Supplemental Environmental Project (SEP): Regional Monitoring Program for Water Quality in San Francisco Bay

Basic Information

Project Name: San Francisco Bay RMP Studies 2024 (RMP SEPs)

Project Budget, Total: $1,041,200

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RMP SEPs Description

These SEPs will fund four high-priority projects by the Regional Monitoring Program for Water Quality in San Francisco Bay (RMP) to provide information needed to support management of water quality in San Francisco Bay.

SEP	Budget	Summary
1) PCBs in San Leandro Bay	$664,700	Comprehensive study of PCBs (polychlorinated biphenyls) in San Leandro Bay to develop San Francisco Bay PCBs model to inform review and revision of the San Francisco Bay TMDL.
2) Sediment Dynamics in a North Bay Fluvially Influenced Salt Marsh	$121,500	Assessment of sediment fluxes in a mudflat–salt marsh environment to determine the relative importance of fluvial vs. Bay-derived sediment to long term rates of accretion in this and other restored marshes, and to inform future marsh restoration prioritization and methods.
3) Sediment Conceptual Models for San Pablo Bay and Suisun Bay	$125,200	Compilation and assessment of information to document understanding of the dynamic processes (between marshes and mudflats, changes in the erodible sediment pool) in the bays and evaluation of local tributary sediment loads and the tributary-marsh-erodible sediment pool pathway. Results will inform sediment management associated with dredging and marsh resilience and adaptation to and protection from sea level rise.
4) Microplastics in San Francisco Bay Sport Fish	$130,000	Assessment of microplastics in typically consumed Bay fish from throughout the Bay to determine the level of exposure to microplastics in the food web and human consumers.

RMP SEPs to be Implemented By

The projects below will be performed by the San Francisco Estuary Institute (SFEI) as part of the RMP SEPs. Each of the projects is described below with key tasks, schedules, and deliverables.

Project 1. PCBs in San Leandro Bay

This project will measure the flux of sediment and contaminants into and out of San Leandro Bay (SLB) during the wet season of 2024/25. These measurements will confirm the limited data indicating high loads from East Creek Channel and will obtain data for the other SLB tributaries, which have received even less attention. The project will use OPTICS (OPTically-based In-situ Characterization System; U.S. Patent No. 11079368), a tool that combines robust aquatic instrumentation and innovative data processing techniques to provide high-resolution measurements of surface water concentrations of contaminants. OPTICS uses in-situ optical and water quality sensors, periodic discrete surface water sample collection and analysis for calibration and validation, and a multi-parameter statistical prediction model to provide characterization of surface water contaminants. The OPTICS analysis will be coupled with standard hydrodynamic data collection (water column currents and discharge) to estimate contaminant fluxes into and through SLB. Additional concurrent sampling will include passive samplers and sediment traps to provide additional information on PCBs loading and bioavailability in SLB. The project will also estimate sediment erosion rates at the sediment-water interface using a high shear stress flume, SEDflume.

SLB is a high-priority area within San Francisco Bay for evaluation of PCBs fate and transport due to a high degree of impairment, management actions that are in progress and planned to reduce stormwater loads, and a preliminary conceptual model and simple fate model that suggests the PCBs impairment would likely be mitigated through reduction of those loads. The RMP has conducted a very limited amount of actual measurement of stormwater loads into SLB, but the small dataset obtained indicates that these inputs are still substantial despite management actions taken to date in the watershed.

The information generated by this project will be used to refine the SLB-focused PCBs fate and transport model the RMP is developing, allowing better characterization of model boundary conditions and data for calibration and validation of model results for sediment and contaminant transport. The empirical data and modeling will provide information that will support the upcoming revision of the PCBs TMDL. In addition, the project will demonstrate the use of methods that can be used in other parts of San Francisco Bay to understand sediment and contaminant transport at finer spatial scales along the Bay margins.

Tasks

1. Collect field data: deploy six moored OPTICS monitoring platforms; conduct velocity measurements along transects; conduct discrete surface water sampling for total suspended solids and PCBs; deploy and collect passive samplers and sediment traps; and collect and analyze six SEDFlume sediment cores to measure erodibility of bed sediment.

2. Conduct sediment and contaminant flux analysis: undertake data processing and quality assurance analysis, flow rate analysis, OPTICS analysis, PCBs analysis, and sediment and contaminant flux estimations.

3. Prepare draft and final technical reports: Document field collection methods, data analysis, uncertainty estimation, and sampling results; provide estimate sediment and contaminant flux into

and out of SLB; and describe applicability of results to inform review of the San Francisco Bay PCBs TMDL.

Schedule of Deliverables

1. Detailed workplan: December 2024
2. Draft technical report: May 2026
3. Final technical report: August 2026

Project 2. Sediment Dynamics in a North Bay Fluvially-Influenced Salt Marsh

This project will assess sediment fluxes in a mudflat–salt marsh environment adjacent to the Petaluma River known as Gray's Marsh, which was recently restored through an unintentional breach. The project will leverage work at the proposed site already funded by the RMP in 2024 to assess the decadal-scale physical response of marshes to restoration. By measuring sediment flux and accretion during the wet and dry seasons, the study will determine the relative importance of fluvial vs. Bay-derived sediment to long-term rates of accretion in this restored marsh. This work will also contribute to our understanding of how sediment transport and accumulation in marshes are influenced by site-specific attributes, such as fluvial influence, which will help inform future marsh restoration prioritization and methods.

Salt marshes provide essential protection against storm impacts to coastal communities but are severely vulnerable to sea-level rise and other hazards. Determining their level of resilience is crucial to predicting their future evolution. Syntheses of measurements made in salt marshes over the past 30 years have produced metrics that indicate marsh health or vulnerability. Most of these metrics have been derived in microtidal marshes not subject to direct river inputs and without management interventions. Although these metrics are hypothesized to be universal across salt marshes, they have not yet been rigorously tested in fluvially-influenced, restored marsh environments. Study of this topic is aligned with manager interest in the importance of local watersheds as a marsh sediment source. It also can inform accretion rates and fluxes in marshes, mudflats, and shoals in relation to waves and local sediment supply.

Tasks

1. Measure waves, currents, suspended-sediment concentration, and suspended-sediment flux within the river and in channels of the mudflat–marsh platform via two instrumentation deployments of two to three months each during wet and dry seasons.

2. Measure mudflat and marsh sediment deposition along three transects.

3. Collect topo-bathymetric elevation data to determine the tidal and seasonal physical and sedimentary dynamics of this system, which is both fluvially influenced and recently restored.

4. Test sediment-provenance approaches to determine the originating watershed of the sediment accumulating in the marsh.

5. Compile project results into a technical report.

Schedule of Deliverables

1. Detailed workplan incorporating input from RMP Sediment Workgroup: March 2025
2. Data release: salt-marsh and Petaluma River time-series data: September 2026

3. Data release: deposition and accretion: September 2026
4. Presentation to RMP Sediment Workgroup: May 2027
5. Report: June 2027

Project 3. Sediment Conceptual Models for San Pablo Bay and Suisun Bay

This project will be coupled with ongoing sediment transport modeling through Destination Clean Bay, a US EPA-funded effort that focuses on developing tools to support multi-benefit water-quality improvements, including identification of high priority data gaps for regional quantitative model development. This project will focus on refining the conceptual understanding of two specific elements within the San Pablo Bay and Suisun Bay subembayments of San Francisco Bay: (1) compiling updated evaluations of local tributary sediment loads, and (2) developing a deeper understanding of the tributary-marsh-erodible sediment pool pathway. The results of the study will provide a framework for understanding sediment transport in all San Francisco Bay subembayments at a more refined and deeper scale.

The RMP recently completed a conceptual model of fine sediment (i.e., sediment silt-sized and smaller) for San Francisco Bay as a whole. The report offered a high-level understanding of how fine-grained sediment moves at different scales within the Bay. The report concluded with a set of key knowledge gaps and uncertainties. Among these was a recommendation to refine our conceptual models of the dynamic processes (e.g., between marshes and mudflats, changes in the erodible sediment pool) in individual subembayments.

Tasks

1. Conduct literature review and convene advisory team: gather information related to sediment dynamics in the subembayments; and convene an RMP Sediment Workgroup sub-group to guide the literature and data gathering efforts.

2. Conduct analyses to produce a refined understanding of sediment dynamics within the subembayments with a focus on expanding the conceptual understanding of two specific elements: local tributary sediment loading within the subembayment and the tributary-marsh-sediment pool pathway. Other analyses may be needed, such as assessing the size and state of the area where wave resuspension is likely to occur.

3. Compile project results into a technical report.

Schedule of Deliverables

1. Detailed workplan: March 2025
2. Progress presentation at annual RMP Sediment Workgroup meeting: May 2025
3. Draft report submitted to RMP Sediment Workgroup: April 2026
4. Presentation to RMP Sediment Workgroup: May 2026
5. Final report completed: August 2026

Project 4. Microplastics in San Francisco Bay Sport Fish

In summer 2024, as part of RMP Status and Trends monitoring, sport fish will be collected and analyzed for a suite of contaminants. This project will leverage this sample collection effort and analyze striped bass and shiner surfperch to assess the level of exposure to microplastics in the Bay food web.

Evaluating levels of microplastics in Bay sport fish is important for understanding potential impacts to fish and for understanding whether humans may be exposed to microplastics through ingestion of sport fish. Some people eat the gastrointestinal tracts of fish, where microplastics are known to be present. In addition, it is possible for microplastics smaller than 150 μm to translocate out of the gut to other tissues.

Striped bass and shiner surfperch are popular for human consumption and are important to analyze to assess potential human exposure routes to microplastics. Striped bass are the most popular sport fish for consumption in the Bay, and a species that is higher in the food chain and provides an integrated signal for regions of the Bay because of its wide foraging behavior and opportunistic consumption of lower trophic level fish. Shiner surfperch are an abundant and popular sport fish species that feeds on invertebrates in the benthic zone and exhibits high site fidelity, making them useful for assessing spatial differences in contaminants.

In total, up to 50 whole shiner surfperch will be collected from sites throughout the Bay. Additionally, up to 20 striped bass will be collected where the gut, liver, and muscle tissue from one side of the fish are preserved for analysis. Field blank samples will be collected as open cleaned-foil samples during sample dissection and stored with the fish samples after dissection. Microplastics will be analyzed in collected samples. Results will be compared to previous results for Bay prey fish and fish in other published studies.

Tasks

1. Analyze microplastics in fish tissues.
2. Compile project results into a technical report.

Schedule of Deliverables

1. Microplastics analysis results: September 2025
2. Report: January 2026

Compliance with SEP Criteria

The RMP SEPs comply with the following SEP criteria:

- It supports development and implementation of a monitoring program and/or study of surface water quality or quantity and/or the beneficial uses of the water.
- Its nexus to violations is that it is located within the same Water Board region in which violations occurred.

The RMP SEPs go above and beyond applicable obligations of dischargers because of the following:

- The SEPs study and associated products are above and beyond what is required in permits or orders issued by the Regional Water Board or what could be accomplished with dischargers' required monetary contributions to the RMP.

RMP SEPs Milestones and Performance Measures

The SEPs scope and progress will be reviewed and tracked through the RMP's governance, which includes its Steering Committee, Technical Review Committee, PCB Workgroup, Sediment Workgroup, Microplastics Workgroup, and Sport Fish Strategy Team. Final products of all study elements will be completed by October 2027, including reports documenting results and findings.

RMP SEPs Budget and Reports to Regional Water Board

Pursuant to the October 2015 Supplement to the Memorandum of Understanding (MOU) between SFEI and the Regional Water Board, SFEI is responsible for identifying in each annual work plan and annual budget for the RMP those studies or elements, or portions of a study or element, that are to be funded by SEP funds. SFEI will keep a copy of accounting records of the SEPs fund contributions and expenditures separately from regular RMP funds. In its annual and quarterly financial reports to the Regional Water Board, SFEI will separately itemize SEPs fund contributions and expenditures by each SEP funder.

SFEI will provide notice to the Regional Water Board within one month after receiving funds from a discharger for the SEPs and the notice will state SFEI's agreement to use the funds received as described herein.

Publicity

Pursuant to the 2015 MOU, SFEI will indicate on its RMP website and annual and other reports that funding for these SEPs is the result of settlement of "San Francisco Bay Water Board" enforcement actions.