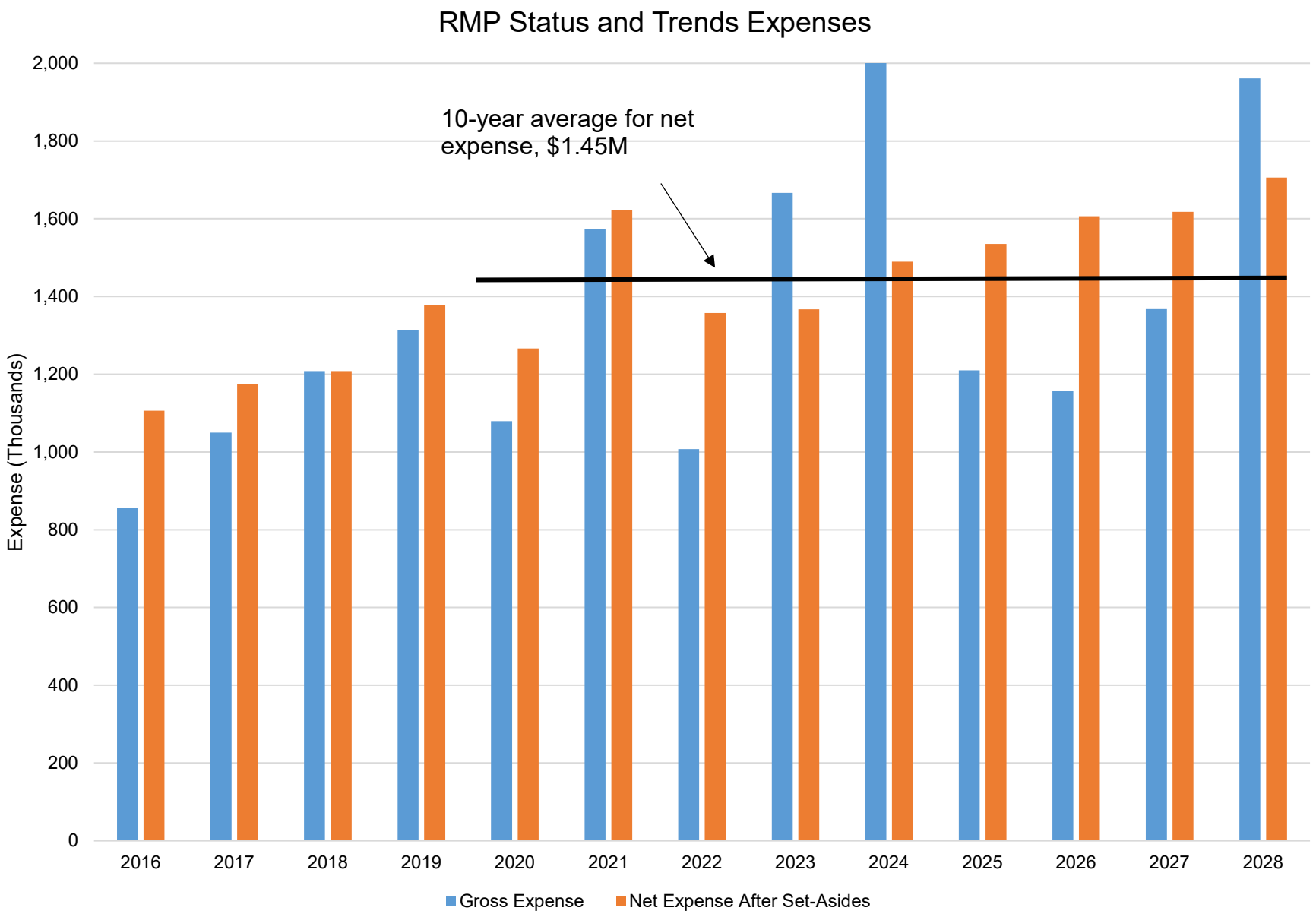
4. Have concentrations and masses increased or decreased?

When recommending addition of any analyte to S&T, the following details need to be specified: relevance of the analyte to a management question, matrix to be monitored, and the frequency, minimum duration, and the spatial extent (e.g., all sites or a subset) of monitoring.

MULTI-YEAR PLAN FOR STATUS AND TRENDS MONITORING

Status and Trends Monitoring costs in the RMP from 2018 to 2028. Values for 2024-2028 are forecasts. Numbers indicate budget allocations in $1000s.

	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Monitoring Type	*Actl*	*Actl*	*Actl*	*Actl*	*Actl*	*Fcst*	*Fcst*	*Fcst*	*Fcst*	*Fcst*	*Fcst*
USGS Moored Sensor Network for Suspended Sediment	250	250	300	400	400	400	400	400	460	460	460
USGS Monthly Cruises for Nutrients and Phytoplankton	235	242	250	250	258	265	273	283	292	299	307
S&T North Bay Selenium				72	127		131		136		140
S&T Water		216		243	25	257	27	265		309	0
Water-Wet season					127	60	135		143		
Water-CTR and Organics								88			
Water-Non-target analysis							12	30			
Water-Passives							51				
S&T Bivalves	118										
Bivalves-archive					20		21		21		22
S&T Bird Eggs	222			256			160			165	
S&T Margins Sediment			319			110					235
S&T Sediment	291					200					320
S&T Target Sediment						95					190
S&T Prey Fish						120					126
S&T Sport Fish		405					531				
S&T Harbor Seals							300				
Archives	47	84	62	84	43	80	56	85	60	90	63
Reporting	10	22	23	12	10	20	25	14	14	14	25
Lab Intercomp Studies	30	55	37	28	22	60	82	30	25	52	82
Grand Total	**1,203**	**1,274**	**991**	**1,345**	**1,007**	**1,667**	**2,204**	**1,195**	**1,151**	**1,389**	**1,970**
Set-Aside Funds Used	**0**	**0**	**88**	**0**	**0**	**300**	**650**	**0**	**0**	**0**	**300**
Set-Aside Funds Saved	**0**	**60**	**275**	**50**	**350**	**0**	**0**	**350**	**500**	**250**	**0**
Set-Aside Funds Balance	**593**	**653**	**928**	**978**	**1,328**	**1,028**	**378**	**728**	**1,228**	**1,478**	**1,178**
Net S&T Funding Needed	**1,203**	**1,340**	**1,178**	**1,395**	**1,357**	**1,967**	**1,554**	**1,555**	**1,651**	**1,639**	**1,670**


RMP Status and Trends Expenses
10-year average for net expense, $1.45M
Expense (Thousands)
2,000
1,800
1,600
1,400
1,200
1,000
800
600
400
200
0
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
2026
2027
2028
Gross Expense
Net Expense After Set-Asides

Regional Monitoring Program for Water Quality in San Francisco Bay

Monitoring Design for the Status and Trends Monitoring Program (2018-2029); sampling frequency from 2022-2029 is reflective of changes made to the Program through the Status and Trends Review process.

Program	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
USGS Moored Sensor Network for Suspended Sediment (5 targeted sites)[1]												
Parameters: SSC, Water temperature, Salinity	X	X	X	X	X	X	X	X	X	X	X	X
USGS Monthly Cruises for Nutrients and Phytoplankton in Deep Channel (38 targeted stations)												
Parameters: CTD profiles, light attenuation, SSC, DO, Chl-a, Phytoplankton speciation, Nutrients (NO_2, NO_3, NH_4, PO_4, Si)[2]	X	X	X	X	X	X	X	X	X	X	X	X
Every 2 Years: Toxic Contaminants in Water – dry season (5 targeted stations and 17 random stations)												
MeHg, Se, Cu (dissolved & particulate fractions in 2017 and onwards); Cu only after 2019		X		X		X		X		X		X
CN, Hardness, SSC, DOC, POC		X		X	X	X	X	X		X		X
Chl-a		X		X		X		X		X		X
CECs – PFAS, bisphenols, organophosphate esters				X	X	X	X	X		X		X
Non-target analysis (5 stations)								?				
Aquatic Toxicity (9 stations)[3]		X						X				
CTR parameters (10 samples at 3 targeted stations)[4], including PCBs and PAHs								X				

Program	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Every 2 years: Toxic Contaminants in Water – wet season (5 targeted stations, 4 ambient stations)												
CECs – PFAS, bisphenols, organophosphate esters					X	X	X		?		?	
Non-target analysis									?			
Every 2 years: Selenium in Water, Clams, and Sturgeon (2 targeted North Bay stations)												
Water – dissolved and particulate Se, chl-a, SSC, DOC		X	X	X	X		X		X		X	
Clam tissue – selenium, stable isotopes (δ13C, δ15N, δ34S)		X	X	X	X		X		X		X	
Sturgeon tissue - selenium					X		X		X		X	
Every 2 years: Toxic Contaminants in Bivalve Tissue (7 targeted Bay stations until 2018[6]; Bay edge stations 2022 onward)												
Se, PAHs (archive only after 2018)	X				X		X		X		X	
PBDEs												
CECs (archive only)					X		X		X		X	
Every 3 Years: Toxic Contaminants in Bird Egg Tissue												
Cormorant Eggs: Hg, Se, PCBs, PBDEs, PFAS, legacy pesticides[5] (3 targeted stations)[7]	X			X			X			X		
Tern Eggs: Hg, Se, PBDEs (variable fixed stations)[8]	X											
Every 5 Years: Toxic Contaminants in Near-field Bay Sediment (12 targeted near-field stations every 5 years)												
PFAS, bisphenols, TOC, N, % solids, grain size						X					X	

Program	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Every 5 Years: Toxic Contaminants in Bay Margin Sediments (12 random stations every 5 years/24 random station every 10 years)												
PFAS, bisphenols, TOC, N, % solids, grain size						X					X	
Ag, Al, As, Cd, Cu, Fe, Hg, MeHg, Mn, Ni, Pb, Se, Zn, PCBs			X								X	
Every 5 Years: Toxic Contaminants in Sediment (7 targeted stations and 10 random stations)[9]												
PFAS, bisphenols, TOC, N, % solids, grain size						X					X	
Ag, Al, As, Cd, Cu, Fe, Hg, MeHg, Mn, Ni, Pb, Se, Zn, PAHs, PCBs	X										X	
PBDEs (discontinued after 2023)	X					X						
Fipronil (discontinued after 2018)	X											
Every 5 Years: Toxic Contaminants in Sport Fish Tissue (7 targeted stations)												
Hg, Se, PCBs, PBDEs, dioxins		X					X					X
PFAS		X					X					X
Legacy pesticides[5]							X					X
Fipronil		X					?					
Every 5 Years: Toxic Contaminants in Prey Fish Tissue (4 targeted stations, 3 species)												
PFAS, bisphenols						X					X	
PCBs (PMUs only)						X					X	
Every 10 Years: Toxic Contaminants in Harbor Seals												
PFAS						SS	SS		X			

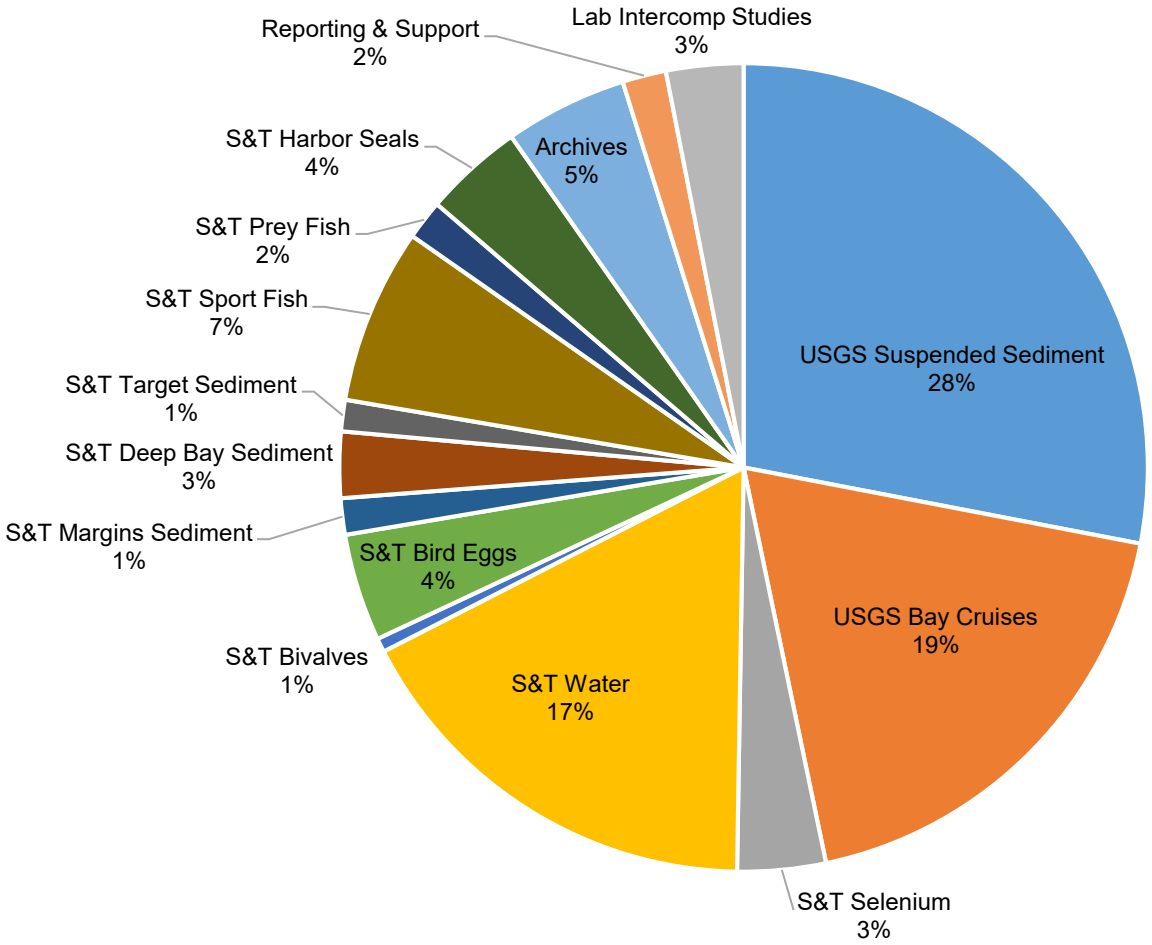
Notes:
"X" = Planned sampling event. "?" = Event that is planned but must be approved by the RMP Steering Committee before implementation. SS = Special Study being conducted to trial sampling methods. Additional parameters can be added to sampling events to support RMP Special Studies.

1. The RMP Status and Trend Program provides direct support to the U.S. Geological Survey (PI: Paul Work) for four SSC stations (Richmond Bridge, Pier 17, Alcatraz Island, Dumbarton Bridge). However, this contribution leverages SSC data at two more stations and salinity at eight stations funded by other partners. In addition, since 2012, the RMP has used Special Studies funds to add DO sensors at eight stations and nutrient-related sensors to three stations.
2. Monthly cruises are completed by the U.S. Geological Survey (PI: Brian Bergamaschi). Phytoplankton speciation and nutrient samples are collected at 14 stations.
3. Aquatic Toxicity is measured following EPA Method 1007.0 (*Americamysis bahia*).
4. CTR sampling occurs at the Sacramento River, Yerba Buena Island, and Dumbarton Bridge sites. Three samples collected at each site and one field blank.
5. "Pesticides" includes the suite of legacy pesticides that has been routinely measured by the RMP: Chlordanes (Chlordane, cis-; Chlordane, trans-; Heptachlor; Heptachlor Epoxide; Nonachlor, cis-; Nonachlor, trans-; Oxychlordane); Cyclopentadienes (Aldrin; Dieldrin; Endrin); DDTs (DDD(o,p'); DDD(p,p'); DDE(o,p'); DDE(p,p'); DDT(o,p'); DDT(p,p')); HCHs (HCH, alpha-; HCH, beta-; HCH, delta-; HCH, gamma-); Organochlorines (Hexachlorobenzene; Mirex).
6. Mussels (*Mytilus californianus*) are collected from Bodega Head State Marine Reserve, an uncontaminated "background" site of known chemistry, and are transplanted to seven targeted locations in the Bay. After ~100 days, mussels from the transplanted sites and a sample from Bodega Head are collected for analysis. Three of the seven transplant sites serve as back-ups in case something goes wrong with the transplants at the four primary sites. At the same time, resident clams (*Corbicula fluminea*) are collected from two sites in the Sacramento River and San Joaquin River.
7. Double-crested Cormorant (*Phalacrocorax auritus*) eggs are collected at three sites: Don Edwards National Wildlife Refuge, the Richmond-San Rafael Bridge, and Wheeler Island.
8. Forster's Tern (*Sterna forsteri*) eggs are typically collected from multiple sites in the Don Edwards National Wildlife Refuge and the Hayward Shoreline Regional Park.
9. Sediment samples are collected in the dry season (summer).

Abbreviations:
Ag: Silver
Al: Aluminun
As: Arsenic
Cd: Cadmium
CECs – Contaminants of emerging concern
Chl-a: Chlorophyll-a
CTD: Conductivity, Temperature, and Depth
CTR: California Toxics Rule, see pollutant list here
https://www.waterboards.ca.gov/northcoast/board_decisions/adopted_orders/pdf/2012/120813_Hatcheries_Att_A.pdf
Cu: Copper
DO: Dissolved Oxygen
DOC: Dissolved Organic Carbon
Fe: Iron
Hg: Mercury
MeHg: Methylmercury
Mn: Manganese
NH_4: Ammonia (dissolved)
Ni: Nickel
NO_2: Nitrite (dissolved)
NO_3: Nitrate (dissolved)
PAHs: Polynuclear Aromatic Hydrocarbons
Pb: Lead
PBDEs: Polybrominated Diphenyl Ethers

PCBs: Polychlorinated Biphenyls
PFAS – Perfluorinated alkyl substances
PFCs: Perfluorinated Compounds
PMU – Priority Margin Unit (Emeryville Crescent, San Leandro Bay, Redwood Creek/Steinberger Slough)
PO_4: Phosphate (dissolved)
POC: Particulate Organic Carbon
Se: Selenium
Si: Silica (dissolved)
SSC: Suspended Sediment Concentration
TN: Total Nitrogen
TOC: Total Organic Carbon
TP: Total Phosphorus
Zn: Zinc

S&T Monitoring - Cost by Monitoring Type



5-Year Window
(2023-2027)

Total cost: $7.6M

PROGRAM MANAGEMENT

Approximately 10% of the total budget

Program management includes the following activities:

Program planning
- Preparing the Detailed Workplan and Multi-Year Plan

Contract and financial management
- Tracking expenditures versus budgets
- Developing and overseeing contracts and invoicing
- Providing financial updates to the RMP Steering Committee

Technical oversight
- Internal review by senior staff of reports, presentations, posters, workplans, memos, and other communications

Internal coordination
- Workflow planning
- Tracking deliverables and preparing RMP Deliverables Stoplight and Action items reports
- Staff meetings

External coordination
- Twenty meetings with external partners (SCCWRP, Wetlands RMP, SWAMP, and others) to coordinate programs and leverage RMP funds

Administration
- Office management assistance

Program Review
Periodically, the RMP conducts an overall peer review of the Program as a whole. Two external Program Reviews have been conducted to date, in 1997 and in 2003. The RMP has evolved considerably since the 2003 Review, with greatly enhanced planning processes that have made the Program much more forward-looking and thoroughly peer-reviewed.

A review of RMP governance was conducted in 2014 and a charter for the Program was adopted in 2015. An internal program review was conducted in 2016, focused on identifying new high priority technical areas and issues for the program to address. New science advisors, program partners, and technical focus areas were identified and will be further developed with the Technical Review Committee and Steering Committee.

The timing and scope of Program Reviews are determined by the Steering Committee. The Steering Committee does not consider a further External Program Review necessary at this time, as ongoing review of critical elements is well established.

Peer Review
Extensive peer review is a key to the cost-effective production of reliable information in the RMP. This peer review is accomplished through the following mechanisms.
- **Workgroups** include leading external scientists that work with stakeholders to develop workplans and provide feedback on project planning, implementation, and reporting
- The **Technical Review Committee** provides general technical oversight of the Program
- **Peer-reviewed publications** provide another layer of peer review for most significant RMP studies

GOVERNANCE

Approximately 10% of the total budget

RMP meetings provide a collaborative forum for communication among regulators, regulated entities, and scientists. This forum is provided by regular meetings of organizational and technical committees to track progress and guide future work. Additional information about the function and activities of each governance group can be found in Figures 1 and 3 in this booklet.

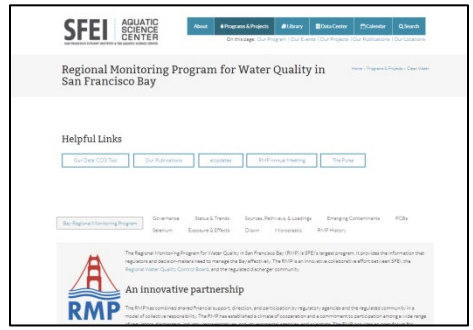
- **Steering Committee** – quarterly meetings to track progress, provide management direction, and track financials.
- **Technical Review Committee** – quarterly meetings to provide technical oversight.
- **Workgroups** – annual meetings to develop multi-year work plans, guide planning and implementation of special studies and Status and Trends monitoring, and provide peer-review of study plans and reports.
- **Strategy Teams** - stakeholder groups that meet as needed to provide frequent feedback on areas of emerging importance, and develop long-term RMP study plans for addressing these high priority topics. The RMP currently has active strategy teams for sport fish monitoring, small tributary loadings, and PCBs.

Photo by Jay Davis

ANNUAL REPORTING & COMMUNICATIONS

Approximately 10% of the total budget (+$85,000 in years when a full Pulse report is produced)

Includes the Pulse of the Bay, Annual Meeting, RMP Update, Multi-Year Plan, State of the Estuary report card, RMP website, Annual Monitoring Report, technical reports, journal publications, Estuary News, oral presentations, posters, & media outreach.



www.sfei.org/rmp

These platforms are used to make information from the RMP available to the following target audiences:

- Primary Audience
  - **RMP Participants**. Need information to encourage support for the RMP and water quality programs in the Bay. The Pulse, Annual Meeting, Multi-Year Plan, State of the Estuary report card, RMP website, newsletter, fact sheets, oral presentations, media outreach.
- Secondary Audiences
  - **Other regional managers**. Need information to inform their decisions and evaluate effectiveness of their actions. A target audience for all communication products.
  - **Regional law and policy makers**. Need information to encourage support for water quality programs in the Bay. The Pulse, State of the Estuary report card, media outreach.
  - **Regional Scientists**. Need to share information to increase understanding of water quality and maintain technical quality of the science. A target audience for all communication products.
  - **Media, public outreach specialists, educators**. Need information to encourage support for the RMP and water quality programs in the Bay, and to protect their health. A target audience for the Pulse, Multi-Year Plan, State of the Estuary report card, RMP web site, newsletter, fact sheets, media outreach.
  - **Managers and scientists from other regions**.

Highlights for the Next Five Years

- RMP Update (2022)
- Pulse of the Bay (2023)
- Continued partnership with SFEP's "Estuary News" to reach broader audience
- Continued website improvement

QUALITY ASSURANCE AND DATA SERVICES

Approximately 6% of the total budget for general support, plus funding in Status and Trends for handling S&T datasets

Data Services

Data management includes formatting, uploading, and reporting each year's Status and Trends data; managing, maintaining, and improving the RMP dataset to enable easy access to RMP data through CD3 (cd3.sfei.org); coordinating with statewide data management initiatives (e.g., SWAMP and CEDEN); and supporting quality assurance evaluation, data analysis, and RMP report production.

Quality Assurance

Quality assurance includes the review of data submitted by analytical laboratories; development and application of the QAPP; review data in comparison to data quality objectives and prior results; review of congener ratios; and troubleshooting problems with the chemical analyses. Occasional special studies to assess sampling methods, analytical methods, or lab performance are conducted.

Online Data Access

CD3 (cd3.sfei.org) is an online visualization tool that makes the RMP data available to water quality managers, stakeholders, scientists, and the public. A data download tool allows users to customize their queries and easily download large quantities of data.

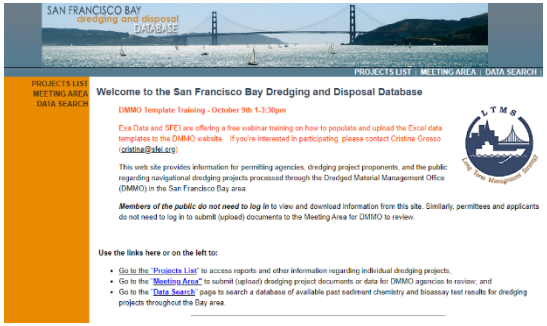
Recent Noteworthy Findings

The RMP's over 25-year dataset contains more than 3.5 million records standardized across all years. All data are stored in SFEI's Regional Data Center database, are comparable to statewide standards, and are regularly exchanged with CEDEN.

CD3 provides public access and visualizes RMP data along with relevant datasets from other programs.

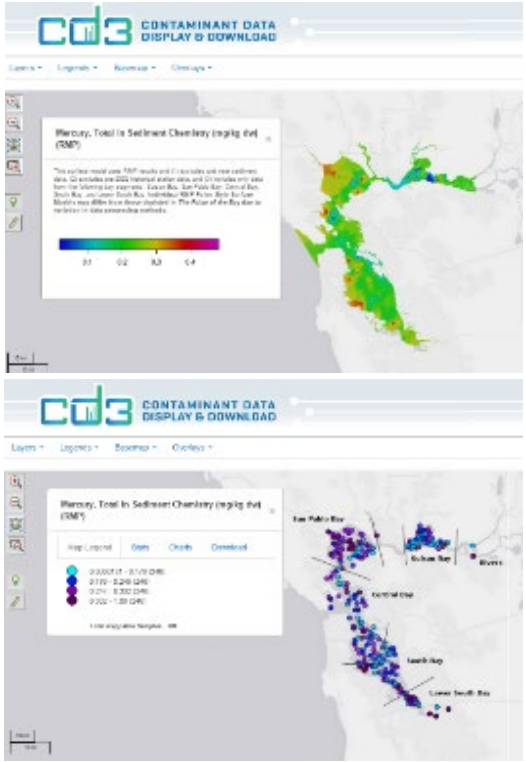
DMMO Database and Website

In 2018, the Dredged Material Management Office (DMMO) dredged sediment testing database and website were transferred to SFEI's Regional Data Center. Near-term priorities include developing standardized data templates, uploading a backlog of data to the database, and integrating DMMO data into CD3. Ongoing costs include uploading data and hosting and maintaining the system.



Priority Initiatives for the Next Five Years

- Efficiencies in Data Uploading and Formatting
- Enhancement of Data Access and Visualization Tools
- Coordination with SFEI's Environmental Informatics Program
- Hosting, managing, enhancing, and providing access to DMMO data



RMP STUDIES ASSISTING PERMITTEES WITH ADDRESSING SPECIFIC PERMIT CONDITIONS

Dredgers

Policy	Provision	Study
2011 Programmatic Essential Fish Habitat Agreement, Measure 1	Conduct benthic recovery study in dredged areas	Benthos Recovery After Dredging, Benthic Assessment Tools
2011 Programmatic Essential Fish Habitat Agreement, Measure 7	Conduct bioaccumulation testing evaluations for in-Bay sediment disposal. Clearly define bioaccumulation triggers for testing and subsequent permitting decisions.	S&T Sediment Monitoring– determine ambient bay sediment concentrations for bioaccumulation testing thresholds
PCBs TMDL	Monitor PCB loads in dredged materials disposed in-Bay relative to TMDL allocation	S&T Sediment Monitoring – determine deep bay and margins sediment concentrations for in-Bay disposal limits
Mercury TMDL	Monitor mercury loads in dredged materials disposed in-Bay relative to TMDL allocation	S&T Sediment Monitoring– determine deep bay and margins sediment concentrations for in-Bay disposal limits
Long-Term Management Strategy	Establish how much dredged material can be disposed of in-Bay and where; review sediment guidelines for the beneficial reuse of dredged sediment; review requirements for PCB bioaccumulation testing	Sediment Conceptual Model, USGS Suspended Sediment Monitoring, Bay sediment budgets, Beneficial Reuse workshop, Floating Percentile Method assessment of chemistry results from dredged sediment, PCB bioaccumulation threshold analysis

RMP STUDIES ASSISTING PERMITTEES WITH ADDRESSING SPECIFIC PERMIT CONDITIONS

Industrial Wastewater Treatment Plants

Policy	Provision	Study
Mercury Watershed Permit	Better understand mercury fate, transport, the conditions under which methylation occurs, and biological uptake	Mercury Strategy Studies: Food Web Uptake (small fish), DGTs, Isotopes
Copper Action Plan	Investigate possible copper sediment toxicity	S&T Sediment Toxicity
Copper Action Plan	Investigate sublethal effects on salmonids	Effects of Copper on Salmon (NOAA)
North Bay Selenium TMDL	Monitor selenium in the food web to inform the TMDL	North Bay Selenium in Water, Clams, and Sturgeon

RMP STUDIES ASSISTING PERMITTEES WITH ADDRESSING SPECIFIC PERMIT CONDITIONS

Municipal Wastewater Treatment Plants

Policy	Provision	Study
Mercury Watershed Permit	Better understand mercury fate, transport, the conditions under which methylation occurs, and biological uptake	Mercury Strategy Studies: Food Web Uptake (small fish), DGTs, Isotopes
Copper Action Plan	Investigate possible copper sediment toxicity	S&T Sediment Toxicity
Copper Action Plan	Investigate sublethal effects on salmonids	Effects of Copper on Salmon (NOAA)
Nutrient Watershed Permit	Characterize nutrients and nutrient-related parameters in the Bay	Contributions to Nutrient Management Strategy studies

RMP STUDIES RELATED TO SPECIFIC PERMIT CONDITIONS

Urban Stormwater

MRP link: https://www.waterboards.ca.gov/sanfranciscobay/board_decisions/adopted_orders/2022/R2-2022-0018.pdf

Policy	Provision	Study or linkage
Municipal Regional Stormwater Permit (MRP)	C.8. Pollutants of Concern Monitoring	Sources, Pathways, and Loadings Workgroup (SPLWG) / Small Tributary Loading Strategy (STLS) studies on PCBs and Hg and other POCs can fulfill a portion of requirement in conjunction with BASMAA efforts.
		ECWG in collaboration with SPLWG conducted a special study for emerging contaminants in stormwater, including PFAS, organophosphate esters, bisphenols, stormwater CECs (including tire ingredients), and ethoxylated surfactants. A strategy for ongoing stormwater monitoring and modeling of CECs is currently being developed.
MRP	C.11a/12.a. Assess Mercury / PCB Load Reductions from Stormwater	STLS/ SPLWG information could be used by stormwater programs to help refine and document a methodology assessing load reductions
MRP	C.11e/12.f. Plan and Implement Green Infrastructure to Reduce Mercury / PCB loads	STLS/ SPLWG information and the RWSM outputs can help stormwater permittees with quantifying relationships between areal extent of green infrastructure and load reductions.
MRP	C.11f/12.h. Prepare Implementation Plan and Schedule to Achieve TMDL Wasteload Allocations	STLS/ SPLWG information and the RWSM outputs can help stormwater permittees with the development of a reasonable assurance analysis.
MRP	C.12.i. Fate and Transport Study of PCBs: Urban Runoff Impact on San Francisco Bay Margins	PCB Workgroup developed Conceptual Models for three Priority Margin Units—Emeryville Crescent, San Leandro Bay, and Steinberger Slough/Redwood Creek
		STLS/ SPLWG concentrations and loads information is helping to complete the Bay margins mass balance pilot projects that aims to provide information on the fate of PCBs in Urban Runoff and impact on San Francisco Bay margins.

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 a 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.
- To be eligible for SEP funding, RMP projects must have been reviewed and recommended by the Steering Committee 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 project must implement or support implementation of the RMP's Multi-Year Plan.
- Additional proposal topics that are aligned with each workgroup's strategy but not included in the Multi-Year Plan will also be eligible for SEP funding following review and recommendation by the Steering Committee.

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.

The Steering Committee can update the list at anytime but at least once per year in July after the special studies for the following year are selected. The Steering Committee will have the option to add the studies that were recommended but not funded to the list, delete older studies that are no longer a priority, and add up to three additional studies proposed and supported by each workgroup.

Table 3: List of RMP Projects Eligible for Supplemental Environmental Project Funding

In the following table, the proposed projects are grouped into the following categories:

- Projects that have been reviewed by a RMP workgroup, the Technical Review Committee, and/or Nutrient Management Strategy Steering Committee
- Additional Project Ideas from RMP staff

Project	Estimated Budget Range	Nexus Keywords	Geography	Matrix	Oversight Group	Project Lead	Year Proposed
Projects that have been reviewed by a RMP workgroup and the Technical Review Committee and approved by the Steering Committee							
Identification and Pilot Monitoring of High-Priority Current Use Agricultural Pesticides in Region 2	$75,000 - $125,000	Emerging Contaminants, Pesticides	North Bay	Stormwater	ECWG	SFEI	2014
Characterizing PFAS in San Francisco Bay Seals	$80,000 - $160,000	Emerging Contaminants, PFAS	South Bay	Seals	ECWG	SFEI	2018
Non-targeted analysis of South Bay harbor seals	$75,000 - $250,000	Emerging Contaminants, Non-target	South Bay	Seals	ECWG	SFEI	2020
Monitoring for Halogenated Azo Dyes in Bay Sediments	$65,000 - $130,000	Emerging Contaminants, Azo dyes,	Whole Bay	Sediment	ECWG	SFEI	2020
Developing Bioscreening Thresholds for the Glucocorticoid Receptor Cell Assay	$50,000 - $200,000	Water toxicity, aquatic species	Whole Bay	Surface water	ECWG	SFEI	2019

Project	Estimated Budget Range	Nexus Keywords	Geography	Matrix	Oversight Group	Project Lead	Year Proposed
Efficient extraction of endocrine disruptors from sediments from San Francisco Bay	$15,000 - $45,000	Water toxicity, aquatic species	Whole Bay	Sediment	ECWG	SFEI	2019
Monitoring Microplastics in San Francisco Bay Sport Fish	$50,000- $200,000	Microplastic, Sport Fish	Whole Bay	Sport fish	MPWG	SFEI/U. Toronto	2019
Microplastics in South Bay Sediment Cores	$50,500	Microplastics	South Bay	Sediment	MPWG	SFEI	2020
Tire Particle/Contaminant Fate and Transport	$90,000 - $115,000	Microplastics	Whole Bay	Particles	MPWG	SFEI	2021
Biogeochemical transformation rates in San Francisco Bay	$50,000 - $300,000	Nutrients	Whole Bay	Water	Nutrients	SFEI	2021
Richmond Harbor PCB Conceptual Model Development	$50,000- $100,000	PCBs, Central Bay	Richmond Harbor	Sediment, Fish, Water	PCBWG	SFEI	2018
Second Survey of PCBs in Prey Fish in San Leandro Bay	$75,000	PCBs	San Leandro Bay	Prey fish	PCBWG	SFEI	2021
Filling Bathymetry Data Gaps	$50,000- $250,000	Bathymetry	Whole Bay	Sediment	SedWG	USGS	2019
Toxicity Reference Value Refinement	$30,000	Toxicity, Dredged sediment, Beneficial reuse	Whole Bay	Sediment	SedWG	SFEI	2019

Project	Estimated Budget Range	Nexus Keywords	Geography	Matrix	Oversight Group	Project Lead	Year Proposed
Estimation of future sediment loadings from local tributaries	$70,000	Sediment, future conditions	Whole Bay	Water	SedWG	SFEI	2021
Identifying mechanisms controlling selenium bioavailability at the base of the food web in North versus South San Francisco Bay	$112,000	Selenium, Bioavailability, South Bay	North and South Bay	Water	SeWG	USGS	2020
Use of Remote Stormwater Sampling Devices to Improve Temporal Coverage of Sampling	Year 1: $160,000 Year 2: $120,000	PCBs, methods development, remote samplers	Whole Bay	Stormwater	STLS SPLWG	SFEI	2017; revised 2022
Develop a Statistical Model for Trends Evaluation	$35,000-$50,000	Stormwater flows, pollutant loads, PCBs	Whole Bay	Stormwater	STLS SPLWG	SFEI	2018
Mallard Island Monitoring for Loads and Trends	$150,000 - $200,000	Sediment load, Delta, PCBs, Hg, Se, Pesticides microplastics, CECs, Bay mass balance	North Bay	Sediment	SedWG STLS SPLWG ECWG Delta RMP	SFEI	2020

Detailed Project Descriptions

Projects are grouped by oversight workgroup

Emerging Contaminants Workgroup

Identification and Pilot Monitoring of High-Priority Current Use Agricultural Pesticides in Region 2

The RMP CEC Strategy uses a tiered risk framework to rank the relative concern associated with emerging contaminants in the Bay. Current use pesticides (CUPs) are listed in Tier I (Possible Concern), excluding fipronil and pyrethroids (Moderate Concern and Low Concern, respectively). Relatively few current use pesticides have been monitored in the Bay; the CEC Strategy suggests screening level monitoring efforts for Tier I contaminant families to determine their concentration in ambient Bay water and sediment, effluent, runoff, and biota.

There are over 1,000 CUPs in existence; therefore, prioritizing which to monitor in the Bay is essential. The Department of Pesticide Regulation has developed a tool that combines spatially-explicit use data for agricultural pesticides with USEPA aquatic life benchmarks to provide a systematic prioritization of potential risks to wildlife. (Urban use data is not available at this spatial resolution.)

We propose employing this tool to prioritize and map agricultural pesticide use in Region 2. Pilot water and sediment monitoring can then be conducted within the tidally-influenced portion of a major agricultural tributary, and within the Bay near the point of discharge and within the relevant embayment. A previous RMP pesticide mapping exercise indicated the majority of agricultural pesticides were applied in Napa County, suggesting monitoring be focused on the Napa River and subsequently San Pablo Bay.
A key consideration is the loads of pesticides potentially discharged via the Napa River relative to those discharged via the Sacramento-San Joaquin River Delta. If the same pesticides are used in both regions, the Napa River might be considered a relatively minor pathway for pesticides to enter the Bay. However, a comparison of both the previous RMP pesticide mapping exercise and a more recent prioritization for the agriculturally-similar Russian River watershed with DPR's current prioritization for pesticides potentially discharged to the Bay via the Delta suggests that while there is some overlap, there are also notable differences in the types of pesticides used in the Napa River and Delta watersheds. These usage differences suggest the Napa River may contribute different types and levels of pesticides to the Bay, with a unique array of potential risks that should be evaluated.

Characterizing PFAS in SF Bay Seals

Perfluoroalkyl and polyfluoroalkyl substances (PFASs) are an important class of chemicals that are widely used in industrial, commercial and residential applications. They are of concern because they are highly persistent and many are associated with a myriad of health effects. Some of the highest concentrations in the world of perfluorooctane sulfonate (PFOS) have been observed in Bay seals and cormorants. The RMP routinely monitors for about a dozen of the ~3,000 PFASs in use today. This study will use recently developed methods to provide a more comprehensive picture of the complete suite of PFASs in seals from the Lower South Bay. This is of critical importance as manufacturers phase out the use of PFOS and perfluorooctanoic acid (PFOA) in favor of alternative PFASs. Very little is known about these alternatives – both in terms of chemical structure and production volumes. Hence this study will produce a unique dataset for identifying the presence of these alternatives. Use of this novel method will be critical for tracking the use of this very pervasive and toxic class of compounds.

Non-targeted analysis in South Bay harbor seals

Non-targeted analysis is a powerful and rapidly evolving new tool in environmental investigations that allows researchers to screen samples for thousands of chemicals to identify new contaminants that may have been missed by traditional targeted methods. The purpose of this study is to screen for a wide range of contaminants in archived Bay harbor seal tissues using non-targeted and related suspect screening analytical approaches. Harbor seals are apex predators in the Bay, which means contaminants that biomagnify tend to be present in their tissues at higher concentrations compared to species lower in the food web.

Previous RMP investigations have indicated that South Bay harbor seals are exposed to high levels of per- and polyfluorinated alkyl substances (PFAS), a broad class of fluorine-rich contaminants that are of growing environmental concern because they are ubiquitous, extremely persistent, and several have been shown to be highly toxic and bioaccumulative. However, only a few different PFAS were examined in these previous studies. A recent study of marine mammals collected across the northern hemisphere identified an additional 33 PFAS that have not been examined in Bay species (Spaan et al., 2019).

In addition to PFAS, harbor seals tend to bioaccumulate hydrophobic and persistent chlorinated and brominated organic contaminants. The RMP funded a non-targeted analysis of San Francisco Bay seals nearly a decade ago, which identified chlorinated and brominated organics including legacy pollutants and a few additional contaminants that had not been previously monitored (Sutton and Kucklick, 2015). Methods have improved significantly in recent years; an examination of Bay samples using improved methods may reveal new insights.

PFAS bind to proteins and tend to accumulate in the blood and liver, while chlorinated and brominated organics tend to accumulate in fatty tissue. Samples of harbor seal liver and blubber archived from animals found in the South Bay will be analyzed to screen for a wide range of contaminants. The number of samples analyzed will depend on the level of funding. Higher levels of funding would permit a comparison of contaminants in samples collected recently and in previous time periods to identify temporal trends. Results may indicate the presence of PFAS and other contaminants accumulating in Bay wildlife that are not typically analyzed in targeted monitoring studies. Alternatively, should results reveal most compounds are already included in targeted monitoring studies, this will help confirm that current Bay monitoring sufficiently captures priority contaminants.

Azo Dyes in Bay Margin Sediments

More than 10,000 dyes are used in textile manufacturing, and azo dyes account for >70% of the global industrial demand. These dyes are not only used in textiles, but also in lacquers and varnishes, printing inks, plastics, and to color cosmetics, waxes (e.g., candles), soaps, leather, and paper. In addition to their environmental release as part of industry waste, azo dyes may also be released to the environment via the use (e.g., laundering) and disposal of products containing them. Brominated and chlorinated azo dyes are structurally diverse, and therefore have diverse environmental fates and toxicities, but many are mutagenic, genotoxic, or carcinogenic. Despite their potential risk to aquatic food webs, environmental monitoring of these dyes remains relatively rare. However, recent studies revealed brominated azo dyes to be the most commonly detected and abundant contaminant in indoor dust (Dhungana et al., 2019; Peng et al., 2016). Other recent studies have implicated halogenated azo dyes in the mutagenicity of urban river water and sediment samples (de Aragão Umbuzeiro et al., 2005; Palma de Oliveira et al., 2006; Vacchi et al., 2017). Halogenated azo dyes have not been previously monitored in San Francisco Bay; monitoring is needed to assess whether and to what extent these contaminants are present in the Bay. The goal of this study is to assess Bay sediment samples for brominated and chlorinated azo dyes using high-resolution mass spectrometry. This project would use archived margin sediment samples from Lower South Bay. As an add-on option, this project could also include analysis of archived North Bay margin sediment, to be collected in 2020, in order to begin to assess spatial distribution of azo dyes within the Bay. Concentrations in Bay sediment would be compared to available toxicity thresholds to assign detected chemicals to a tier in the RMP tiered risk-based framework for CECs and determine whether follow up study is needed. As an additional add-on option, samples could also be assessed for microplastics, as halogenated azo dyes may be riding on microfibers.

Developing Bioscreen Thresholds for the Glucocorticoid Receptor Cell Assay

Contaminants of emerging concern (CECs) exerting endocrine disrupting properties present a major concern for the health of coastal ecosystems. While they are typically found at very low concentrations (picogram to nanogram per liter range), they can act jointly via a common mode of action leading to adverse effects on aquatic organisms. This issue cannot be fully addressed using the current chemical-by-chemical risk assessment approach, which targets known chemicals and relies on chemical specific toxicity thresholds. Moreover, traditional toxicity endpoints (e.g. growth and survival) do not represent the variety of other relevant sublethal effects that can be induced by prolonged exposure to low levels of CECs, such as impaired tissue development, immune functions, behavior, or reproduction. In vitro cell assays have been proposed as rapid bioanalytical screening tools to detect and integrate the response of multiple known and unknown CECs, thus providing the potential for a more comprehensive assessment approach. But before cell assays can be incorporated in monitoring programs, it is essential to establish the quantitative linkage between key cellular events and organismal responses, a key component in developing a robust interpretive framework for bioanalytical screening results. Due to the lack of relevant ecotoxicological data for many CECs, such linkage has only been characterized for a few classes of CECs (e.g. estrogenic chemicals). This project aims to advance the role of cell assays in environmental assessments by developing bioanalytical screening thresholds associated with relevant toxicity endpoints for a group of understudied CECs known as steroidal anti-inflammatory drugs or glucocorticoids (GCs). This bioanalytical interpretive framework will help water quality managers in their task to protect beneficial uses of aquatic resources by identifying and prioritizing CECs that are most likely to impact aquatic life. Chemical by chemical monitoring may not be effective or adequate to evaluate their occurrence and impact on aquatic life. Bioanalytical screening tools capable of integrating the response of chemical mixtures present a complementary and efficient method to streamline monitoring and assessment of receiving waters.

Efficient Extraction of Endocrine Disruptors from Sediments from San Francisco Bay

Pharmaceuticals and personal care products are found below sewage treatment plants in many parts of the world at concentrations that have biological activities in aquatic organisms (reviewed in (Cooke et al. 2013). The hormone mimics that are most troubling include chemicals that act as estrogens, androgens or glucocorticoid mimics. Recent publications suggest that sediment may be a sink for endocrine active compounds (Sangster et al. 2014; Zhang et al. 2015). In a recent study, the methods used may not have efficiently extracted contaminants from sediments from San Francisco Bay. The current project will investigate alternative extraction methods that may work better for polar compounds that elicit endocrine activities and begin to develop a method that can be standardized for adequate monitoring strategies in the bay. 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. This targeted study will have two objectives: (1) To develop a robust extraction method for endocrine disruptors that may be bound to sediments obtained from San Francisco Bay (2) To test the extracts by two in vitro assays for estrogen receptors and glucocorticoid receptors. The overall objective of this effort is to develop a method to adequately extract hormone mimics from bay sediments.

Microplastics Workgroup

Monitoring Microplastics in San Francisco Bay Sport Fish

Plastic has become a way of life in modern society. Annual global plastic production was estimated to be 299 million tons in 2013; nearly a third of plastic production (75 to 80 million tons) is used for plastic packaging including single-use items. Plastic does not readily degrade but it does fragment into smaller and smaller particles. Until recently, in the Bay Area, concern was primarily focused on management of larger plastic debris, while smaller plastic debris, referred to as microplastic (<5 mm wide) went largely unnoticed. However, in 2015, the RMP conducted a limited special study to monitor microplastic in treated effluent from eight wastewater treatment facilities and nine ambient Bay surface water locations. The concentrations of microplastic in the Bay were higher than similar studies of the Great Lakes and Chesapeake Bay. These findings resulted in considerable media attention and spurred policy actions at a State and Federal level. The RMP followed up this limited pilot study in 2016 by developing management questions and conducted a one-day workshop to vet these questions and determine consensus priorities for future work. These priorities were articulated in the 2016 RMP Microplastic Strategy document that has been reviewed by an external expert panel and RMP stakeholders. In 2016, SFEI was able to secure funding ($880,000) to begin a two-year project addressing several aspects of the microplastic strategy including an evaluation of microplastic in sediment, water, effluent, stormwater and prey fish; however, a high priority element, the monitoring of sportfish was not included based on the timing of the grant. The RMP will sample sportfish in 2019. A small amount of funding has been made available to archive some fish samples for later analysis for microplastics. Funding for a Supplemental Environmental Project will allow us to analyze the archived sportfish for microplastic, enable analyses of both gut and tissue samples to assess the potential for translocation of fibers from the gut to tissue, review and synthesize the data, prepare a report and upload the data to CEDEN. This information will be important for assessing human health risks. The budget for this project is scalable by the number of samples analyzed.

Microplastics in South Bay sediment cores

Following findings of abundant levels of microplastics in San Francisco Bay, the RMP has elevated microplastics to the Moderate Concern category within the RMP's emerging contaminants tiered risk-based framework. The RMP's recommended strategy for Moderate Concern contaminants includes determining whether Bay concentrations are increasing or decreasing in the Bay. We propose to evaluate sediment as a suitable matrix for monitoring microplastic concentration trends by measuring microplastics in sediment cores. In the summer of 2020, there are two RMP studies collecting and analyzing sediment cores, providing the opportunity to collect samples with minimal additional costs. Additionally, microplastic concentration trends in the sediment core from one of the sites will be compared to trends in PCB sediment concentrations.

Tire particle and contaminant fate and transport

The Tires Conceptual Model project, which was funded in 2020 and is currently underway, is identifying several key data gaps crucial to identification and design of management actions. All of these data gaps relate to release of contaminants from tire particles and their fate and transport. This project proposes to fill the highest priority of those data gaps – particle surface area measurements – and to complete related, relatively inexpensive additional tests (morphology, particle size distribution, and density) to support conducting the particle surface area measurements and to inform future monitoring and management efforts.

Results from this project are expected to determine whether tire wear particles that travel primarily through the air (smaller particles) or the particles that fall on or near the road (larger particles) have the greatest overall surface area, and thus the greatest potential to support formation and release of tire-related pollutants like 6PPD-quinone into stormwater and the Bay. This information has tremendous implications for tire-related mitigation strategies. The information will also improve interpretation of tire-related toxicity data from the scientific literature that we would like to use to support the RMP. It will also inform monitoring approaches for tire particles and tire-related contaminants.

The results from this project will have implications for both the proposed RMP Tires Strategy and the proposed Stormwater CECs Monitoring Strategy. This project provides foundational information for the strategy, informs and improves science generated by others that we hope to use to support the RMP, and provides information that will be immediately useful to state management agencies addressing (1) pollutants that leach from rubber particles (California Department of Toxic Substances Control) and (2) the particles themselves (California Ocean Protection Council).

Nutrients Technical Workgroup

Biogeochemical transformation rates in San Francisco Bay

This study would quantify nutrient-related transformation rates in San Francisco Bay (SFB). The SFB Nutrient Management Strategy (NMS) is currently carrying out a multi-year field study measuring nutrient cycling in the South Bay (SB) and Lower South Bay (LSB). However, major data gaps remain related to nutrient transformation rates in other regions of SFB. The goals of this work would be to conduct targeted field studies in one or more other regions to: (1) establish a better understanding of nutrient dynamics in the system, and (2) use the study results to refine and calibrate the biogeochemical model under development by the NMS. These measurements would lead to a better mechanistic understanding of nutrient cycling in SF Bay and improved model performance that would help to inform upcoming nutrient management decisions.

PCB Workgroup

Richmond Harbor PCB Conceptual Model Development

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 (PMUs) 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 was second (2016-2017). The third will be Steinberger Slough in San Carlos (2018). The purpose of this study would be to complete the fourth and final conceptual model for Richmond Harbor. The report will also summarize conclusions across all four PMUs.

Second survey of PCBs in prey fish in San Leandro Bay

This study would perform a second survey of PCBs prey fish in the San Leandro Bay priority margin unit (PMU) as part of a long-term monitoring plan. The first survey was performed in 2016.

Sediment Workgroup

Filling Bathymetry Data Gaps

The USGS recently completed an updated DEM for San Francisco Bay based on all available bathymetry data. In addition to a lack of data in some locations, particularly close to the Bay margin, some of the data used are over thirty years old. In order to develop an accurate sediment budget and better understand the transport of sediment within the Bay, bathymetric surveys will be conducted in

priority areas. The extent of the project will depend on the amount of available funding. A list of priority areas is being developed by the Sediment Workgroup.

Toxicity Reference Value Refinement

Toxicity Reference Values are used as a conservative screening tool to efficiently evaluate whether observed invertebrate test organism body burdens could indicate adverse ecological effects on benthic organisms in situ. SFEI published a report in 2018 (Lin et al., 2018) in an attempt to promote consistent application of TRVs to evaluate bioaccumulation testing results submitted by individual dredgers in San Francisco Bay for the six different contaminants with bioaccumulation trigger values (PCBs, PAHs, DDTs, chlordanes, dieldrin, dioxins/furans, and mercury). The assessment provided low confidence level TRV recommendations for PCBs, DDTs, total chlordane, and dieldrin and was not able to provide a recommendation for dioxins/furans or total PAHs due to insufficient quality data in the Environmental Residue Effects Database (ERED). The report recommended including data from outside the ERED for additional relevant, published, peer-reviewed sediment toxicity studies. This study would identify additional studies that could be included to increase the confidence level of the SFEI report, update the report, and determine what (if any) additional data gaps exist to provide higher confidence TRV screening values for San Francisco Bay.

Estimation of future sediment loadings from local tributaries

With the development of the Bay regional watershed model, future erosion and sediment transport processes in watersheds that drain to the Bay can now be represented and simulated in a dynamic manner. The model predicts sediment loadings at event scale for tributaries based on the physically-based processes representation. The erosion and transport of sediment are driven by instantaneous rainfall intensity and transport capacity of flow. Thus the model can evaluate the impact of total rainfall changes in the future, as well as the impact of the rainfall pattern changes (i.e., more extreme rainfall events). We propose to use the dynamic sediment model with downscaled climate model predictions to estimate future sediment loadings to the Bay from local tributaries.

Selenium Workgroup

Identifying mechanisms controlling selenium bioavailability at the base of the food web in North versus South San Francisco Bay

Preliminary results from a 2017 study indicated that dissolved concentrations of selenium (Se) in South San Francisco Bay were considerably elevated over those measured in North Bay (NB) but bivalve Se concentrations were comparable. Based on these data Se bioavailability at the base of the food web appeared to be lower in SB than in NB but the underlying mechanisms for those

differences are not presently understood. There are a number of potential bio/chemical mechanisms that could potentially influence bioavailability including 1) aqueous speciation of filtered selenium (i.e., selenite, selenate,selenide), 2) solid phase speciation in particulate material (i.e., inorganic or elemental vs. organic forms including selenocysteine/selenomethionine), and 3) algal species (dinoflagellates, cryptophytes, diatoms, chlorophytes). In addition to bio/chemical mechanisms, physical transport processes including residence times could influence Se uptake into phytoplankton. A scoping study is needed to evaluate some of these potential mechanisms that could be affecting differences in selenium bioavailability between North and South Bay and to address knowledge gaps important in the refinement of the San Francisco Bay Se criterion.

Sources Pathways and Loadings Workgroup / Small Tributaries Loading Strategy Team

Develop a Statistical Model for Trends Evaluation

A key task for regional stormwater management is to assess how regional scale pollutant loads to the Bay are changing through time (and consequently how Bay Water Quality is changing). Recent RMP efforts have led to progress towards determining a methodology for tracking regional trends. This progress was made by completing a trend analysis using a statistical modeling effort for one extensively monitored Bay Area watershed, the Guadalupe River. That analysis resulted in valuable information as to how much of a change could be identified (given the natural variability of pollutant loads across storms and across years) and what the sampling program must look like to detect those changes. However, the Guadalupe River is a large and complex Bay Area watershed, and therefore represents just one type of watershed in the Bay Area. Results for the Guadalupe River analysis will not apply to all watersheds regionally. As such, a similar analysis is desired on a second, smaller and less complex watershed (Zone 4 Line A in Hayward, CA). This project would refine and complete the statistical trend analysis for Zone 4 Line A, to serve as a second test case for monitoring program design and methodology for evaluating loading trends in individual watersheds. The characterization of the variance in load predictability observed in Z4LA will advance our understanding of the range of uncertainty in estimating loads and trends in the region. Results from the two watershed analyses will be used to develop a sampling program for trends assessment over time, and will enable us to make an estimate of field, lab, and data management costs for such a program going into the future.

Expanded Pilot Testing of Remote Stormwater Sampling Devices

Stormwater sampling in urbanized small tributaries around SF Bay over the past 15 years has revealed some tributaries episodically yield relatively high pollutant concentrations and loads. These highly unpredictable releases of pollutants during certain storms are hypothesized to be associated with pollutant release and transport from source areas that likely make up < 1% of the watershed

area. Although further sampling in these watersheds may reveal predictable patterns, the highly episodic nature of these releases makes capturing these events using a storm based grab sampling approach infeasible since it might take many years (sampling nearly all moderate to large storms) to see another release. However, such watersheds are of high management interest both in locating and abating sources and also in measuring success such as reduced loads. To support the development of the STLS Trends Strategy and evaluation of trends over time, and to further investigate loads in watersheds with episodic pollutant transport events, a form of continuous sampling is needed that has an acceptably low likelihood of missing these "rare" release events. One option for consideration is to collect a flow-paced composite stormwater sample using an in-stream remote micro-pump sampler previously developed by the EPA and currently being improved by the USGS. Using this low-cost remote sampling method, and by collecting several micro-pumped, small aliquot super-composites, all moderate and large storm events may be captured and analyzed each wet season. The super composites could individually be analyzed and applied to the flow data to estimate seasonal and annual loads, and to support dynamic simulation model calibration and assessment of pollutant trends. This proposal aims to develop and test the use of this method and make recommendations for future use. The watersheds of Guadalupe River or Sunnyvale East Channel may be ideal candidates for methods development and testing. Estimated budget is $80k per watershed during the start-up year and $60k per watershed for subsequent years but final budgets would be influenced by the final scope and the sampling locations chosen. Estimated costs including data management costs based on two sites for year 1: $160k; year 2: $120k.

Mallard Island Loads Study

Contaminants from the Central Valley watershed pass into San Francisco Bay via the channel adjacent to Mallard Island near Pittsburg, CA. The RMP, working with USGS and DWR data, studied this location for six years (Water Years 2002-06, 2010), collecting water samples during storms and analyzing these for suspended sediment, PCBs, OC pesticides, PAHs, PBDEs, dioxins/furans, mercury speciation (total, dissolved, methyl and acid labile), and selenium. contaminant loads were estimated by extending RMP suspended sediment load methods published in 2006 using 1990s data. Subsequent USGS work suggests a step decrease in North Bay SSC since 1999, so the earlier published regression-based formulas may no longer be accurate given likely changes in vertical and horizontal SSC variation in the water column and recent restoration of some Delta Islands. Since the Delta is the largest single supply for sediments and many contaminants to San Francisco Bay, errors in loading estimates from this source may have large impacts on net Bay budgets.

Analysis and Reporting of Non-targeted Analysis (NTA) Sediment Data

Study Budget, Total: $22,800 – $37,600

SFEI Contacts:

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- Financial – Jennifer Trudeau, jent@sfei.org

Analytical Laboratory Partner: Lee Ferguson Lab, Duke University

Study Description

Non-targeted analysis, a key element of the RMP's CEC strategy, can help to provide a measure of assurance that the RMP is not missing unexpected yet potentially harmful contaminants simply because of failures to predict their occurrence based on use or exposure prioritization criteria. This type of non-targeted study can lay the foundation for future targeted CEC monitoring by helping to identify new potential contaminants of concern without a priori knowledge of their occurrence. The RMP has conducted successful non-targeted analysis of nonpolar, fat-soluble compounds in bivalve tissue and seal blubber (Sutton and Kucklick 2015), and polar, more water-soluble compounds in Bay water and wastewater effluent (Overdahl et al. 2021), as well as of fire-impacted stormwater (Miller et al. 2021).

In 2018, the RMP funded a study using non-targeted techniques from two different labs (led by Lee Ferguson at Duke and Eunha Hoh at San Diego State University), to examine both nonpolar and polar contaminants in Bay sediment, a matrix that had not yet been screened. Sediment is an important Bay matrix that may act as an important sink for both polar and nonpolar contaminants, and transfer them to the food web, particularly via exposure of lower trophic level benthic organisms. The RMP has conducted targeted chemical monitoring of ambient Bay sediment for decades. This study was the first to characterize Bay sediment via non-targeted analysis. It included assessment of near-shore, "margin" sediment from sites that are more likely to be depositional sediment environments influenced by current uses of chemicals.

The 2018 study proposal deliverables included a draft manuscript that would also serve as an RMP technical report. The preparation of this draft manuscript for publication in a peer-reviewed journal was originally envisioned as the responsibility of the analytical partner, resulting in budgeting relatively little RMP staff time towards reporting. At this time, the portion of the work led by Eunha Hoh is being reported in a manuscript led by the Hoh lab. However, Lee Ferguson no longer has sufficient staff capacity and is now unable to prepare a manuscript for his portion of the project and has passed the data to SFEI staff after only preliminary analysis (provided data tables include structure annotation and putative identification of detected compounds in each sample). To get the most out of this dataset, SFEI staff will need to further assess distribution patterns, pathway influences, potential compound sources, and available toxicity information to inform prioritization.

The original study proposal deliverables also included a plain language RMP fact sheet developed by SFEI staff describing the results and their implications for RMP stakeholders and the general public. Preparation of this document would allow comparison and synthesis of the results from Duke and

San Diego State University efforts. This fact sheet would be a companion to past RMP fact sheets for non-targeted analysis of fat-soluble compounds in harbor seals and mussels (Sutton and Kucklick 2015) and polar compounds in water, wastewater, and stormwater (Sun et al. 2020).

Depending on available resources and RMP communications priorities, revised deliverables can include SFEI staff preparation of a technical report (Option 1 in the Budget table) or a draft manuscript (Option 3), as well as a 2-page fact sheet to describe the results and their implications modeled after past RMP fact sheets for non-targeted analysis (Options 2 and 4).

Budget

Task	**Estimated Staff Hours**	**Estimated Cost**
Data analysis	60	$10,300
GIS	8	$1,300
Writing		
Technical report	50	$9,500
Manuscript	75	$14,000
Fact sheet data synthesis & writing	30	$5,100
Fact sheet design	20	$4,500
Response to reviewer comments		
from RMP	10	$1,700
from Journal peer-review	20	$3,500
Total for Fact sheet		$11,300
Total for Option 1: RMP Technical Report only		**$22,800**
Total for Option 2: RMP Technical report + Fact sheet		**$34,100**
Total for Option 3: Manuscript only		**$26,300**
Total for Option 4: Manuscript + Fact sheet		**$37,600**

(Note: while there is a small amount of money left in the original 2018 project budget, this amount is not included in the proposed budget; it is intended to support the manuscript being led by our San Diego State University analytical partners and initial scoping of the revised deliverables approved by the RMP.)

Timeline

June 30, 2023 – Completion of data analysis
August 31, 2023 – Draft report/manuscript
September 30, 2023 – Draft fact sheet
November 30, 2023 – Final report/manuscript
December 31, 2023 – Final fact sheet

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PFAS in Archived Sport Fish Communications Supplement

Study Budget, Total: $15,000 - $25,500

SFEI Contacts:

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- Financial – Jennifer Trudeau, jent@sfei.org

Analytical Laboratory Partner: SGS AXYS

Study Description

Perfluoroalkyl and polyfluoroalkyl substances (PFAS) are an extensive family of synthetic fluorine-rich chemicals. These compounds are generally known to be persistent and toxic, with many individual PFAS also identified as bioaccumulative. These growing concerns have made PFAS a major concern across California and Federal agencies as related to human and ecological health.

The RMP has a robust sport fish status and trends monitoring program designed to assess levels of legacy contaminants, such as PCBs and mercury, with a limited amount of PFAS analysis beginning in 2009. The most recent round of PFAS sampling occurred in 2019 at six sites across the Bay, including samples of five species, but only 16 samples in total were analyzed (Buzby et al., 2021). PFAS were observed in 14 of the 16 samples, with higher levels noted in the South Bay. To improve understanding of PFAS occurrence in sport fish and inform future monitoring design, the RMP funded a study to examine archived samples of four fish species from previous RMP sport fish sampling events in 2009, 2014, and 2019 across subembayments. A total of 60 samples were analyzed, adding significantly to the currently available sport fish data and improving the potential to elucidate any temporal or spatial trends in the Bay.

The 2022 study proposal deliverables included a draft report with a potential to include a manuscript for publication. However, the appropriated funding is not enough to cover the needed analysis and work to create a manuscript highlighting the recent sport fish efforts in the Bay. This funding request would support SFEI staff to prepare a draft manuscript. Publishing this work in a peer-reviewed journal is important to add to the growing body of literature regarding PFAS in fish and widely increase the reach of the important studies done by the RMP. Federal agencies such as USEPA generally do not consider monitoring studies that have not gone through formal peer review as part of journal publication. Likewise, many academic and government scientists outside of California are unaware of RMP data and information on PFAS, limiting the influence of our findings. Further, publication of this study is key to informing overall water quality impacts of PFAS in San Francisco Bay and the potential need for consumption advisories in California, as other states (such as Michigan and New Jersey) have implemented.

In coordination with this manuscript, an additional communication supplement is recommended to highlight this work at the SETAC Conference in Europe in May. This would include costs for attendance as well as creation of a poster synthesizing the findings of the report/manuscript, modeled after previous RMP conference posters. This effort further aids in improving the audience informed of our work while building on peer networking and partnership opportunities globally. (NB: The potential conference attendant, Miguel Méndez, is now located in Boston, which reduces the relative cost of transit to Europe relative to someone traveling from the Bay.)

Budget

Task	Estimated Staff Hours	Estimated Cost
Writing		
Manuscript	70	$10,900
Response to reviewer comments		
from RMP	10	$1,400
from Journal peer-review	20	$2,700
SETAC Conference Presentation		
Conference & Travel Incidentals (fees, flights, room and board)	-	$3,300
Poster Writing and Design	32	$5,200
Attendance	16	$2,000
Total for Manuscript		**$15,000**
Total for Conference		**$10,500**
	TOTAL	**$25,500**

(Note: There are limited/no allocated funds within the archived sport fish study budget for a manuscript or additional communications efforts. These funds would add to available funds for a report, combining the writing process for both a report and manuscript.)

Timeline

March 31, 2023 – Completion of preliminary data analysis
April 9, 2023 – Draft Poster
April 27, 2023 – Final Poster
July 31, 2023 – Draft manuscript
October 31, 2023 – Final manuscript

References

Buzby, N., Davis, J., Sutton, R., Miller, E., Yee, D., Wong, A., Sigala, M., Bonnema, A., Heim, W., & Grace, R. (2021). Contaminant Concentrations in Sport Fish from San Francisco Bay: 2019 (SFEI Contribution No. 1036). San Francisco Estuary Institute. https://www.sfei.org/documents/contaminant-concentrations-sport-fish-san-francisco-bay-2019

DESTINATION CLEAN BAY

Decision Support Tools for Multi-Benefit Water Quality Improvements

PROPOSAL TO THE EPA WATER QUALITY IMPROVEMENT FUND 2022
SUBMITTED BY THE **SAN FRANCISCO ESTUARY INSTITUTE** with

San Francisco Bay Regional Water Quality Control Board

San Francisco Bay Regional Monitoring Program
Steering Committee composed of state and federal regulators, municipal wastewater, industrial wastewater, municipal stormwater, and dredging entities

San Francisco Bay Nutrient Management Strategy
Steering Committee composed of state and federal agencies, scientific partners, dischargers, and a non-profit organization

Bay Area Clean Water Agencies
A consortium of 65 wastewater agencies and municipalities

SEPTEMBER 20, 2022

PROPOSAL TO THE EPA WATER QUALITY IMPROVEMENT FUND 2022

Applicant Name: San Francisco Estuary Institute

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DUNS #: 187018866

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SFEI San Francisco Estuary Institute

ABSTRACT

Watershed and Bay monitoring and modeling are the focus of the tool development proposed in ***Destination Clean Bay: Decision Support Tools for Multi-Benefit Water Quality Improvements***. The proposed work builds on the strong foundation established by the Nutrient Management Strategy (NMS) and Regional Monitoring Program for Water Quality in San Francisco Bay (RMP) and integrates across these efforts to identify the optimal path toward the multi-benefit management of vexing water quality issues. In particular, these advancements include the development of new models and decision support tools that provide managers with the information needed to evaluate nutrient management scenarios for the fundamental health of the Bay, identify PCB and contaminant of emerging concern (CEC) reduction opportunities for enhanced aquatic life and human health, and prioritize sediment management needs for restoration and community resilience. The NMS and RMP are stakeholder-guided, technically robust programs that have excelled at collecting long-term monitoring data and developing predictive models for watersheds and the Bay. The work proposed will be completed in four years and will inform the review, revision, and implementation of regional stormwater and wastewater permit conditions, nutrient load management options, PCB and CEC management plans (including the PCB TMDL), and sediment management options.

WATER QUALITY IMPROVEMENTS AND LINKAGE TO STRATEGIC PLANS

Since 1993, the San Francisco Estuary Institute (SFEI) has managed the Regional Monitoring Program for Water Quality in San Francisco Bay (RMP), a multi-faceted, management-driven, stakeholder-guided program that tracks water quality in San Francisco Bay (SF Bay). During that time, the RMP has relied on discharger funding to perform long-term monitoring and special studies that place the RMP among the leading long-term monitoring programs in the world. The RMP has built one of the most forward-looking contaminants of emerging concern (CECs) programs and informed numerous management actions on chemical use. RMP data and models have also informed numerous stormwater management projects to control PCBs and other legacy contaminants. In partnership with the US Geological Survey (USGS), the RMP detected a steady increase in algae in the Bay, starting around 1995, suggesting a waning resistance of this critical ecosystem to harmful algal blooms in response to high nutrient inputs. This finding led to a separate, major collaborative regional monitoring effort—the Nutrient Management Strategy (NMS)—to address this topic.

The proposed project serves to leverage decades of locally-funded work by the RMP and NMS to directly inform an unprecedented level of investment in water infrastructure anticipated in the next decade. The activities proposed under this project will inform near- (1-5 years) and long-term (5+ year) high-stakes management decisions. Local, state, and federal agencies face billion-dollar decisions about water supply development, wastewater infrastructure, stormwater management, navigational channel dredging, and wetland restoration. The data gathering and decision support tools proposed here represent the culmination of decades of monitoring and model development at a time when a suite of regulatory and non-regulatory management drivers are converging. Significant investments could be misapplied without these tools and the ability to meet future needs could be jepardized.

Data collected as part of this project will feed into the development of models and decision support tools to 1) determine whether the Bay receives sufficient sediment to protect vulnerable communities and habitats from rising sea levels; 2) shape PCB and CEC remediation strategies to protect aquatic

life and increase safe fish consumption by vulnerable populations; 3) directly inform billions of dollars in stormwater and wastewater investment for gray and green infrastructure and develop nature-based solutions (NbS) for multi-benefit wastewater management; and 4) assess whether climate-driven physical changes to the system make SF Bay more susceptible to harmful algal bloom occurrences, such as the massive bloom and resulting fish kill in August of 2022, more prone to prolonged fish contamination, or less likely to support existing or planned habitat restoration and flood control strategies.

Linkage to EPA's Strategic Plan and CCMP/Estuary Blueprint

Due to the breadth of applications for the tools proposed herein, this project supports all relevant goals and objectives from **EPAs 2022-2026 Strategic Plan** (Strategies 1, 2, 4; Goals 1, 2, 5; and Objectives 1.2, 2.1, and 5.2). The outputs and outcomes of this project most directly align with Goal 1 (Tackle the Climate Crisis) and Objective 1.2 (Accelerate Resilience and Adaptation to Climate Change Impacts) by developing tools to assess water quality under future conditions and developing multi-benefit NbS for water quality improvement and climate adaptation. The decision support tools developed as part of this project also support Goal 5 (Ensure Clean and Safe Water for All Communities) and Objective 5.2 (Protect and restore waterbodies and watersheds) by further evaluating contaminant pathways to the Bay, fate within the Bay, and management actions to address these issues.

This project maintains consistency with all local or regional plans calling for enhanced shoreline resiliency and improvements to SF Bay water quality, including the **Comprehensive Conservation and Management Plan (CCMP)** for the San Francisco Estuary, or **Estuary Blueprint**. Specific objectives and actions of the CCMP most relevant to this project include those related to scientific research, regional governance, and informing management actions (Objective C, L, J, Action 20, 21), climate resilience through multi-benefit solutions (Objective F, Action 1, 3, 4, 6), and mitigation or remediation of legacy and on-going pollution (Objective I, Action 19 and 22).

Climate Change Resiliency

Sea level rise, runoff after wildfires, and changes in rainfall patterns (e.g., droughts and floods) all affect the types of contaminants, concentrations and loads, dominant pathways of delivery, and fate within the Bay. This proposal incorporates sea level rise and changes in rainfall patterns as inputs to the models to generate future water quality scenarios. Specifically, sediment modeling in the watersheds and Bay will inform plausible scenarios regarding the region's capacity to supply sufficient sediment to adapt to various sea level rise projections. Nutrient modeling of future scenarios will consider the consequences of rising temperatures, changes in ocean conditions, and factors that affect the stratification of the water column.

Scenario modeling will provide critical information to regulators and managers about the likelihood that harmful algal blooms like that seen in the summer of 2022 will occur in the future, and the types of management actions (e.g., nutrient load reductions) needed to prevent or mitigate the impacts of such events. The SF Bay Regional Water Quality Control Board has requested numeric estimates of nutrient load reductions to inform the SF Bay Nutrients Watershed Permit for Wastewater Dischargers. Watershed and Bay models can also be used to assess how sea level rise, runoff following wildfires, and watershed hydrology or Bay hydrodynamic changes affect PCB and CEC delivery to the Bay and future impairment of the Bay. This information builds the case for sufficient funding for green and grey infrastructure upgrades to address the climate crisis.

PROJECT ACTIVITIES, OUTPUTS, AND OUTCOMES

Destination Clean Bay has four major tasks with a suite of outputs and outcomes illustrated in Figure 1 and summarized in Table 1. The first three tasks represent the culmination of decades of work by the RMP, NMS, and numerous partners to build decision support tools necessary to inform a coming wave of water quality improvement investments. Task 1, **High Priority Data Collection for Model Development**, includes monitoring activities and data synthesis for PCBs, CECs, and sediment that are needed to develop a suite of decision support tools. While these activities are ongoing priorities for the RMP and NMS, USEPA funding for these activities will accelerate the timeline so they are better aligned with management decisions. Tasks 2 and 3 leverage the data collected under Task 1 to improve the accuracy of the decision support tools under Tasks 2 and 3. In Task 2, **Dynamic Watershed Modeling**, the team will leverage the last decade of stormwater monitoring and modeling to further develop a dynamic watershed model to enable load estimations for multiple contaminants, inform the location of gray and green infrastructure projects throughout the region, enable scenario testing at the watershed scale, and provide boundary conditions for in-Bay modeling. Task 3, **Estuarine Sediment and Water Quality Management Toolbox**, upgrades the existing decision support framework for PCBs, CECs, nutrients, and sediment in the Bay, while leveraging the cutting-edge modeling capabilities developed through the NMS. Task 4, **Management Applications**, uses the tools from Task 3 to inform near-term regulatory actions and infrastructure investments. Water managers in the region currently expect to allocate unprecedented

White sturgeon carcass at Coyote Point, San Mateo Co. on August 23, 2022, coinciding with the Bay's largest-ever algal bloom which lasted over a month. To date, tens of thousands of fish have been observed along the shoreline, including >150 white sturgeon (Acipenser transmontanus) and several green sturgeon (Acipenser medirostris).

levels of funding for stormwater and wastewater improvements. The outputs and outcomes from this project will directly inform these projects and guide investments to address the the climate crisis and aging infrastructure.

Destination Clean Bay's approaches build on peer-reviewed science informed by a network of advisors and partners too large to capture in this proposal. The project builds on cutting-edge research led by the RMP and NMS on CECs, nutrients, PCBs, and sediment to advance its outcomes and the region's shared objective to implement highly consequential projects for a more resilient San Francisco Bay.

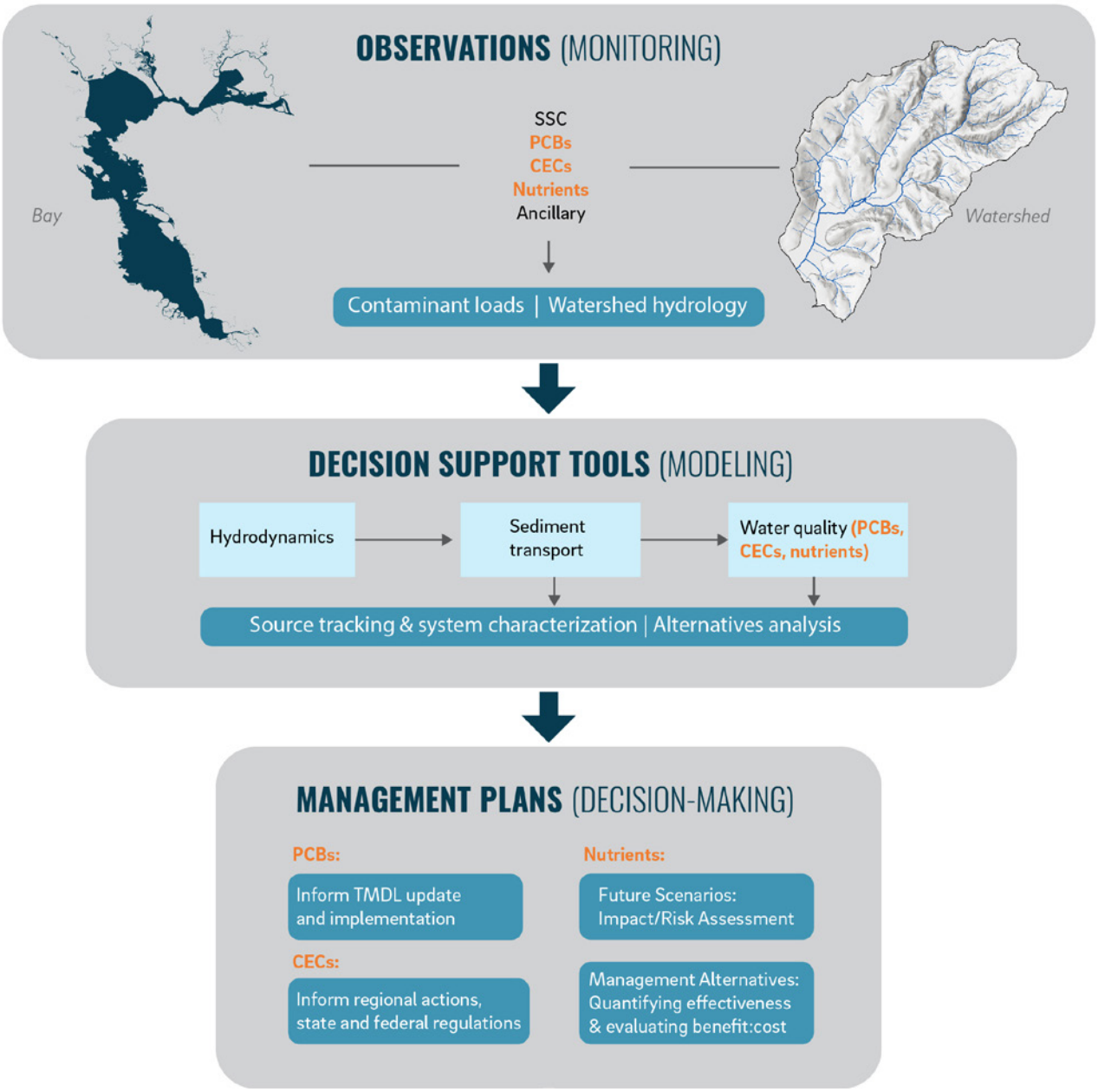


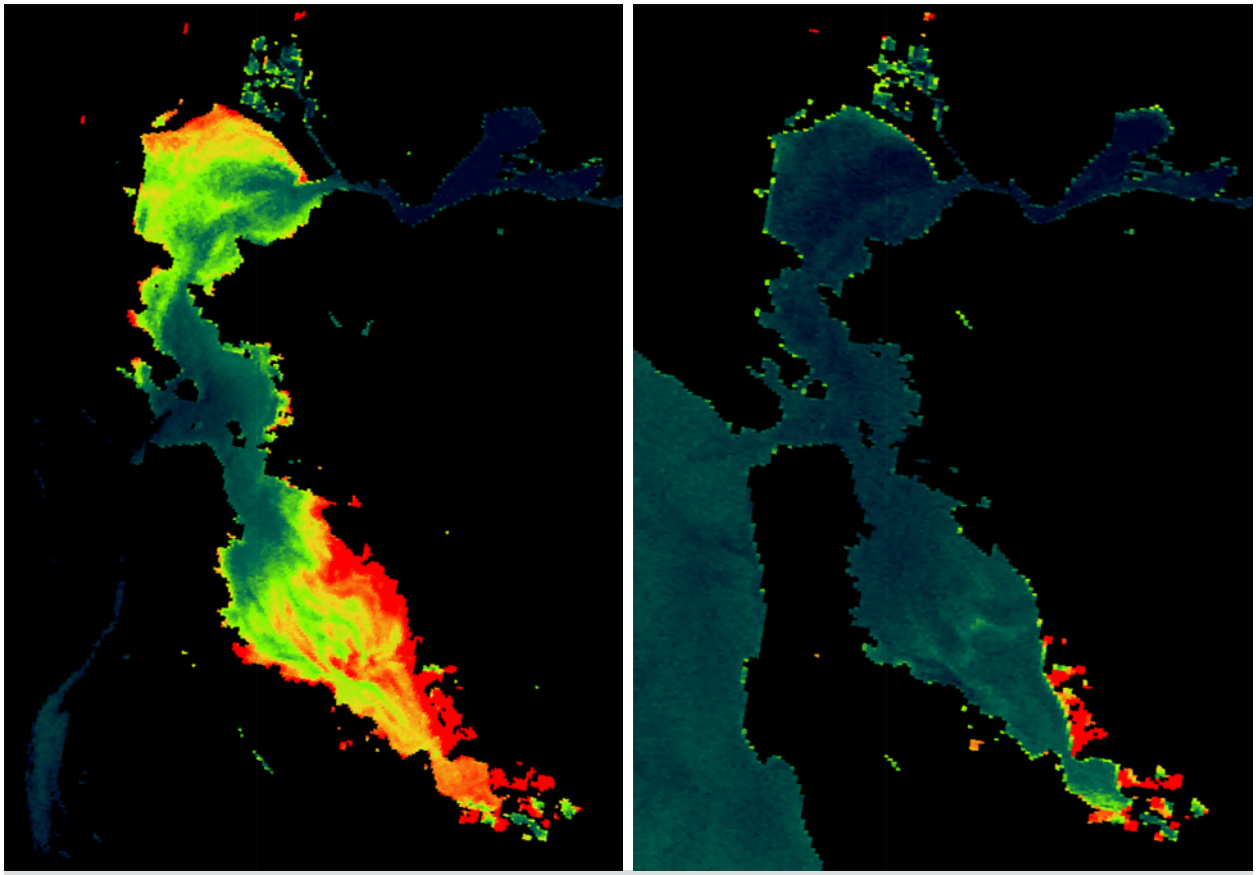
Figure 1. Destination Clean Bay forms a tiered approach to informing consequential, near-term management decisions to improve the health of San Francisco Bay.

Table 1. Outputs and Outcomes

TASK	*OUTPUTS*	*OUTCOMES (quantitative environmental results)*	
		Short-term outcomes (1 to 5 years)	Long-term outcomes (5 to 20+ years)
1 High Priority Data Collection for Model Development	Load estimates for priority local tributaries Nutrient-related data (shoals) and high-frequency turbidity data for improved model calibration. PCB and CEC data within priority Bay locations needed for scenario simulations Calibration data for Watershed Dynamic Model, in-Bay model, and PCB fate and food web models Key source areas identified Remote samplers developed Reports summarizing monitoring data	Updated numeric watershed contaminant and sediment load model estimates Science-based revisions to the PCB TMDL, regulatory action by DTSC for priority CECs, and update the Municipal Regional Stormwater Permit update in 2027 Provisional science-based nutrient load estimates for the 2024 Nutrient Watershed Permit Directly inform shoreline resilience and habitat restoration strategies towards the objective of restoring 23,000-ac of tidal marsh by 2027	Ensure PCB TMDL implementation and target attainment Inform future stormwater and wastewater permit updates to discharge limits and monitoring requirements Inform CEC source identification and management actions
2 Watershed Contaminant Load Modeling	A calibrated regional Watershed Dynamic Model PCB and CEC load estimates for watersheds draining to San Francisco Bay Technical report documenting model development	Optimized management actions via scenario planning efforts for PCBs and CECs through quantitative fate-transport modeling, demonstrated through implementation and monitoring efforts driven by the Municipal Regional Stormwater Permit. Watershed-scale sediment budgets to inform contaminant transport, shoreline resilience, and habitat restoration	Meet the PCB load allocation for urban stormwater dischargers of 2 kg/yr by 2030 through an optimized set of management strategies
3 Estuarine Sediment and Water Quality Management Toolbox	Numerical modeling tools for simulating the transport and fate of multiple contaminants (nutrients, PCBs, CECs) and sediments for the Bay and key priority margin areas PCB food web model Source apportionment for nutrients Open-source/Public-domain model, including documentation, making the model publicly available through a dedicated website (web design, hosting and serving large datasets, etc.)	Inform potential PCB TMDL revisions in 2028, ongoing DTSC management actions for priority CECs, and the 2027 Municipal Regional Stormwater Permit update Quantitative nutrient transport estimates for all 5 subembayments Numeric estimates of 'safe' nutrient levels to reduce the magnitude of major algal bloom events Identify CEC hot spots in the Bay Inform shoreline resilience and habitat restoration strategies	Meet the PCB TMDL target of 10 ppb in fish Measured success of future stormwater and wastewater permit updates Inform CEC source identification and management actions Large-scale reductions in nutrient loads to all subembayments to SF Bay. Rough estimates indicate >20% reductions are achieveable in this time period.
4 Management Applications	Model-driven scenario analysis of CEC, PCB, and nutrient load reductions, including future- scenario (e.g., reduced sediment load, remediation efforts, increased population, climate-driven temperature changes) Planning-level designs for three horizontal levees or treatment wetlands at wastewater treatment facilities Quarterly meetings with dischargers and regulators to address barriers to implementation of nature-based solutions (NbS)	Estimate the impact of management scenarios for PCBs, nutrients, CECs, and sediment, in terms of bioaccumulation in fish, the growth of algal blooms, and the consequences of climate change. Identify nutrient input scenarios that prevent the types of massive blooms observed in 2022 and resulting fish kills Engineering designs for polishing at least 5 million gallons per day (mgd) of treated wastewater via nature-based shoreline resilience solutions Estimate the quantifiable benefits associated with nature-based solutions at a minimum of 3 full- or pilot-scale NbS projects with wastewater agencies Increase the efficiency of permitting NbS projects for shoreline resilience and water quality enhancement Enhanced understanding of the economic, social & environmental costs/benefits of advanced nutrient reduction	Optimized nutrient reduction strategies from the region's 37 wastewater agencies, which discharge ~400 mgd of treated effluent Optimize the placement of the ~2.5 million cubic yards of sediment dredged from SF Bay each year to meet shoreline resilience and habitat restoration goals Remove >60% of nitrogen and certain contaminants of emerging concern from at least 5 mgd of wastewater via NbS Improved understanding of horizontal levee treatment performance for nitrate-concentrated effluent streams Implement nature-based wastewater treatment solutions for at least half of the 18 WRRFs where NbS is deemed suitable

TASK 1. High Priority Data Collection for Model Development

This task fills priority data gaps, identified by expert advisors to the RMP and NMS, for PCBs, CECs, nutrient-related parameters (nutrients, chlorophyll-a, salinity, temperature), and sediment in local tributaries and in the Bay. Rigorous monitoring for these constituents provides the foundation for the modeling described in **Task 2** and the decision support tool development described in **Task 3**. Local tributary data are needed to estimate contaminant and sediment concentrations and loads, evaluate factors contributing to spatial variability in loading estimates, identify potential contaminant sources, and provide calibration data for the expanded watershed models in **Task 2**. Local tributary monitoring will be conducted during or shortly after rain events—when contaminants and sediment are most likely to be mobilized and delivered to the Bay—in water years 2023 and 2024. To expand the number of samples that can be collected during a single water year, remote samplers will be developed and tested as part of this task for sampling CECs in local tributaries as well as PCBs in tidal areas, which drain a large portion of industrial areas around the Bay and are a main source of PCBs. Priority CECs for local tributary monitoring include perfluoroalkyl and polyfluoroalkyl substances (PFAS) and tire contaminants. PFAS in surface waters are a high priority for the US EPA and State and Regional Water Boards. Tire contaminants have been measured in watersheds by the RMP, and at least one—6PPD-quinone—was found at concentrations that could have impacts on steelhead trout. A watershed



Sentinel 3 OLCI Imagery showing relative algal bloom intensity on August 23, 2022 (left) and September 8, 2022 (right). The NMS is seeking to refine the algorithms to develop semi-quantitative estimates of chlorophyll-a and suspended sediment from this imagery (Task 1.5) to aid in early-warning of algal blooms and improve scenario modeling capabilities.

sediment supply synthesis will update estimates of sediment delivered to the Bay by local tributaries to identify gaps in knowledge, prioritize future local tributary sediment monitoring, and update sediment load estimations using the regional Watershed Dynamic Model (**Task 2**).

The in-Bay monitoring components of this task expand ongoing data collection for nutrients along the spine of the Bay (1969-present), suspended sediment and turbidity in key South Bay locations (2008-present), and biogeochemical mapping along the eastern shoal of South Bay (2017-present); fill priority data gaps for key locations within the margins of the Bay for PCBs and CECs; and support the development of remote sensing products to augment sediment and nutrient monitoring activities. For PCBs, prey and sport fish data will inform the bioaccumulation model. Priority CECs for in-Bay monitoring identified by the RMP include PFAS, tire contaminants, bisphenols, and organophosphate esters. CECs will be measured in water and sediment to advance understanding of CEC distribution and residence time and thus inform assessment of the potential for adverse effects on aquatic life. Monitoring data for all constituents will be used to calibrate the in-Bay models to be developed as part of **Task 3**. All monitoring efforts will be supported by well-established quality assurance project plans and data management protocols, with the data made publicly available via RMP and NMS websites and on the California Environmental Data Exchange Network. Data will also be summarized in peer-reviewed technical reports that are publicly available on the RMP and NMS websites.

Water quality sensors deployed off the USGS vessel R/V Peterson. Task 1.3 leverages long-standing local funding to continue monitoring along the spine of SF Bay and refine the In-Bay Nutrient Transport Model (Task 3.3)

TASK 2. Dynamic Watershed Modeling

The RMP has begun the development of a regional Watershed Dynamic Model (WDM) for the nine counties surrounding SF Bay. Currently, the WDM includes hydrodynamic and sediment modules and is able to produce estimates of sediment loads for each watershed draining to the Bay. This is the first such regional dynamic model developed for the Bay Area. These two modules form the basis for estimating contaminant loads for water soluble and sediment-bound chemicals. Extending the application of the WDM to PCBs and CECs will fill knowledge gaps created by the logistical and funding limitations within the RMP. The WDM will also identify PCB and CEC hot spots that SFEI can sample in the field to verify the model output. Targeted monitoring data collected in Task 1 will augment existing data for model calibration and validation.

Outputs from the WDM inform the in-Bay sediment and contaminant transport models under Task 3. After integrating these models, SFEI can estimate the water quality benefits of grey and green stormwater improvements in priority management areas. The watersheds draining to locations such as Steinberger Slough in San Mateo County or San Leandro Bay in Alameda County currently have PCB remediation projects in place or under consideration. The WDM and in-Bay models will be capable of estimating whether PCB removals at known PCB hot spots, such as the Delta Star Inc. and Tiegel Manufacturing properties, will result in improvements in fish bioaccumulation.

Point Molate and several areas throughout San Pablo Bay received reports of dead sturgeon and other large fish resulting from the historic algal bloom of 2022. This area also represents a major pathway of sediment from the Sacramento-San Joaquin Delta to the Central Bay and outer coast. The In-Bay Sediment and Nutrient Transport Models (Tasks 3.1 and 3.3) will greatly enhance our ability to model the effects of eutrophication and the region's ability to adapt to rising sea levels.

TASK 3. Estuarine Sediment and Water Quality Management Toolbox

This task builds on watershed and in-Bay monitoring and modeling from **Tasks 1 and 2** to develop robust decision support tools to inform site-specific management of PCBs, CECs, nutrients, and sediment within SF Bay.

For PCBs, CECs, and sediment, the in-Bay models developed to date are rudimentary. The existing Total Maximum Daily Load (TMDL) for PCBs in the Bay is based on a very simple one-box model for the whole Bay, coupled with a similarly general food web model. This simple one-box approach was also used to forecast water quality improvements associated with cleanup of PCB hot spots, and indicated that local watershed load reductions would result in reduced concentrations in sport fish in a 10-year time frame, but this forecast was highly uncertain. This simple approach was also used to forecast CEC contamination in the Bay. We understand now that more sophisticated modeling is needed to inform cleanup actions and green infrastructure both in the watershed and in the Bay. The hydrodynamic model under development through the NMS shall be applied to inform in-Bay fate and transport of PCBs and CECs as well as nutrients.

Model development will address management questions for PCBs, CECs, and sediment developed through the RMP planning process. For PCBs, modeling will address questions related to the management of high priority contaminated margin areas and the Bay and provide a strong foundation for the review and potential revision of the TMDL scheduled for 2028 (Tasks 3.1 and 3.2). For CECs, the modeling will help to identify priority monitoring locations and assess potential impacts, spatial and temporal variation, long-term forecasts, and effects of management actions. For sediment, modeling will provide insights on transport between subembayments and supply from the Bay to tidal marshes and restoration projects. Long-term scenario planning will consider the effects of climate change and sea level rise, in terms of contaminant recovery and sediment transport.

With respect to nutrients, substantial progress has been made within the NMS over the last several years on in-Bay numerical model development, including the implementation of a multi-year modeling plan. This proposed project includes critical work necessary to predict the Bay's response to nutrient enrichment and the consequences of large investments in wastewater infrastructure upgrades to reduce nutrient loading. On-going modeling efforts of the NMS are beginning to answer management questions surrounding acceptable levels of nutrient loading to the Bay, serving to inform the next iteration of the SF Bay Nutrient Watershed Permit (**Task 3.3**). High priority questions remain, however, regarding which wastewater facilities contribute the greatest load in each subembayment (**Task 3.4**). Refinement of a coupled hydrodynamic and water quality model in a system as complex as SF Bay is needed to apply the model to answer critical management questions in **Task 4**. SFEI will make this model open source (**Task 3.5**), following best practices, to enable researchers, regulators, and practitioners to leverage the model to answer other water quality management questions not considered here.

TASK 4. Management Applications

Within the next decade, wastewater and stormwater agencies have committed to implement significant water quality improvement projects. Wastewater entities currently plan on spending, at a minimum, over $1.6 billion within the next 5-7 years to upgrade plant processes expected to reduce nitrogen loading by ~7,000 kg per day. In the event a future version of the SF Bay Nutrient Watershed Permit requires load reductions, these figures will increase significantly. Under the 2022 Phase 1 Municipal Regional

Stormwater Permit, stormwater agencies must reduce PCB loading to SF Bay by 1.47 kg/yr through an array of gray and green approaches. Cities must also retrofit a minimum of 102 acres of impervious surface with green infrastructure throughout the nine-county Bay Area by 2027. The PCB TMDL is scheduled for possible revision in 2028, and RMP stakeholders have identified modeling to evaluate management scenarios as an essential foundation for this process.

Decision support tools intended to support the implementation of stormwater, wastewater, and shoreline resilience projects, include **future scenario evaluation** to inform the scale of nutrient loads considered suitable to maintain the health of the Bay (**Task 4.1**), and the water quality implications of performing site-specific wastewater upgrades via gray and green infrastructure (**Task 4.2**). The WDM and in-Bay model will also be used to assess the effectiveness of various management scenarios under future conditions to inform management interventions to **reduce watershed loads of PCBs and CECs** (**Task 4.1**). SFEI will also perform **site-specific evaluations of nature-based solutions** for nutrient management and shoreline resilience (**Task 4.3**). This award will leverage an existing project resulting from an obligation under the Nutrient Watershed Permit to evaluate potential nutrient reduction by NbS. Approximately half of the region's thirty-seven wastewater agencies in the region maintain significant potential for deploying NbS. This project funds the engineering and cost estimation analyses necessary to move towards the implementation stage.

Municipal stormwater represents a persistent ongoing source of PCBs, metals, and other pollutants impacting the sediment and water quality of SF Bay. The Watershed Dynamic Model (Task 2) aims to increase the certainty that site-specific forms of grey and green infrastructure will reduce pollutant loading to the Bay.

BUDGET DETAIL AND TIMELINE TABLE

See Budget Detail and Timeline (Table 2), on the following page.

SFEI will be the grant recipient and will receive $1,886,579 of the grant request summarized in Table 2, for their lead role in delivering Tasks 1-5. The remainder of the budget represents costs of laboratory analysis for the delivery of project deliverables with consultants and partners already engaged in closely aligned projects through the RMP, NMS, and an on-going evaluation of nature-based solutions: Task 1: $355,,000, Task 2: $0, Task 3: $403,860, Task 4: $258,000. Each of these tasks shall be procured in a manner consistent with the requirements established for SFEI and the EPA. Additional components of the funding request include $77,000 in direct costs for monitoring equipment.

Sources of match for this project include the RMP ($1,505,00) and the NMS ($1,325,000) which represents funding sourced by the SF Bay Regional Water Quality Control Board from a number of partners. The Bay Area Clean Water Agencies (BACWA) have also matched $150,000 for Task 4.3 to contribute towards an ongoing project to evaluate NbS for nutrient management at the region's wastewater treatment facilities.

The costs and associated timelines and deliverables summarized in Table 2 are highly cost-effective in furthering future implementation, given the scale of existing commitments to implement stormwater and wastewater infrastructure projects, as well as near-term shoreline resiliency needs for sea level rise adaptation and habitat enhancement. ***Destination Clean Bay*** will inform nearly all such projects in the coming one to two decades. The costs of these implementation projects are not accounted for within the match amount, though this value likely dwarfs the grant request amount by three orders of magnitude.

Table 2. Budget Detail and Timeline

Time-frame	*Task*	*Implementing Lead*	*Federal Portion (EPA grant)*	*Match*	*Outputs/Deliverables*
Task 1. High Priority Data Collection for Model Development			*$980,000*		
Q1-10	1. Local Tributary PCB, CEC, and Nutrient Monitoring	SFEI RMP	$385,000	$210,000	• Load estimates for priority local tributaries, • Data for Watershed Dynamic Model calibration • Identification of key pollutions source areas • Remote samplers developed
Q9-12	2. Watershed Sediment Supply Synthesis	SFEI RMP	$75,000	$0	• Sediment load estimates for key watersheds, • Data for Watershed Dynamic Model calibration update • Technical report
Q1-16	3. Bay Water Quality, Sediment, PCB, and CEC Monitoring	SFEI RMP & NMS	$220,000	$1,090,000	• Extension of long-term water quality and turbidity data sets • PCB and CEC data for priority Bay locations • Data for in-Bay model calibration (nutrients, sediment, PCBs, CECs) • Calibration between turbidity and suspended sediment in South Bay • Calibration data for the in-Bay PCB fate model and PCB food web model • Assessment of potential CEC impacts in the Bay
Q1-10	4. Shoal Monitoring	SFEI NMS	$100,000	$180,000	• Maps of primary productivity on the shoals in South Bay • Technical report
Q3-10	5. Bay Remote Sensing (Suspended Sediment & nutrients)	SFEI NMS	$200,000	$0	• Broad-scale sediment and light attenuation estimates and trends • Calibration data for in-Bay sediment model • Resources permitting, chlorophyll-a calibration included for the in-bay nutrient model
Task 2. Watershed Contaminant Load Modeling			*$0*		
Q1-10	1. Watershed PCB, CEC, and nutrients model	SFEI RMP	$0	$170,000	• PCB, CEC, and nutrient load estimates for watersheds draining to San Francisco Bay • Technical report
Task 3. Estuarine Sediment and Water Quality Management Toolbox			*$1,220,000*		
Q1-12	1. In-Bay PCB, CEC, and Sediment Model	SFEI RMP & NMS	$780,000	$400,000	• Sediment, PCB, and CEC fate model for the Bay and key priority margin areas • Evaluation of PCBs, CECs, and sediment: compare scenarios of different loadings, identify optimal management options
Q1-8	2. Food Web Bioaccumulation Model	SFEI RMP	$140,000	$0	• PCB food web model
Q1-12	3. In-Bay Nutrient Transport Model	SFEI NMS	$0	$500,000	• Nutrient transport model for the Bay
Q10-12	4. Source Apportionment	SFEI RMP & NMS	$150,000	$100,000	• Apportion nutrient sources to particular sub-regions of SF Bay • Identify zones of influence, and assess sediment provenance and fate
Q13-16	5. Community Model	SFEI NMS	$150,000	$60,000	• Model documentation • Updates and versioning of the model based on expert feedback • Convene users and advisors • Web hosting for open source use, and model maintenance
Task 4. Management Applications			*$780,000*		
Q2-8	1. Future Scenario Evaluation	SFEI RMP & NMS	$300,000	$75,000	• Identify plausible biological (e.g. blooms), physical (e.g. stratification), and biogeochemical consequences on existing and future nutrient loading & recommended protected nutrient levels in a final report
Q8-16	2. Nutrient Management Alternatives	SFEI NMS	$230,000	$45,000	• Establish the biogeochemical consequences of proposed nutrient removal strategies and inform 'safe' levels of nutrients in the Bay in a final report and site-specific evaluations.
Q1-8	3. Nature-based Solutions	SFEI NMS	$250,000	$150,000	• Planning-level designs for three horizontal levees or treatment wetlands at wastewater treatment facilities • Quarterly meetings with dischargers and regulators to address barriers to NbS implementation
		TOTAL	*$2,980,000*	*$2,980,000*	

PROGRAMMATIC CAPABILITY AND PAST PERFORMANCE HISTORY

Organizational Experience

SFEI is a nonprofit recognized in the first CCMP in 1993 as the science steward of the Bay and also administers a Joint Powers Authority created by the State Water Resources Control Board and the Bay Area Clean Water Agencies to assist with the efficient delivery of scientific, monitoring, and information management support functions. The tasks proposed in this proposal leverage three decades of work by SFEI as the implementation entity for the RMP to assess the chemical, physical, and biological health of the Bay. These tasks also leverage ten years of outputs and outcomes from the NMS, under the management of SFEI. The NbS evaluations have been performed in close partnership with SFEI's Resilient Landscapes team, composed of experts in evaluating NbS for a range of management applications and anticipated benefits. The RMP and NMS ensure technical excellence by collaborating with leaders in the field as collaborators and as science advisors providing peer review of workplans and products.

To ensure timely and successful implementation of this project, the individual tasks shall be managed within SFEI's existing project management process for the NMS and RMP. Stakeholders, including EPA Region 9 staff, will be made aware of project performance and milestone performance through multiple stakeholder venues. SFEI's stakeholder network will inform reports of quantitative or qualitative outcomes resulting from this project (e.g., number and size of green infrastructure projects informed by models or the status of NbS projects under consideration or implemented by wastewater agencies). SFEI will work with EPA staff to ensure all contracts and subawards maintain consistency with the procurement provisions of the regulations at 2 CFR Part 200. All contractors or subawardees shall be informed of the necessary reporting requirements upon initiation of an agreement with SFEI.

Table 3 summarizes five of the numerous assistance agreements or contracts SFEI has managed in recent years. SFEI has successfully completed and managed all federally funded assistance agreements and has met all reporting requirements, including documentation of progress towards achieving the expected outputs and outcomes of those agreements.

Staff Experience/Team Expertise

The project team draws together talented practitioners with a complementary range of backgrounds. The team of technical experts leading the project includes SFEI scientists David Senn (nutrient biogeochemistry), Rebecca Sutton (microplastics, CECs), Kelly Moran (CECs), Ellen Plane (shoreline resilience, nature-based solutions), Allie King (hydrodynamic modeling, biogeochemistry), Farid Karimpour (hydrodynamic modeling, biogeochemistry), Alicia Gilbreath (local tributary monitoring), Tan Zi (watershed modeling), and Jay Davis (PCBs, bioaccumulation). Clean Water Program Directors at SFEI

Table 3. EPA-funded Assistance Agreements With SFEI Within the Past Three Years

EPA Grant Number	*Project Title*	*Amount*	*Start Date*	*End Date*
W9-99T53101-0	Healthy Watersheds, Resilient Baylands (SFEP as applicant)	SFEI work funded for $1,002,635	2016	2022
W9-99T69401-0	Preparing for the Storm (Zone 7 Water Agency as applicant)	SFEI work funded for $472,000	2017	2023
CD-99T93601-0	Wetlands Protection Development - Protect and Restore Vernal Pools	$390,375	2017	2021
W9-98T15501-0	Shared Basemap to Measure Baylands Change	$486,500	2020	2023
W9-98T15501-0	Next Generation Urban Greening: Integrating Water Quality, Biodiversity, and Resilience	$1,765,000	2020	2024

(David Senn, Jay Davis) will ensure overall implementation and delegation to project managers within the organization.

SFEI currently anticipates the involvement of several expert collaborators (as contractors) engaged in ongoing or planned elements of this project. Program Directors shall coordinate with SFEI's Managing Director, Jennifer Hunt, and EPA staff to ensure all contracts meet the procurement provisions of the regulations at 2 CFR Part 200. Craig Jones (contaminant and sediment fate modeling) and Frank Gobas (bioaccumulation modeling) will support Task 3 while Rusty Holleman and Pradeep Mugunthan provide hydrodynamic and biogeochemical modeling expertise under both Tasks 3 and 4. Ian Wren and HDR Inc. provide technical and engineering support under Task 4.3. All proposed contractors currently hold critical roles in the RMP, NMS and on-going nature-based solutions projects managed by SFEI.

PARTNERSHIPS AND COMMUNITY ENGAGEMENT

This project supports collaboration of a diverse range of highly-effective partner organizations that have been working together since 1993 to collect data and communicate information in support of management decisions. These partners include the SF Bay Regional Water Quality Control Board, thirty-seven wastewater agencies, ten industrial wastewater dischargers, nine countywide stormwater programs and up to eighty-eight dredging operators. In addition, the RMP and NMS rely on a suite of world-class advisors to inform the direction and priorities of these programs. Partners of the RMP and NMS joined together at this time to leverage decades of regional monitoring and modeling to develop decision support tools to inform management and operational solutions that address multiple water quality concerns. The forecasting capacity developed in this project will advance future work with underserved communities to understand and pursue cleanup options for the often highly contaminated locations where these communities fish and depend on the Bay for other beneficial uses.

EXPENDITURE OF AWARDED GRANT FUNDS

Since its formation in 1993, SFEI has successfully completed numerous projects funded by government grants, contracts, and innovative partnerships. In addition to SFEI's own governance process, both the RMP and NMS maintain steering committees and subcommittees intended to ensure timely, efficient, and technically robust implementation, at the programmatic and project-specific scales. This oversight, coupled with SFEI's own program management controls, fiscal oversight, and deliverable tracking systems, ensure this project shall maintain SFEI's track record of successful implementation and diligent contract management.

SFEI manages many multi-partner grant agreements, including the RMP ($4 M/y) and NMS ($2.2 M/y). Implementation partners maintain experience in grant reporting and documentation requirements. SFEI maintains primary responsibility for ensuring successful completion of the grant and is ready to initiate tasks immediately upon notification of a grant award. SFEI oversees all project scheduling, progress, and deliverables, including progress reports that provide timely information on project outputs and outcomes. SFEI receives regular implementation and match fund expenditure reports from project partners. SFEI monitors costs/progress and works closely with team members to ensure projects are completed on time, within budget, and on-target to achieve desired environmental outcomes.

Should the project be delayed, SFEI will maintain close communication with the EPA to communicate issues and achieve workable solutions for all parties. All SFEI EPA grants have submitted acceptable final technical project reports that demonstrate successful project completion.

Bay RMP Deliverables Stoplight Report_new

Bay RMP Deliverables Scorecard Report

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.

Focus Area	Project	Task	Deliverable	Assigned To	Due Date	Old Due Date	Days overdue	Due Date Extended (external delay)	Due Date Extended (internal delay)	# of extensions	Status	Comments
	Bay RMP (2021)	Small Tributaries Loading POC Watershed Reconnaissance Monitoring	Laboratory analysis, QA & Data Management	Adam Wong	02/28/22	09/01/21	504			2		Final Samples only sent out end of August. Still don't have data. Haven't received data back from the lab, most notably from SGS AXYS as we haven't finalized the contract with them. Discussions still ongoing about wrapping analysis or WY21 samples in with WY22. Final samples still not processed by SGS AXYS
142758	RMP SEP	20. MTC Bay Area Land Use Update	Collect and transform data relevant to RMP Stakeholders	Tony Hale	03/31/22	03/31/21	658			3		A critical partner, MTC, was directed away from the land-use data layer renewal by more pressing concerns. They are now fully engaged, have approved our approach, and provided our team access to the requisite resources. All of SFEI's tasks will be complete by the end of Q1 2022 but the final map from MTC may be further delayed due to rearrangement of priorities for staff at MTC. Still waiting for MTC.
Sediment Strategy	RMP SEP	18. USGS Sediment Flux and Flocculation, Benicia Bridge	Technical Report	Melissa Foley	11/30/22	01/31/22	352			2		Draft delivered; report going through USGS review Daniel Livsey and Paul Work, leads (USGS) Checking in with Paul Work and David Hart in early December to assess progress and next steps, Date of subcontract term The report is going through internal review with the USGS. RMP staff has reviewed the draft report.
Sources Pathways and Loadings	RMP SEP	14. Quantifying Stormwater Flow and Sediment Flux to the Bay	Technical Report	Alicia Gilbreath	12/31/22	12/01/21	413			2		COVID and dry years so far - not much data have been collected. Water Board staff and confirmed an extension is possible and we have informed contractors. I suggest we push this to December 31st, 2022. I think it doing to be hard to get USGS to work up the data in the spring - thats the time they spend setting up new monitoring stations.
Sources Pathways and Loadings	RMP SEP	14. Quantifying Stormwater Flow and Sediment Flux to the Bay	Summary Factsheet	Alicia Gilbreath	12/31/22	12/01/21	413			2		COVID and dry years so far - not much data have been collected. Water Board staff and confirmed an extension is possible and we have informed contractors. I suggest we push this to December 31st, 2022. I think it doing to be hard to get USGS to work up the data in the spring - thats the time they spend setting up new monitoring stations.
Sources Pathways and Loadings	RMP SEP	14. Quantifying Stormwater Flow and Sediment Flux to the Bay	Post data to CD3	Alicia Gilbreath	12/31/22	12/01/21	413			2		COVID and dry years so far - not much data have been collected. Water Board staff and confirmed an extension is possible and we have informed contractors. I suggest we push this to December 31st, 2022. I think it doing to be hard to get USGS to work up the data in the spring - thats the time they spend setting up new monitoring stations.
	Bay RMP (2021)	DMMO Database	DMMO Database Enhancements	Cristina Grosso	12/31/22	12/31/21	383			2		Due to staffing shortages, we will need to request an extension for this Special Study. The Data Services team was busy with other RMP-related projects, and we did not hire a new DBA/DBD to replace Shira until November.
	Bay RMP (2020)	6. Status and Trends Monitoring	Margins report	Don Yee	01/31/23	12/31/21	383			3		SFEI workflow issues Internal draft reviewed, in revision
	Bay RMP (2020)	24. Stormwater Conceptual Model	Conceptual model report	Diana Lin	01/31/23	09/30/21	475			3		Main conceptual models were completed with joint funding from OPC. We will provide an additional memo that summarizes additional relevant findings and recommendations for the Bay. Delays in getting data needs from CalTrans and CARB.; Main memo findings will be shared during MPWG, and written up afterwards. Some delay in getting numbers for calculations. Draft report sent out for review, final comments requested by 1/25.
	Bay RMP (2020)	3. QA and Data Services	QA Summary Report for 2020 S&T Activities	Don Yee	02/15/23	03/31/21	658			7		Sample data receiving mid May 2021, so adjusted date based on time for QA of data; SFEI workflow issues Some sediment ancillary data review not yet complete. prioritized below margins report
	Bay RMP (2021)	3. QA and Data Services	QA Summary Report for 2021 S&T Activities	Don Yee	02/15/23	09/30/22	110			2		Bird eggs still outstanding To be completed with 2020 summary, lower priority than margins report
Selenium Strategy	Bay RMP (2017)	2017 Sturgeon Derby Monitoring	Data management	Adam Wong	02/28/23	09/30/17	1936			2		Data mgmt for this got lumped in with planned data mgmt for NB selenium monitoring work. No sturgeon plug monitoring in 2020 or 2021 delays data mgmt efforts another year Extended due date to 2023, assuming fishing efforts happen in November 2022. Will add a new deliverable for later years with funding
	Bay RMP (2020)	41. Selenium in North Bay clams and water	Technical Report	Melissa Foley	02/28/23	06/30/21	567			4		Data and workflow issues No sturgeon results from 2020 and 2021; technical report likely delayed until 2022. Workflow issues Internal workflow issues

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	Bay RMP (2021)	Integrated watershed modeling and monitoring implementation strategy	Complete draft integrated watershed modeling and monitoring implementation strategy	Lester McKee	02/28/23	09/01/21	504			3		Have spend the last 4 weeks laying out the vision (again) and getting internal agreement. Made a start on the writing in ernest yesterday. Plan to have a full internal wroking draft by mid April and a draft ready for external review by April 30th and then complete the project by June 30th. Main slow down has been staff capacity. It was on my plate since last August and only now do I have bandwidth. Only me and Alicia at the moment have time - Kelly and Tan are busy until 3rd week of April. I suggest this could end up not being true as well so its possible the rest of the internal work wont get done in April, pushing the external review to June and completion in July or August. So I propose October 31st as the new deadline to give us plenty of room. OK? "Still to complete first draft and have internal review / input but the team have learned alot and gelled around some core ideas over the past few years since this project was conceived so the result will be a much better planning document that if we had rushed at it 2 years ago. Then there will be committee review, before finalisation. So the timeline that seems practically doable would seem to be : 1. Internal draft completed by late Feb, then 2. RMP workgroup / committee review by mid-late March, then 3. Finalisation and publication early to mid April. "
	Bay RMP (2021)	Floating percentile method	Revise sediment guidelines using floating percentile methodology	Don Yee	02/28/23	06/30/21	567			5		RB & EPA too busy with WQIF proposals for draft review, expect response early/mid Nov, draft to sed group ~Thanksgiving Delay getting comments from DMMO team on methods; internal delays due to workflow issues. Adam will have data analysis done by end of 2021.; Draft ready for SedWG meeting in May Received RB/EPA review comments Jan 2023, in revision
Selenium Strategy	Bay RMP (2019)	Selenium in Muscle Plugs	Collect and analyze muscle plug samples	Martin Trinh	03/31/23	03/31/20	1023			2		Muscle plug samples will be collected during CDFW cruises between August and October 2019. Laboratory analysis will follow. Data management and reporting was not funded. https://www.sfei.org/sites/default/files/events/SeWG%20-%2003%20-%20Sturgeon%20Muscle%20Plug.pdf Not enough tissue was collected by CDFW in 2019 so this will be delayed until 2020. No ability for DFW to collect samples for the RMP in 2020 and 2021 so this will be delayed again until 2022.
Sediment Strategy	RMP SEP	21. Sediment Dynamics Assessment and Uncertainty Analysis for San Francisco Bay	Interpretive Technical Report	Scott Dusterhoff	04/01/23	12/31/21	383			3		Final report completed following comments at the Sediment WG in May 2022. There have been unexpected delayed and staff turnover that has made this effort take longer than initially envisioned
	Bay RMP (2021)	Special Study: Toxicology Thresholds for Emerging Contaminants	Task 1. Synthesize and assess quality of available CEC toxicity thresholds; identify toxicity threshold knowledge gaps	Ezra Miller	04/01/23	11/01/20	808			1		This work is complimentary to and leveraging work done for a statewide CEC synthesis and prioritization project for the State and Region 2 Water Boards, which has been delayed due to covid and delays in other related projects. As a result, this project is now slated to be finished for (and results presented at) the 2022 ECWG meeting.
	Bay RMP (2021)	Special Study: Toxicology Thresholds for Emerging Contaminants	Task 2. Calculate thresholds to fill knowledge gaps, preliminary results presentation to the ECWG	Ezra Miller	04/01/23	04/01/21	657			1		This work is complimentary to and leveraging work done for a statewide CEC synthesis and prioritization project for the State and Region 2 Water Boards, which has been delayed due to covid and delays in other related projects. As a result, this project is now slated to be finished for (and results presented at) the 2022 ECWG meeting.
	Bay RMP (2021)	Special Study: Toxicology Thresholds for Emerging Contaminants	Task 3. Compare measured concentrations and updated thresholds to assess placement of Possible Concern contaminants within the tiered risk-based framework and identify priorities for future work	Ezra Miller	04/01/23	09/01/21	504			1		This work is complimentary to and leveraging work done for a statewide CEC synthesis and prioritization project for the State and Region 2 Water Boards, which has been delayed due to covid and delays in other related projects. As a result, this project is now slated to be finished for (and results presented at) the 2022 ECWG meeting.
	Bay RMP (2021)	Special Study: Toxicology Thresholds for Emerging Contaminants	Task 4. Presentation to the ECWG and "living document" made available to stakeholders	Ezra Miller	04/01/23	04/01/22	292			1		
	Bay RMP (2021)	F. 2021 Bird Egg Data Mgmt	Processing and upload bird egg data	Adam Wong	04/30/23	10/31/22	79			1		Samples still being processed. Guessed at an extension date
	Bay RMP (2021)	Integrated watershed modeling and monitoring implementation strategy	Final report	Lester McKee	04/30/23	09/01/21	504			3		Have spend the last 4 weeks laying out the vision (again) and getting internal agreement. Made a start on the writing in ernest yesterday. Plan to have a full internal wroking draft by mid April and a draft ready for external review by April 30th and then complete the project by June 30th. Main slow down has been staff capacity. It was on my plate since last August and only now do I have bandwidth. Only me and Alicia at the moment have time - Kelly and Tan are busy until 3rd week of April. I suggest this could end up not being true as well so its possible the rest of the internal work wont get done in April, pushing the external review to June and completion in July or August. So I propose October 31st as the new deadline to give us plenty of room. OK? "Still to complete first draft and have internal review / input but the team have learned alot and gelled around some core ideas over the past few years since this project was conceived so the result will be a much better planning document that if we had rushed at it 2 years ago. Then there will be committee review, before finalisation. So the timeline that seems practically doable would seem to be : 1. Internal draft completed by late Feb, then 2. RMP workgroup / committee review by mid-late March, then 3. Finalisation and publication early to mid April. "
	Bay RMP (2021)	Special Study: CEC in Urban Stormwater Year 3	Task 4. Draft manuscripts and management summary	Rebecca Sutton	05/01/23							
	Bay RMP (2021)	Impact of Remediation Actions on San Leandro Bay Recovery from PCB Contamination	Task 4: Draft technical report	Diana Lin	05/01/23	10/31/22	79			1		Pushed back because due to delay in receiving laboratory results. PCB data from laboratory expected this week
	Bay RMP (2021)	Special Study: Nutrients Light Attenuation and moored sensors	Task 2: Technical memo evaluating the potential utility of remote-sensed products for estimating surface turbidity and light attenuation.	Dave Senn	05/31/23	12/31/22	18			1		Major shift in modeling-related work focus (including evaluation of RS-Kd) due to HAB event. Work thus far suggests that RS products have promising potential, but the in-depth analysis will happen over the next several months we pursued the sediment transport model trials first, and remote-sensing second). The recently-awarded EPA-WQIF project includes support for remote-sensing that (in addition other uses within the WQIF project) has the potential to greatly increase

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Emerging Contaminants	RMP SEP	16. Sunscreen in Wastewater	Technical Report	Diana Lin	06/15/23	10/31/21	444			3		SFEI will be leading report instead of Stanford U because Bill Mitch's student has graduated. Sample collection was delayed one year due to Covid pandemic. Samples will be collected summer 2021. Draft report undergoing review process.
Emerging Contaminants	Bay RMP (2018)	Non-targeted Analysis of Sediment and Water	Fact sheet	Rebecca Sutton	06/30/23	08/02/19	1265			7		While Eunha's manuscript is already in preparation, Lee is no longer able to take the lead on preparing a manuscript. He has turned over data to SFEI staff. We anticipate presenting a revised scope and budget for this deliverable by end of the year. De-prioritized for ECWG meeting in favor of North Bay Fire NTA. Draft report and fact sheet by fall '19; Final report and fact sheet by Dec '19. Lee and Eunha would like to present their findings to the ECWG in spring 2020 before finalizing the report. Lab and internal COVID-19 impacts and continued prioritization of the North Bay Wildfire NTA study have delayed this project. Lee and Eunha would like to present preliminary findings to the ECWG in spring 2021 before finalizing the deliverables. Preliminary findings were presented at the ECWG meeting. The GC-based manuscript is in preparation now, while the LC-based analysis is ongoing. Complete analysis via LC-based methods (Duke University) has been delayed due to equipment failures. Analysis should be complete in January 2022. Manuscript preparation for the GC-based results (SDSU) has also been delayed, and will resume in January 2022. Revised deliverables and need for additional funding will be discussed at January SC meeting.
Emerging Contaminants	Bay RMP (2018)	Non-targeted Analysis of Sediment and Water	Technical report	Rebecca Sutton	06/30/23	08/02/19	1265			7		While Eunha's manuscript is already in preparation, Lee is no longer able to take the lead on preparing a manuscript. He has turned over data to SFEI staff. We anticipate presenting a revised scope and budget for this deliverable by end of the year. De-prioritized for ECWG meeting in favor of North Bay Fire NTA. Draft report and fact sheet by fall '19; Final report and fact sheet by Dec '19. Lee and Eunha would like to present their findings to the ECWG in spring 2020 before finalizing the report. Lab and internal COVID-19 impacts and continued prioritization of the North Bay Wildfire NTA study have delayed this project. Lee and Eunha would like to present preliminary findings to the ECWG in spring 2021 before finalizing the deliverables. Preliminary findings were presented at the ECWG meeting. The GC-based manuscript is in preparation now, while the LC-based analysis is ongoing. Complete analysis via LC-based methods (Duke University) has been delayed due to equipment failures. Analysis should be complete in January 2022. Manuscript preparation for the GC-based results (SDSU) has also been delayed, and will resume in January 2022. While Eunha's manuscript is already in preparation, Lee is no longer able to take the lead on preparing a manuscript. He has turned over data to SFEI staff. We anticipate presenting a revised scope and budget for this deliverable by end of the year. Revised deliverables and need for additional funding will be discussed at January SC meeting
	Bay RMP (2021)	Special Study: CEC in Urban Stormwater Year 3	Task 5. Final manuscripts and management summary	Rebecca Sutton	07/01/23							
	Bay RMP (2021)	Impact of Remediation Actions on San Leandro Bay Recovery from PCB Contamination	Task 5: Final technical report	Diana Lin	07/01/23	12/31/22	18			1		
	Bay RMP (2021)	Selenium in Clams	Task 4. Draft Report	Amy Kleckner	07/31/23	12/31/22	18			1		
	Bay RMP (2021)	Selenium in Clams	Task 5. Final Report	Amy Kleckner	09/30/23	02/28/23	-41			1		
Emerging Contaminants	RMP SEP	19. Quaternary Ammonium Compounds (QACs) in Bay Area Wastewater	QA/QC and data management	Diana Lin	12/31/23	12/31/21				1		Bill Arnold received an NSF grant that allows for two additional years of monitoring (pro bono). Preliminary data for samples collected to date will be presented at the 2022 ECWG meeting., Bill Arnold will present preliminary data at ECWG
PCB Strategy	Bay RMP (2019)	Priority Margin Unit Stormwater PCB Monitoring	Stormwater sample collection at Emeryville Cresent sites in WY19 and WY20	Alicia Gilbreath	12/31/23	04/30/20	993			2		Extended through WY2023 Analysis of samples will be covered by SEP funds (3300-011-A). Results will be reported in the WY20 STLS POC Reconnaissance Monitoring Report (due 12/31/20). https://www.sfei.org/sites/default/files/events/PCBWG%20-%2002%20-%20Priority%20Margin%20Unit%20Stormwater%20PCB.pdf Due to low rainfall, sampling was not completed in WY20 and so the study shall be extended into WY21. This project got an extension because of the low rainfall seasons during climatic years 2020 and 2021.
	Bay RMP (2020)	21. Priority Margin Unit Stormwater PCB Monitoring	Stormwater sample collection at Emeryville Cresent sites in WY19 and WY20	Alicia Gilbreath	12/31/23	04/30/21	628			2		This project got an extension because of the low rainfall seasons during climatic years 2020 and 2021. Funding rolled forward from previous years so sampling can happen this wet season. If wet season does not include a storm at a low tide, then we will need to roll forward another year if possible.
Emerging Contaminants	Bay RMP (2019)	Ethoxylated Surfactants Study	Manuscript and summary for managers	Diana Lin	04/15/24	08/01/20	900			2		Draft due 8/31/20. Final due 1/31/21. Sampling delayed due to COVID-19. Draft due February 1, 2021. Final due July 1, 2021. The manuscript will be ready for RMP review before the end of the year. Summary for managers will be provided after additional results from ethoxylated surfactant 2021 study results are in. Extension in deadline to incorporate additional results for Part 2 funded RMP study. Manuscript was reviewed by the RMP and has been submitted.
Emerging Contaminants	RMP SEP	19. Quaternary Ammonium Compounds (QACs) in Bay Area Wastewater	Present data at ECWG	Diana Lin	05/31/24	05/31/22						Additional funding from NSF increased the scope of the project. The ECWG agreed to the suggested revised due dates for the deliverables so they can include the additional data.
Emerging Contaminants	RMP SEP	19. Quaternary Ammonium Compounds (QACs) in Bay Area Wastewater	Technical Memo	Diana Lin	08/31/24	08/31/22				1		Additional funding from NSF increased the scope of the project. The ECWG agreed to the suggested revised due dates for the deliverables so they can include the additional data.

Focus Area	Project	Task	Deliverable	Assigned To	Due Date	Old Due Date	Days overdue	Due Date Extended (external delay)	Due Date Extended (internal delay)	# of extensions	Status	Comments
	Bay RMP (2021)	C. 2021 Water Cruise										

Bay RMP Action Items Stoplight Report_New

Bay RMP Action Items Scorecard Report

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Primary	Deliverable	Assigned To	Due Date	Old Due Date	Days overdue	# of extensions	Due Date Extended (external delay)	Due Date Extended (internal delay)	Status	Comments	Meeting Date
SC Action Items from 11/02/2022	Highlight how long bills are outstanding in the future	Jennifer Hunt	01/25/23								11/02/22
TRC Action Items from 09/22/21	Gather small group for Bivalve design review	Jay Davis	12/31/23	01/31/22	352	3				Item is of low urgency. Will convene the small group this fall. Low urgency and Jay has limited capacity due to RMP management transition and WQIF	09/22/21
SC Action Items from 11/02/2022	Document the process for starting a new workgroup	Jay Davis	04/30/23	01/25/23	-7	1				Will present initial outline at Jan SC meeting	11/02/22
SC Action Items from 11/02/2022	Discuss event-based monitoring planning at the December 2023 TRC meeting and January 2024 meeting	Jay Davis	01/26/24								11/02/22