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

Emerging Contaminants Workgroup Annual Meeting

Day 1 - April 22, 2026
San Francisco Estuary Institute

Meeting Summary

ECWG Science Advisors	Affiliation	Present
Bill Arnold	University of Minnesota	Yes
Miriam Diamond	University of Toronto	Yes
Lee Ferguson	Duke University	Yes
Derek Muir	Environment and Climate Change Canada	Yes
Heather Stapleton	Duke University	Yes
Dan Villeneuve	U.S. Environmental Protection Agency	No

Attendees

Aidan Cecchetti (SFBRWQCB)
Alison Fisher (SFPUC)
Alyssa Demko (DTSC)
Amy Kleckner (SFEI)
Andria Ventura (Clean Water Action)
Andy James (University of Washington)
Angelica Berumen (City of San Leandro/EBDA)
Anne Cooper Doherty (DTSC)
Anthony Khalil (SFEI)
Ben Priest (CIL)
Bernard Crimmins (Clarkson University)
Bonnie de Berry (EOA/BAMSC)
Brandon Steets (Geosyntec)
Bruno Guerraz (SGS AXYS)
Bushra Khan (UC-Davis)
Chunjie Xia (University of Indiana)
Damien Reggio (EBMUD)
Diana Lin (SFEI)
Don Yee (SFEI)
Edward Kolodziej (University of Washington)
Elise Sbarbori (City of Palo Alto)
Eric Dunlavey (SJSC)
Ezra Miller (SFEI)
George Cobb (Baylor University)
Gerardo Martinez (SFBRWQCB)
Gregory LeFevre (University of Iowa)
Heather Bischel (UC-Davis)
Jay Davis (SFEI)
Jen Jackson (DTSC)
Jennifer Dougherty (SFEI)
Jennifer Sun (SFEI)
Jeremy Conkle (Delaware River Basin Commission)
June-Soo Park (DTSC)
Kara Mirmelstein (SFEI)
Karin North (City of Palo Alto)
Katie Janss (SFEI)
Kayli Paterson (SFEI)
Kelly Grant (DTSC)
Kelly Moran (SFEI)
Kimberlee West (SFBRWQCB)
Kristy Fournier (DSRSD)
Lisa Welsh (Geosyntec)
Lester McKee (SFEI)
Lorien Fono (BACWA)
Luisa Valiela (US EPA Region 9)
Mary Cousins (BACWA)
Maggie Monahan (SFBRWQCB)
Manoela de Orte (SWRCB)
Meléa Emunah (Stanford University)
Meltem Musa (OEHHA)
Michelle Azurin (SFEI)

Michelle Lin (SJSC)
Miguel Méndez (SFEI)
Noah Rudko (SFEI)
Rebecca Greenwood (SWRCB)
Rebecca Sutton (SFEI)
Reid Bogert (C/CAG)
Richard Looker (SFBRWQCB)
Richard Grace (SGS AXYS)
Robert Budd (DPR)
Robert Rossi (DTSC)
Robert Wilson (City of Santa Rosa)
Sasha A'Hearn (SacSewer)
Shoba Iyer (SF Environment)
Sierra Garcia (SFEI)
Simret Yigsaw (City of San Jose)
Terry Grim (ZeptoMetrix)
Tom Bruton (DTSC)
Thomas Mumley (Retired)
Veronica Suarez (SacSewer)
Xueyuan Yu (San Diego RWQCB)

1. Introductions and Goals

Amy Kleckner opened the Emerging Contaminants Workgroup (ECWG) meeting by outlining the meeting's objectives, which centered on project science updates, the evaluation of special study proposals, and strategic planning for future initiatives. She provided a brief summary of the Regional Monitoring Program for Water Quality in San Francisco Bay (RMP), detailing its governance structure and role of the ECWG. During her presentation, Amy emphasized the RMP's 2026 fiscal outlook, noting a total budget of $9.2M, with approximately $3.7M dedicated to special studies. Projections suggest the total budget will stabilize near $9M through 2030, which is attributed to the full allocation of the Tracking Bay Health (TBH) grant and a subsequent two-year extension of its performance period.

2. Information: 20 Years of the Emerging Contaminants Workgroup

Rebecca Sutton began the meeting by providing a retrospective of the workgroup's two-decade history. The initiative originated from a 2003 report by former SFEI scientist Daniel Oros, who advocated for the identification of unknown organic contaminants before they reached legacy status in San Francisco Bay. This foundational work shifted the regional focus from reactive monitoring of established pollutants to an anticipatory program centered on emerging contaminants. Over the last 20 years, the term "emerging" has evolved, as many prioritized substances are now recognized as active environmental threats. The ECWG's success is attributed to robust collaboration between stakeholders, the scientific community, and regulators, supported by a dedicated panel of expert advisors.

Rebecca also detailed several major milestones since the program's formal establishment in 2006. Initially staffed by Susan Klosterhaus with modest annual budgets, the program has grown significantly in scope and impact. Key highlights include:

- **PBDEs (2013):** Monitoring of polybrominated diphenyl ethers (PBDEs) demonstrated rapid environmental recovery following state bans, proving the efficacy of source control.
- **Microplastics (2015):** A pilot study on microplastics influenced state and federal regulations and led to the creation of the RMP Microplastics Workgroup.
- **Urban Pesticides (2017):** A collaborative study on flea control pesticides in wastewater led to a pioneering urban pesticides monitoring program by the California Department of Pesticide Regulation.
- **6PPDQ (2020):** RMP stormwater data supported findings that tire-derived 6PPDQ was toxic to coho salmon, and allowed California to become the first global jurisdiction to regulate the source chemical in tires.

To date, the ECWG has informed over 20 state and federal policy decisions. As of 2026, the program is entering a new phase of expansion with increased funding aimed at pioneering new scientific areas and further influencing environmental policy.

3. Information: RMP CECs Science Update

Rebecca Sutton opened with a concise overview of ongoing Contaminants of Emerging Concern (CECs) initiatives. She formally introduced the SFEI CECs team, welcoming new staff members Noah Rudko and Jennifer Sun. Rebecca outlined the current program through four primary strategic pillars: (1) Bay monitoring and risk screening, (2) pathways modeling and monitoring, (3) novel approaches, and (4) learning from others/sharing expertise.

She reviewed the tiered risk-based framework, detailing active Bay monitoring, focusing first on High Concern contaminants. Status and Trends (S&T) monitoring for organophosphate esters (OPEs) in water is planned once QA/QC hurdles are cleared. Per- and polyfluoroalkyl substances (PFAS) science remains a major focus, encompassing a Synthesis and Strategy report currently in draft, continuous S&T monitoring of water, sediment, and biota (including fish and bird eggs), and pilot studies on prey fish and marine mammals. Additionally, there is a project to use ^{19}F-NMR to investigate various Bay matrices.

Regarding Moderate Concern CECs, Rebecca noted that wet season monitoring for 6PPD-quinone (6PPDQ) is ongoing, while S&T monitoring for bisphenols is awaiting QA/QC resolution. In the Possible Concern category, special studies are currently evaluating quaternary ammonium compounds (QACs) in Bay water, and plastic additives in Bay water and sediment, alongside continued wet season monitoring for vehicle- and tire-derived contaminants.

Pathways monitoring efforts were also highlighted, starting with wastewater projects. Ongoing monitoring into biocides, including isothiazolinones and carbendazim, and plastic additives aims to clarify Bay contamination routes; the latter project was extended following a laboratory change. PFAS monitoring has entered a third phase, continuing investigation of upstream sewersheds, influent, and effluent with novel methods including ultra-short chains (USC), fluorotelomer alcohols (FTOHs), Extended List (with polyfluoroalkyl phosphate esters [PAPs]), and total fluorine methods (including ^{19}F-NMR). Stormwater initiatives also emphasize PFAS, featuring a depth sampling pilot and analysis via similar novel methods to wastewater (i.e., USC, FTOHs, Extended List, and total fluorine) plus studies on tire rubber markers, biocides, and QACs. Furthermore, precipitation has been added as a monitoring pathway, with a PFAS pilot study set for presentation later in the meeting.

Turning to novel approaches, Rebecca focused on ecotoxicology and nontarget analysis (NTA). Current NTA projects are examining stormwater, microfibers, Bay water, sport fish, and marine mammals. She also noted a project applying bioassays to Bay water and an ongoing pro bono in-vitro cell assay study for stormwater that is currently being prepared for publication.

In closing, Sutton recognized several scientific achievements, including the publication of studies on QACs in wastewater, PFAS in fish, and a global study on flame retardants (PBDEs). A manuscript regarding QACs in Bay sediment and water is presently under review. After discussing recent and upcoming conference participation, Sutton concluded with a reminder of future workgroup sessions for SPLWG and MPWG, as well as the Fall 2026 meeting of the Stormwater CECs Stakeholder-Science Advisor Team (SST) to review the developing monitoring strategy.

The discussion was initiated by Tom Mumley, who requested a series of brief updates regarding various active ECWG projects. He emphasized the importance of maintaining a clear overview of all ongoing studies, including their current status and anticipated delivery dates for work products, to facilitate timely reviews and constructive input. Tom inquired specifically about the

literature review concerning the co-benefits of enhanced nutrient removal technologies being implemented at Bay wastewater treatment plants. Rebecca confirmed that the project has secured funding and is being spearheaded by Noah Rudko and Miguel Méndez, with a draft report projected for completion this summer. Karin North expressed her support for this initiative and advocated for continued monitoring of wastewater treatment plants, particularly at Palo Alto and across the South Bay, to better evaluate how these emerging technologies impact the Bay.

4. Discussion: CEC Strategy Update

Rebecca Sutton provided an update on the CECs Strategy, beginning with an examination of the multi-year plan (MYP) and its core components. She first addressed the Strategy element, which includes the annual CECs strategy funding, a tires-focused strategy, a literature review regarding the co-benefits of advanced nutrient treatment for CECs, and a newly suggested pathways strategy in the future. The CECs strategy is uniquely significant as it provides flexible funding for literature reviews, scientific collaboration, and stakeholder engagement to maintain the program's leadership in this rapidly advancing field. Future growth for the CECs strategy is projected for 2028, coinciding with an expansion of the program team. Alongside the CECs strategy, a specialized tire strategy has received annual funding for four years and is expected to sunset in 2027. The ongoing co-benefits project is slated for completion this summer and is expected to inform a proposal for monitoring Bay Area wastewater treatment plants (WWTPs) as they undergo upcoming upgrades. A new addition to the MYP, a pathways strategy is recommended for 2030, and will encompass wastewater, stormwater, and potentially precipitation.

Rebecca then introduced the stormwater monitoring component, noting that the ECWG oversees monitoring while the SPLWG directs modeling. The RMP plans to continue allocating substantial annual resources, approximately $325K supplemented by $250K in additional priorities, toward stormwater CECs monitoring. Efforts remain heavily focused on PFAS, with water year 2027 support augmented by the EPA PFAS Sources to Solutions grant. A future proposal is recommended to analyze available data and develop a conceptual model for PFAS-contaminated sites, targeting a pathway that may have significant implications for stormwater. This evolution of the stormwater program remains a collaborative, ongoing process involving advisor and stakeholder teams to address an ever-changing monitoring landscape.

She continued with discussion of future work for contaminants classified under the tiered risk-based framework as well as NTA and toxicology.

High Concern

- PFAS: Future studies are expected to focus on fish contamination, a major driver of PFAS concern in the Bay, including development of a Bay bioaccumulation conceptual model and more consistent monitoring of fish though the Protecting Bay Fishers EPA proposal, a follow-up study to further investigate observations via the current NTA study, and analysis of temporal trends of prey fish. Multi-year monitoring of stormwater and precipitation is recommended, as well as the conceptual model of contaminated sites including analysis of available data. Further, there are plans for a potential fourth phase of wastewater monitoring, expansion of analytical methods for Bay water and sediment, and development of an in-Bay model including a mass balance.
- OPEs: With more incoming data for OPEs in Bay water and wastewater, it is anticipated that future work will focus on the development of a synthesis and strategy along with a conceptual model, similar to ongoing work on PFAS. We also recommend recurrent

monitoring in stormwater and a pilot study of bird eggs, where certain OPEs could be bioaccumulating.

Moderate Concern

- 6PPDQ (and other tire- and vehicle-derived contaminants currently classified as Possible Concern): A recommended focus of future work is the development of a conceptual model of hexamethoxymethylmelamine (HMMM) in stormwater to inform pilot modeling within watersheds. Another potential study is to determine chemical indicators to characterize the amount of tire material in stormwater and sediment samples to effectively and efficiently monitor this contamination.
- Bisphenols: With the resolution of QA concerns, it's expected that recurrent monitoring will continue in stormwater.
- Carbendazim (and other biocides including isothiazolinones): Incoming data from pathways monitoring will help inform future monitoring in Bay water.

Low Concern

- Personal Care Ingredients: A study is currently proposed to examine paraben preservatives and related transformation products in wastewater.

Possible Concern/New Classes

- QACs: A follow up study on wastewater examining upstream sewersheds, influent, effluent, and biosolids is being proposed to better understand sources of contamination and establish trends over time.
- A variety of anticipated projects for novel contaminants in the Bay include alternative brominated flame retardants, antioxidants, liquid crystal monomers, polyhalogenated carbazoles, siloxanes, and synthetic dyes.

NTA

- Future projects in this category would expand to include bird eggs, which have not been previously studied using NTA, as well as a future idea to characterize extractable organohalogens.

Toxicology

- Antimicrobial resistance is an important area of interest internationally, with continued discussions with experts on how to best proceed.
- Additional priorities are in development after a year on pause due to uncertain funding.

During the discussion, meeting participants explored several key areas. Lee Ferguson and Heather Stapleton suggested collaborating with Dr. Kirsten Overdahl for prospective monitoring of synthetic dyes. Miriam Diamond offered her expertise to help guide future RMP initiatives regarding antimicrobial resistance, noting the importance of harmonizing testing methods and aligning with broader efforts to address management priorities. She indicated that the RMP could provide unique value by connecting antimicrobial resistance with available biocide monitoring data. Derek Muir proposed investigating aromatic amines as a new contaminant class, citing their significant presence in urban sediments; Lee added that this science complements work on synthetic dyes, as aniline serves as a primary building block for them.

Additionally, Lee suggested monitoring specific PFAS (PF6, TFSI, and BF4) across various matrices as indicators of lithium-ion battery contamination, which may stem from landfill leachate or electronics recycling. Karin North highlighted the prevalence of closed landfills in the Bay Area and advocated for strategic sampling to distinguish between different contamination sources. In response, Lee pointed out that older, closed landfills typically show less contamination compared to active sites affected by modern lithium-ion battery formulations. Karin also noted that home and vehicle battery fires represent further potential contamination risks. Tom Mumley indicated the need to develop a CECs modeling strategy, emphasizing the necessity of identifying core Bay modeling requirements to inform multi-year monitoring for emerging contaminants. He also recommended development of a stormwater monitoring strategy, building upon the recently completed stormwater monitoring approach report. Rebecca added that a future pathways strategy will focus on a more holistic integration of wastewater and stormwater pathway monitoring and modeling to support adaptive, iterative workflows. Miriam expressed support for a strategy that includes conceptual models to identify data gaps.

5. Discussion: QACs Risk Screening

Rebecca Sutton and Ezra Miller presented an updated risk screening approach on QACs including preliminary Bay water data from an ongoing study with Dr. Bill Arnold of the University of Minnesota. QACs (also called “quats”) are compounds that have been used since the 1930s in a wide range of industrial, agricultural, and consumer products, especially as antimicrobials. The COVID-19 pandemic has led to increased use of QACs, which likely continues today. QACs are a broad category of compounds separated into several subclasses: benzyl alkyl dimethyl ammonium compounds (BACs), dialkyl dimethyl ammonium compounds (DADMACs), ethylbenzyl alkyl dimethyl ammonium compounds (EBACs), and alkyl trimethyl ammonium compounds (ATMACs). Their widespread applications in products have led to growing exposures that could potentially impact human and ecological health. Further, QACs have been associated with WWTP upsets at levels greater than 2 mg/L, which can then lead to water quality impacts to receiving water bodies. A few Bay Area WWTPs have noted intermittent levels over five times larger than the noted threshold, though further study is needed to directly connect these high detections to WWTP upsets locally. Upstream sewershed investigations by local agencies have indicated widespread use at groceries, schools, restaurants, and food manufacturers, which may be leading to these increasing levels.

Rebecca discussed monitoring data from studies conducted between 2021 to 2023 in Bay water, sediment, stormwater, and wastewater. The levels found in pathways (effluent and stormwater) were in the hundreds to thousands of ng/L while levels in Bay water were in the low hundreds. The median concentration in sediment was around 0.4 ng/g. Though no robust ecotoxicity thresholds exist for QAC mixtures, those available for individual QACs indicate relatively high potential for water toxicity and low potential for sediment toxicity. Because data for only seven water samples were available, these preliminary results led to the placement of QACs in the Possible Concern category of the tiered risk-based framework, with more data needed in surface water to adequately assess its placement in a higher tier. Now, preliminary results from a 2025 study examining Bay Water in 22 locations have shown an order of magnitude decrease in QAC concentrations from those measured in 2021. This decrease could be due to changes in use and/or a difference in the subset of sampling locations for which data are available in time for this meeting (focused in the North and Central Bay) compared to 2021 (in the South and Lower South Bay).

Ezra Miller then discussed several environmental impacts of QACs beginning with its known toxicity to aquatic species. Overall, there is more toxicity data available for biocidal QACs, such

as BACs and shorter chain DADMACs, due to associated regulatory requirements. This includes several studies of Bardac 2280 (composed of 80% DADMAC C10:C10), which has shown acute lethality in white sturgeon larvae and fry along with reductions in growth for fish that did survive acute exposure. Within the Bay region, the greatest areas of concern may be in the Delta where sturgeon spawn, as well as in the Lower South Bay (LSB) where high QAC concentrations have been detected, though we do not know if spawning occurs in the region. Tom Mumley asked about the presence of white and green sturgeon in the LSB, which Jay Davis and Amy Kleckner noted are likely present from available anecdotal evidence though limited knowledge exists from researchers who monitor the area. Eric Dunlavey remarked that Jim Hobbs and his team from UC Davis catch white sturgeon in the Bay and would be a good contact for more information. Ezra continued with discussion of unmeasured degradates, which still have a similar structure to parent QACs, and potentially contribute to toxicity. Another noted impact is the contribution of QACs to the development of antimicrobial resistance (AMR), with several questions remaining on the contribution of QACs to the overall load that is promoting AMR. Bill Arnold noted the complexity of the microbial ecology relating to AMR. At present, these contaminants are suggested to remain in the Possible Concern tier until the full 2025 dataset is available for a risk screening.

During the discussion on the updated risk screening, Derek Muir suggested that current data supports elevating the status of QACs. Regarding production data, Miriam Diamond asked if more information was accessible, and Derek Muir noted that certain QACs are covered under the Toxic Substances Control Act (TSCA) excluding pesticides, which mandates EPA publication of production figures. Bill Arnold suggested the Toxics Use Reduction Institute might have information, and Shoba Iyer pointed out that national aggregate production volumes can be found in a preliminary screening report by Biomonitoring California, and highlighted that textiles and clothing treated with antimicrobials could contribute to wastewater loads during washing. Addressing the focus on specific species, Heather Stapleton questioned the emphasis on white sturgeon; Ezra explained White Sturgeon are now a candidate species under the California Endangered Species Act (CESA) and candidate species receive full protections under CESA while going through the review process, making them a high interest Bay species.

On the topic of chemical classification, Rebecca inquired about separating the QACs into subclasses, but Bill Arnold and Anne Cooper Doherty explained that distinguishing them would be difficult, in part due to overlapping antimicrobial and surfactant properties. Anne Cooper questioned the shifting number of analyzed QACs, which Bill attributed to extraction challenges or their removal from the analytical method due to their rare detection in water.

Finally, participants highlighted WWTP implications. Anne Cooper emphasized the necessity of prioritizing treatment impacts, and Mary Cousins expanded on this by questioning which specific QACs pose the greatest risk, noting that further research is essential to establish methods, identify commercial laboratories, assist with data interpretation, and clarify the challenges QACs present to wastewater processing. Bill Arnold expressed willingness to hold subsequent discussions regarding current knowledge on WWTP impacts. Tom Mumley added that QACs are expected to transition to the Moderate Concern tier unless widespread lower concentrations are found in Bay water, emphasizing that challenges in splitting the class mean the group should remain lumped, alongside a need for additional whole organism toxicity testing. Additionally, Aidan Cecchitti raised the possibility of incorporating polyDADMAC compounds into analytical methods, given their use as flocculants or flocculant aids.

6. Discussion: PFAS Synthesis and Strategy

Diana Lin provided an update on the draft PFAS Synthesis and Strategy report, which aggregates California's most extensive long-term PFAS dataset to inform monitoring and support regulatory actions. The initiative is guided by three primary management drivers: assessing risks to human and ecological health, identifying contaminant sources to guide mitigation strategies, and addressing the anticipated future necessity of managing PFAS loads into the Bay. Since 2006, the RMP has continuously broadened its scope, monitoring PFAS across various matrices including water, sediment, harbor seals, fish, and bird eggs.

Stormwater and wastewater are recognized as the primary pathways for PFAS entering the Bay, driven by both legacy inputs (such as firefighting foams and historical PFOS products) and contemporary sources (including consumer products, industrial discharges, and human excretion). Median concentrations of highly detected analytes, specifically PFOS, PFOA, PFHxA, and PFPeA, are generally comparable between wastewater and stormwater, typically in the tens of ng/L. However, stormwater concentrations demonstrate high variability, spanning more than two orders of magnitude, up to 180 ng/L. Considering total runoff volumes, stormwater serves as a major pathway that has historically lacked targeted management. Ambient Bay water concentrations clearly reflect these pathway influences, with dry and wet season sumPFAS levels remaining in a similar, though lower, range of tens of ng/L.

Within Bay sediment and biota, PFOS is the dominant compound, showing levels comparable to other urbanized regions. Across all matrices, spatial trends indicate elevated PFAS concentrations in the South and Lower South Bay, with wet-season increases observed near urban creek mouths, while sediment levels remain similar between open Bay and margin sites. From a temporal perspective, PFOS concentrations in South and Lower South Bay sediment experienced a significant 73% decline from 2012 to 2023. Bird eggs exhibit similar downward trends for PFOS, though most other matrices currently lack sufficient data to evaluate long-term temporal trends.

PFAS bioaccumulation and biomagnification within the Bay food web pose substantial risks. Sport fish sampled in 2014 and 2019 revealed elevated PFOS levels in the South and Lower South Bay, with 90% of Bay-wide samples exceeding the Massachusetts human consumption threshold for one meal per day (0.5 ng/g). Although human health risks drive the High Concern designation, the data also highlights ecological threats. Multiple sport and prey fish samples, particularly in the South Bay, exceed Canadian guidelines established to protect marine mammals and piscivorous birds (4.6 ng/g).

Diana then discussed the proposed near-term strategy beginning with an overview of key management drivers. California EPA Office of Environmental Health Hazard Assessment (OEHHA) is working on a fish consumption threshold for PFOS, and there is potential for a finding of impairment of beneficial uses in San Francisco Bay. Water quality managers and regulators need updated fish data for risk evaluations and reliable temporal trends data. If there is a finding of impairment, this would take us into a regulatory framework with specific information needed to identify and characterize major sources and pathways, including quantification of PFOS loadings into the Bay and models to evaluate management and recovery scenarios. The draft monitoring strategy is composed of six elements:

1. Continue Bay S&T monitoring

    a. Evaluation of temporal trends in water, sediment, fish, and bird eggs to continue to assess human health and ecosystem risks.

2. Expand Fish Monitoring

    a. This includes analysis of more samples across species as well as an increased frequency of fish monitoring with a proposed transition to 3-year (instead of 5 year) monitoring efforts for sport fish.
    b. A recently submitted grant proposal, Protecting Bay Fishers, could help advance these goals by adding an additional round of expanded sport fish monitoring in 2027, including a consumption survey and close coordination with regional stakeholders including local fishers.

3. Develop a Bay Fish Bioaccumulation Conceptual model

    a. The conceptual model development, which is a proposed special study for 2028, would identify priority species for modeling as well as gather and identify data needs for modeling.
    b. This would be followed by a quantitative model to inform management decisions.

4. Continue Pathways Monitoring

    a. Continue building datasets to best understand major sources, pathways, and loadings of PFAS to the Bay.
    b. Several special studies are being proposed under this element including
        i. The Water Board has compiled a comprehensive monitoring dataset from regional contaminated sites. Because this data has not yet been analyzed to improve our understanding of potential loading and transport pathways to the Bay, this proposal seeks to conduct a thorough data analysis and develop a conceptual model.
        ii. Stormwater monitoring represents a key component of the MYP, serving as a priority focus area for the tracking and modeling of stormwater CECs. This proposal will be discussed by Rebecca during Day 2.
        iii. We suggest an ongoing investigation into precipitation as a pathway, with initial outcomes to be shared later today and a multi-year monitoring proposal slated for Day 2.
        iv. BACWA members are currently undertaking several PFAS investigations, and we suggest maintaining a continuous partnership in future monitoring on mutual concerns, including tracking sewershed sources and improving load estimations.

5. Explore and Pilot Novel Methods

    a. In conducting this synthesis, we examined alternative PFAS monitoring and distinguished several precursors and subgroups that remain uninvestigated in our work. To refine our comprehension of PFAS risks and exposure pathways, commercial laboratories have developed innovative targeted methodologies that we are currently piloting on both stormwater and wastewater matrices. Rebecca presented preliminary observations from stormwater later in the day.

   b. Additional proposed projects to pilot methods include direct TOP assay in sediment, periodic application of NTA for overlooked PFAS, and application of novel PFAS methods in sport fish.

6. Develop Quantitative Models

   a. The final component involves constructing quantitative models to assist the regulatory framework in managing PFOS. A recommended special study would establish an in-Bay mass balance model to integrate key PFAS pathways and Bay loadings, factor in internal transport and bioaccumulation in fish, and simulate potential regional recovery scenarios.

A current draft of the Synthesis and Strategy is available for review with comments due by 5/13.

During the monitoring strategy discussion, Lee Ferguson highlighted the importance of precursor assays in upstream sewersheds and noted technical limitations, such as incomplete conversion in the TOP assay, which requires rigorous quality assurance. He emphasized evaluating the distribution of precursors across different particle size fractions, noting that particulate precursors, like colloidal side-chain fluoropolymers or microfibers, are critical to consider for total loads and biosolids transport. When asked by Lorien about potential Teflon pieces in samples, Lee clarified they would likely escape detection under current analytical methods, pointing instead to acrylates and urethanes as the probable precursors.

Miriam Diamond then discussed the potential use of the total hydrolyzable precursors (THP) assay, with expanded comments from Chunjie Xia on the use of this method for capturing contributions of more neutral or volatile PFAS, resulting in more fluorine than observed in a standard TOP assay. Miriam also notes that 7:3 FTCA comes from side-chain fluoropolymers and emphasizes maximizing modeling efforts in the coming years as PFAS composition changes through breakdown. Heather Stapleton added that 7:3 FTCA derives from 8:2 FTOHs and acrylates and suggested using GC-MS methods for neutral PFAS, which factor into potential biomagnification. Advisors supported focusing future efforts on time-sensitive bioaccumulation models designed for fish populations rather than individual fish.

Tom Mumley advocated for separating carboxylates from sulfonates and further examining the importance of precursors to these categories (especially PFOS). He added that the 2024 sport fish data should be included in the report as they are important to add for this key matrix driving concern in the Bay. He also recommended initiating simple Bay and food web modeling immediately, drawing from lessons learned with PCBs, to accompany conceptual transport and fate frameworks. Tom also emphasized support for expanding fish monitoring frequency. He also noted the importance of leaning on the SFRWQCB to better understand contaminated land sites as significant regional sources of PFAS. These efforts are worth doing and prioritizing to avoid undesirable regulatory consequences. Data Solicitation for 2030 California Integrated Report is currently open with any relevant data needing to be uploaded to CEDEN by August 10th, 2026 to be included. Miriam Diamond also added to develop more specific questions to be answered from the monitoring and modeling projects to best support management decisions. Derek Muir advocated for use of lower thresholds developed in Europe, especially for aquatic life exposures, and the potential for use of any available toxicity data on the sum of PFAS. Jay Davis added that no regulatory fish threshold currently exists for California, with OEHHA still working on developing relevant regulatory standards.

7. Information: PFAS in Precipitation: Preliminary Findings

Chunjie Xia, research associate at Indiana University, presented preliminary findings of the pilot year of monitoring precipitation for PFAS. The widespread use of PFAS has led to detections across the environment, including remote areas of the globe, where only atmospheric deposition could take them. PFAS moves readily through the air environment, going from industrial emissions entering the air, transported through the atmosphere, and ultimately deposited back through dry and wet deposition. A previous study examining the flow of PFAS through the environment in the Great Lakes found accumulation of PFBA from the atmosphere at three of the lakes, most significantly in the more remote Lake Superior, and emphasized the overall importance of the air pathway to deliver PFAS across the Great Lakes.

Chunjie continued with discussion of the SF Bay study, noting the collection of rain from seven sites (n = 10) with co-located stormwater collection at two of the sites (n = 4). Samples were collected using a 5 gallon HDPE bucket open for several hours (or days if at a small automated sampler site). A total of 26 PFAS across four classes (PFCAs, PFSAs, FASAs, FTSAs) were analyzed using LC-MS/MS. In rain samples, TFA levels were an order of magnitude higher (hundreds of ng/L) than the sum of the other 25 PFAS, likely due to multiple degrading environmental sources, though data remain insufficient for definitive conclusions. PFCAs contribute significantly to rain concentrations, showing a pattern similar to the Great Lakes, though 6:2 FTS (a replacement chemical used in industrial applications, chrome plating, and AFFFs) was unexpectedly dominant. Potential sources of this contamination could include wastewater effluent and airports. Stormwater levels are generally higher than rain levels (roughly two times greater or more) likely due to the increased particulate matter and debris found in these samples. Interestingly two PFAS, FBSA and PFBS, were only found in stormwater. Overall, the levels of PFAS in SF Bay are in line with levels reported in other studies from the US and globally.

During the discussion, meeting participants raised several points regarding the findings and methodology, beginning with Lee Ferguson suggesting that there might be a blank issue with 6:2 FTS, which Chunjie noted was not currently the case. Lee also noted that perfluoropropanoic acid (PFPrA) was also detected at relatively high levels. Miriam Diamond commented that the PFAS would not be strongly particle-sorbed, suggesting that the higher contributions in stormwater might not be associated with particles and pointing to additional watershed sources. Lee Ferguson also inquired about the current state of knowledge regarding breakdown to TFA. Derek Muir responded that there is a relationship to vehicles with transformation happening across the atmosphere while Bill Arnold added that pesticides could also be contributing sources. Kelly Moran noted that current Bay samples are generally downwind of the region’s urbanized areas, but incoming and future samples will capture areas generally upwind of urbanized areas. Tom Mumley inquired about deployment logistics ties to stormwater, with Miguel Méndez clarifying that sample buckets were deployed together with ongoing stormwater events. Robert Budd raised a question about accounting for the first flush in sample collection, but Ezra Miller noted that complications with various stormwater needs prevented collection of this type of sample this year.

8. Discussion: New PFAS Analyses in Stormwater

Rebecca Sutton then presented preliminary findings from recent, expanded PFAS analyses on stormwater. While a substantial dataset centered on EPA Method 1633 (comprising 40 analytes)

has been established through stormwater monitoring since 2018, ongoing analytical progress has introduced new methods capable of identifying a broader range of PFAS. To investigate the widespread presence of this chemical class, manual stormwater samples were gathered from six sites in water year 2025 using ISCO pumps and analyzed via eight additional PFAS methods. This screening helps determine which specific analytes warrant further testing across other matrices, with a particular focus on wastewater as another critical pathway to the Bay.

Extended List

- An expanded version of EPA Method 1633 including 35 additional PFAS, 5 new subclasses (monoPAPs, diPAPs, Nafion byproducts, perfluoroalkylphosphonic acids, and perfluoroalkylphosphinates), and expansion of six existing classes.
- N-MeFBSAA was found in all samples at low ng/L (< 2 ng/L).
- 6:2 diPAP was in 5 of 6 samples at levels typically higher than other PFAS (max: 15 ng/L), with overall detection frequency in-line with previous monitoring.
- TFSI, a PFAS used in lithium ion batteries, was detected in 50% of samples at ~1 ng/L.
- Four analytes (PFBSA, PFHxSA, 10:2 FTS, and 6:2 monoPAP) were found in one or two samples at generally low ng/L levels (< 2 ng/L) except for 6:2 monoPAP which was found at 6.4 ng/L. 10:2 FTS was detected in previous monitoring at similar levels along with a couple of others in the class including 6:2 FTS.

Ultra Short Chains (USCs)

- A recently introduced method that analyzes five prevalent USCs (defined as PFAS with a carbon chain length of 3 or fewer), which are receiving heightened scrutiny on the international stage.
- TFA was detected in all samples at hundreds of ng/L (max: 990 ng/L), which is consistent with levels observed globally.
    - TFA is an extremely persistent and mobile compound and is the terminal degradate of a variety of PFAS used commercially, including refrigerants as a replacement to ozone harming chemicals.
- PFMeS detected in one sample at comparably low levels (19 ng/L).

Fluorotelomer Alcohols (FTOHs)

- Newly developed method examining six common FTOHs, which are widely used in consumer products including paints, coatings, cookware, and cleanings products.
- 6:2 FTOH was found in a single sample at 34 ng/L along with 4:2 FTOH found in two samples in hundreds of ng/L (max: 630 ng/L).
    - FTOHs degrade and transform into perfluorinated carboxylic acids (PFCAs).

Regarding the storage protocols for FTOH samples, Derik Muir raised a question about how to prevent their potential volatilization. Richard Grace advised that samples ought to be frozen as rapidly as possible, ensuring zero headspace. Additionally, Richard noted an interest in assessing the breakdown of side-chain fluoropolymers via TOP analysis, while pointing out the difficulty of securing sufficiently pure analytical standards. To support method development, Lee Ferguson offered to provide suitable standards for side-chain fluorinated polymers.

Total Oxidizable Precursors Assay (TOP) + USC TOP

- The Total Oxidizable Precursor (TOP) assay identifies perfluoroalkyl acid (PFAA) precursors by converting them into PFCAs via a hydroxyl radical-based oxidation reaction. Recent technical progress has additionally enabled the post-oxidation detection of ultra-short-chain (USC) PFAS.
- Pre- and post-oxidation PFCA levels changed significantly (>35%) in four out of six samples, a result primarily driven by elevations in PFOA, PFHxA, and PFPeA. These observations align with past reports of TOP in stormwater, suggesting some contribution of unknown precursors to stormwater PFAS.
    - Precursor presence in stormwater appears somewhat similar to observations in wastewater effluent, and lower than wastewater influent or sewershed samples.
- No precursors were detected via USC TOP. Elevated method detection limits may influence this finding.

Total Fluorine Methods

- Adsorbable Organic Fluorine (AOF): A technique that quantifies the organic fluorine content adhering to an adsorbent medium as the sample passes through it.
    - Each sample had a detect that ranged from 11-88 µg/L.
- Extractable Organic Fluorine (EOF): A method designed to isolate and measure organic fluorine recovered from a sample using solvent or extraction techniques.
    - All samples were non-detect (MDL: 5 µg/L).
- Total Fluorine (TF): An evaluation of the sum of all fluorine-bearing compounds present in a sample, encompassing both inorganic and organic constituents.
    - Every sample found fluorine (range: 73-390 µg/L).

Interpreting these findings and comparing them across different PFAS analytical methodologies presents a significant challenge. The cumulative amount of PFAS identified through alternative techniques, including the highly prevalent TFA, accounts for only a minor fraction of the overall organic and total fluorine concentrations measured.

Rebecca initiated a discussion regarding the selection of analytical methods for stormwater and upcoming wastewater monitoring. For stormwater, she suggested the ongoing utilization of the Extended List, USC, and FTOHs, while noting that the integration of TOP and total fluorine methods requires additional consideration, and USC TOP was explicitly excluded. Regarding wastewater, the effectiveness of both USC TOP and TF methods remains uncertain, whereas all alternative methods were recommended for piloting in upcoming monitoring.

During the discussion, Lee Ferguson emphasized the importance of defining the goals for the TOP assay and the specific monitoring questions it would help answer, while also expressing strong support for using the Extended List to track TFSI levels in SW. He further indicated limited utility of total fluorine methods, given the inability to interpret the values at this time. Bill Arnold emphasized ^{19}F-NMR signals tend to identify fluorine signals associated with pesticides and pharmaceuticals. Derek Muir noted that including ^{19}F-NMR would be valuable for evaluating fluorine compounds and providing more information on the relevant PFAS classes.

Regarding wastewater, Diana Lin highlighted the State Water Board's (SWB) ongoing interest in testing via various total fluorine methods, despite limited ability to interpret the data. Lorien Fono queried Bill about the utility of developing data on the presence of fluorine-containing pharmaceuticals and pesticides that could act as precursors to TFA. Richard Grace reported that the USC TOP assay was best applied on samples from highly contaminated sites, and total fluorine methods were best applied to screen products for PFAS. Heather asked whether

samples with fluorinated pesticides had been treated via the USC TOP assay to see if they degraded to TFA, and Richard indicated this had not been explored.

Tom Mumley suggested that methods with unresolved questions should be deprioritized, given competing resource demands and the lack of a clear, overriding benefit from their inclusion. Margaret Monahan noted that the SWB is promoting total fluorine methods statewide, and Tom indicated these methods could be added later once more is known about how to understand the values. Miriam Diamond supported use of TF for its comprehensive ability to capture the expanding universe of PFAS, recognizing the inclusion of inorganic fluorine as a key disadvantage that could be subtracted via a separate measure of total inorganic fluorine. Kimberlee West expressed interest in analyzing precursors rather than total fluorine methods. Derek Muir expressed surprise at the difference in observations for AOF and EOF. Diana asked about how to interpret the high values of the total fluorine methods, and Lee suggested that contamination with inorganic fluoride was a likely factor.

9. Information: PFAS Sources to Solutions Project (USEPA Water Quality Improvement Fund) - Conceptual Model

Kelly Moran delivered an update on the PFAS Sources to Solutions project, first outlining its objective to safeguard human and ecological health in the Bay from persistent PFAS contamination, particularly given the elevated levels found in fish relative to fish consumption (human health) thresholds. Funded in July 2024 through a $5.2M grant, including a 50% match from regional and state partners, including DTSC, BACWA, and BAMSC, the initiative is currently scheduled to conclude in 2027, though SFEI has submitted a no-cost extension request to extend the project through 2029. Kelly highlighted the project's core objectives: identifying priority PFAS product categories for management, strengthening collaboration between water quality managers and California's Safer Consumer Products Program, elevating awareness among communities, manufacturers, and regulators regarding the connection between products and water pollution, and informing future scientific and management initiatives. The project is structured around three primary tasks: 1) Monitoring and estimating loads, 2) Identifying product sources, linkages, and solutions; and 3) Reporting, outreach, and other communications, with a specific focus on municipal wastewater, urban stormwater pathways, and the contribution of consumer products to Bay pollution. She provided key updates for each task.

1) Monitoring and Loads

    - The QAPP associated with the grant was approved in Spring 2025.
    - The RMP has conducted extensive stormwater monitoring, capturing more than 84 events across 43 separate locations throughout the Bay. These collection efforts were split between manual sampling and automated samplers. To address outstanding gaps across Bay Area watersheds and establish a comprehensive dataset for future analysis, additional data collection remains necessary.
        - Additionally, BAMSC sampled at six locations for a total of more than 30 samples. These samples had few PFAS detections, which may have been due to several reasons, including the small, primarily paved drainage watersheds for these sampling locations.
    - Wastewater monitoring is scheduled to progress in two sequential phases over the coming year, starting with influent and effluent in 2026 and expanding to upstream sewershed monitoring in 2027.

    - A summary of the resulting data is currently planned for 2027, but this date may change if the project end date is extended.
- The project's final deliverable is a report estimating PFAS wastewater and stormwater loads and investigating product linkages. This includes comparison of the wastewater and urban stormwater pathway loads PFAS loads to understand their relative importance.
- As mentioned earlier, a draft of the initial deliverable report, the PFAS Synthesis and Strategy, is currently in internal review.

2) Identifying product sources, linkages, and solutions

- We performed an extensive literature review to analyze the available data on PFAS-containing products. This assessment drew from a wide range of academic journal articles, databases, government reports, and patents to examine both directly measured and indirectly indicated content data. Through this process, ten primary product categories were identified:
    - Paints and coatings
    - Vehicle-related
    - Construction and building materials
    - Electronics and home appliances
    - Personal care and hygiene
    - Textiles
    - Food contact materials
    - Medical
    - Manufacturing use
    - Energy production
- We created conceptual models for wastewater and stormwater to establish links between products and pathways, select product categories for testing, and guide management strategies. These models, which detail the transport of PFAS from various sources into wastewater and stormwater systems and ultimately into the Bay, were briefly presented. The stormwater model represents the first time that PFAS-containing products have been directly connected to urban stormwater runoff.
- Within California, a variety of consumer products (textiles, juvenile products, outdoor clothing, paper-based food packaging, menstrual products, firefighting foams, disposable tableware, cosmetics, waterproofing sprays, and carpets) are currently regulated for PFAS content, with new legislation emerging every year. DTSC is currently evaluating floor maintenance products and artificial turf.
- To address data gaps for unregulated priority products identified through the literature search and conceptual model, product testing is progressing in partnership with Dr. Marta Venier and her laboratory group at Indiana University. Current evaluations focus on product categories including building materials, cleaning products, and exterior vehicle care.
- The collected data will be incorporated into the final linkage report to inform efforts to connect PFAS product content with pathways and to establish product priorities for management action to protect Bay water quality
- We will also identify critical information gaps and propose recommendations for future monitoring and continued understanding of sources of PFAS in the Bay.

3) Reporting, outreach, and other communications

- A dedicated website has now been launched to detail the scope of the PFAS Sources to Solutions project, with further communication and updates anticipated as the project progresses into its final stages.
- Several components of the project have already been shared and discussed at scientific conferences, through the RMP, and during informal discussions with experts and stakeholders.

The section's discussion opened with expressions of gratitude to Kelly for her dedicated efforts in the Bay ahead of her upcoming retirement. Regarding project timelines, Mary inquired about shifting deadlines, which Kelly explained are currently under review with a proposed postponement to 2029. Tom Mumley raised a question about the project's future leadership; Rebecca clarified that she and Diana Lin will continue as co-principal investigators. Tom also sought additional clarity on checkpoints and reporting requirements following the approval of proposed timeline extensions. Furthermore, he commended the progress made in identifying primary categories of PFAS-containing products and asked if the various detected compounds had been cataloged. Miguel Méndez explained that a compilation of PFAS across consumer products has been assembled where feasible, though varying analytical techniques, including both targeted analyte lists and total fluorine methods, introduce significant complexity. Tom also highlighted the connection between product use and environmental mobility, noting how it influences the signals observed in the Bay. Ultimately, this initiative will seek to link PFAS-containing products with detected environmental concentrations to prioritize classes of products most likely to contribute to Bay contamination.

9. Information: Setting the Stage for Day 2

Rebecca Sutton thanked the group for their focused, productive discussion, and then reviewed the schedule and goals for the following day. She highlighted the focus on bird eggs, nontarget analysis, and the review and prioritization of special study proposals.

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

Emerging Contaminants Workgroup Annual Meeting

Day 2 - April 23, 2026
San Francisco Estuary Institute

Meeting Summary

Science Advisors	Affiliation	Present
Bill Arnold	University of Minnesota	Yes
Miriam Diamond	University of Toronto	Yes
Lee Ferguson	Duke University	Yes
Derek Muir	Environment and Climate Change Canada	Yes
Heather Stapleton	Duke University	Yes
Dan Villeneuve	U.S. Environmental Protection Agency	Yes

Attendees

Adam Wong (SFEI)
Aidan Cecchetti (SFBRWQCB)
Alison Fisher (SFPUC)
Alyssa Demko (DTSC)
Amy Kleckner (SFEI)
Anne Cooper Doherty (DTSC)
Anthony Khalil (SFEI)
Autumn Ross (SFPUC)
Ben Priest (CIL)
Bernard Crimmins (Clarkson University)
Bonnie de Berry (EOA/BAMSC)
Brandon Steets (Geosyntec)
Bruno Guerraz (SGS AXYS)
Bushra Khan (UC-Davis)
Chunjie Xia (University of Indiana)
Dan Sternkopf (C/CAG)
Damien Reggio (EBMUD)
Diana Lin (SFEI)
Don Yee (SFEI)
Edward Kolodziej (University of Washington)
Elise Sbarbori (City of Palo Alto)
Eric Dunlavey (SJSC)
Ezra Miller (SFEI)
George Cobb (Baylor University)
Gerardo Martinez (SFBRWQCB)
Gregory LeFevre (University of Iowa)
Heather Bischel (UC-Davis)
Jay Davis (SFEI)
Jennifer Dougherty (SFEI)
Jennifer Sun (SFEI)
Jeremy Conkle (Delaware River Basin Commission)
June-Soo Park (DTSC)
Kara Mirmelstein (SFEI)
Karin North (City of Palo Alto)
Kayli Paterson (SFEI)
Kelly Grant (DTSC)
Kelly Moran (SFEI)
Kimberlee West (SFBRWQCB)
Lester McKee (SFEI)
Luisa Valiela (US EPA Region 9)
Mary Cousins (BACWA)
Maggie Monahan (SFBRWQCB)
Meltem Musa (OEHHA)
Michelle Azurin (SFEI)
Michelle Lin (SJSC)

Miguel Méndez (SFEI)
Noah Rudko (SFEI)
Pedro Avellaneda (SFEI)
Rebecca Sutton (SFEI)
Reid Bogert (C/CAG)
Richard Looker (SFBRWQCB)
Richard Grace (SGS AXYS)
Robert Budd (DPR)
Robert Rossi (DTSC)
Sally Abskharoun (Clark University)
Sasha A'Hearn (SacSewer)
Shoba Iyer (SF Environment)
Sierra Garcia (SFEI)
Simret Yigsaw (City of San Jose)
Terry Grim (ZeptoMetrix)
Tom Bruton (DTSC)
Thomas Mumley (Retired)
Veronica Suarez (SacSewer)

11. Information: Summary of Yesterday and Goals for Today

Amy Kleckner welcomed the attendees and re-introduced the ECWG expert advisors. She provided a brief overview of the preceding day's session, highlighting updates on active RMP CEC initiatives along with scientific updates regarding QACs and PFAS. The primary objectives for today's meeting were to review progress on RMP bird egg Status and Trends monitoring and NTA projects, determine funding recommendations for 2027 ECWG special study proposals, and offer constructive feedback to enhance those submissions. Tom Mumley advised the group to approach designated funding with a multi-year perspective to better accommodate prospective long-term projects, emphasizing that this planning style should be integrated into future strategies. Additionally, Tom Mumley requested that the committee formally recognize Derek Muir upon his retirement, acknowledging his 20 years of dedicated service to the ECWG advisory committee.

12. Information: Update on PFAS and PBDEs in Status and Trends Bird Eggs

Jennifer Sun provided an update on recent bird egg monitoring, focusing on preliminary data for PFAS and PBDEs. She highlighted the value of monitoring cormorants, which are year-round residents of the Bay that mainly feed on fish, are a higher trophic level species, and provide sufficient eggs to sample. As a sentinel species for open Bay CECs, cormorant egg monitoring helps track temporal and spatial trends and can be used to evaluate contaminant ecotoxicity. Since 2002, cormorant eggs have been sampled every two to three years, with collection of 9 composite samples across three regions: North Bay, Central Bay, and South/Lower South Bays. Monitoring has included 40 PBDE congeners since 2002, whereas PFAS tracking started with 13 analytes in 2012 and expanded to 40 in 2022. In response to Shoba Iyer's question about the homogenization method for the composites, Ezra Miller clarified that each sample consists of a composite of 7 eggs, thoroughly homogenized excluding the shell.

Jennifer then detailed the findings from the 2024 monitoring cycle. PFOS levels were highest in the Lower South Bay at approximately 100-170 ng/g ww, though levels have been trending downward since 2012. In 2024, concentrations in the Central Bay and North Bay were under 90 ng/g ww, but only the Central Bay exhibited a possible decline in concentration. All 2024 regional levels remained below toxicity guidelines from Australia (200 ng/g for PFOS + PFHxS) and Canada (1,900 ng/g for PFOS). Thirteen PFAS were found in more than half of the 2024 samples. PFOS was the dominant compound across all regions, the North and Central Bays showed higher proportions of long-chain PFCAs and precursors compared to the Lower South Bay (although actual concentrations remained lower than the Lower South Bay). Notably, 7:3 FTCA, a precursor that breaks down into terminal PFCAs, showed the second-highest levels after PFOS in all subembayments, mirroring trends observed in recent sport fish data. However, Jennifer noted that the 7:3 FTCA results are considered semi-quantitative, due to low duplicate precision.

A discussion on the PFAS findings ensued among participants. Derek Muir noted the single detection of the chlorinated precursor 9Cl-9F3ONS in Central Bay, which is manufactured in China but generally not in the US, prompting him to question if it originated from ships entering the Bay. Lee Ferguson inquired about the temporal profiles of the remaining compounds and whether archived samples could be re-examined using modern analytical techniques. Rebecca noted that while bird egg archives are maintained, the availability of older samples is uncertain. Heather Stapleton raised a question regarding the presence of N-MeFOSAA, commonly identified in human blood samples, but Jennifer pointed out that it was rarely detected in these samples.

Jennifer then presented data from 2024 concerning PBDEs, explaining that phase-outs and regulatory bans since 2004 have effectively minimized their environmental prevalence. Following the state ban implemented from 2004 to 2006, levels of key congeners PBDE-47 and -99 decreased substantially and have stayed consistently low. These major reductions prompted their reclassification to a low-concern status in the San Francisco Bay. Nonetheless, current PBDE concentrations remain higher than the ecotoxicity guidelines set by Canada for cumulative PBDEs (29 ng/g ww). Ultimately, a continuous need exists for monitoring PFAS and PBDEs in cormorant eggs, particularly across an expanded range of analytes to evaluate the occurrence and directional trends of precursors and alternative replacement CECs.

During the subsequent discussion, Miriam Diamond questioned the rationale behind transitioning PBDEs to a low-concern category. Ezra Miller responded that although concentration levels still exceed the Canadian toxicity threshold, they are downward trending and remain at consistently low levels. Miriam suggested that while the workgroup should recognize the Canadian guideline, it should not be overemphasized, and noted that evaluating these concentrations relative to population metrics could be beneficial. Heather Stapleton inquired about the potential reasons for higher historical PBDE concentrations in the North Bay compared to the South Bay. Jay Davis identified wastewater discharge as a potential contributor, while Karin North suggested a stronger correlation with a nearby landfill. Heather expressed interest in landfill inputs, noting that specific upholstery materials can serve as sources for unusual PFAS. Specifically, N-MeFOSE-based stain repellants can break down into N-MeFOSAA and then PFOS. Tom Mumley clarified that landfills do not discharge into the Bay unless there is active leakage. He emphasized that the regulatory framework surrounding PBDEs represents a major success, suggesting that monitoring resources would be better spent elsewhere and that the program should consider sunsetting PBDE monitoring to focus on alternate priorities. Jay countered that monitoring should persist given that concentrations remain above the established contaminant threshold. Tom argued that because levels have flattened out, limited resources should be reallocated to other pollutants for maximum overall benefit. Other workgroup members suggested deprioritizing PBDEs by shifting to a less frequent monitoring cycle, with Miriam indicating the value of documenting the long tail associated with the decline. Tom noted there should not be a major loss in statistical power if the monitoring frequency for PBDEs were extended from a three-year to a six-year schedule. Karin, Heather, and Miriam emphasized that characterizing contaminant pathways is essential, as historical routes can re-emerge as future pathways. Lester McKee added that the divergent concentration patterns observed between PBDEs and PFAS support the hypothesis that factors beyond simple hydrological flushing are influencing these trends.

13. Information: Update on Nontarget Analysis of Bay Sport Fish

Sally Abskhroun, a graduate student working with Dr. Bernie Crimmins at Clarkson University, presented preliminary findings on halogenated compounds in San Francisco Bay sport fish. By utilizing nontarget analysis (NTA), the study identifies a broad suite of analytes to establish a chemical fingerprint of both known and unknown halogenated contaminants within fish muscle samples. The methodology involves a two-dimensional gas chromatograph coupled with a high-resolution time-of-flight mass spectrometer (GC×GC-HR-ToF MS) operated in different ionization modes: electron impact ionization (EI) to gather structural details, and negative chemical ionization (NCI) to ascertain the precise molecular masses of the contaminants present. The analyzed samples included shiner surfperch (*Cymatogaster aggregata*) obtained from seven distinct sites, with a primary focus on the Central Bay.

Analysis of these samples revealed an extensive array of halogenated features across both modes, with cumulative concentrations of halogenated organic compounds (HOCs) spanning 3,500 to 12,000 ng/g ww. The overall HOC signature was predominantly characterized by chloromethoxyphenols (MeOPCIs), with organochlorine pesticides (OCPs) and polychlorinated biphenyls (PCBs) representing smaller fractions. Spatial trends indicated that the highest contaminant burdens occurred at the Berkeley Marina, with levels diminishing as distance from this localized hotspot increased. Notably, MeOPCI concentrations generally exceeded those previously measured in Bay harbor seals (ND–1,300 ng/g ww) and Great Lakes trout (2,300–3,600 ng/g ww). Reduced presence in blubber is not unexpected due to the more polar nature of these compounds. Earlier research has established a strong correlation between MeOPCIs and mequinol, an industrial intermediate frequently utilized in pharmaceuticals and a recognized biomarker for wood smoke, suggesting these substances may share common origins, environmental transport mechanisms, or a precursor-product relationship. The possibility that MeOPCIs serve as disinfectant byproducts of mequinol formed during wastewater processing is particularly noteworthy. Within the OCP fraction, DDTs (100–800 ng/g ww) were the primary constituents, followed by lower concentrations of chlordanes (< 100 ng/g ww). These observations fall within the lower range of burdens reported for Bay harbor seals (DDTs: 780–5,400 ng/g ww; chlordanes: 70–2,100 ng/g ww), with the Richmond site exhibiting specifically elevated levels of DDTs.

Sally then detailed the varying assortment of both known and unknown HOCs present at low levels in the tens of ng/g ww. Polychlorodiphenyl ethers represented a widespread contaminant category detected at all sampling sites, whereas other polychlorinated compounds were observed only sporadically at lower concentrations. Furthermore, several benzene-related HOCs were identified, including anisole, an intermediate used in synthesizing dyes, pharmaceuticals, and flame retardants, which reached its highest concentrations across four specific sites. Within the fish samples, a total of 39 novel halogenated organic compounds (NHOCs) were identified, with the South Bay sample displaying the highest detection rates and concentrations. This presence of NHOCs is notably higher than the levels reported in Bay harbor seals (6) and Great Lakes trout (15). The most frequently detected NHOC across all sites was dimethylcarbamoyl chloride, which serves as a chemical intermediate in the manufacturing of pharmaceuticals, pesticides, and dyes.

During the discussion of the results, Jay Davis noted that the DDT levels in the Richmond harbor are expected due to a known DDT Superfund site in that area. Lee Ferguson raised questions about anisole, citing its short residence time and expressing suspicion that it might have been introduced as an artifact from the analysis port. Sally stated she would investigate further to confirm the spectrograph identification. When Derek Muir inquired if these compounds

are currently in production, Sally explained that many are not registered or lack available information, though some were identified as industrial chemicals, intermediates, or metabolites; she committed to further analyzing potential sources. Lee added that some of these substances, particularly brominated anilines, could be dye breakdown products, noting that the fish's diet as bottom dwellers might influence these levels, which were less prominent in seals.

Regarding spatial variations, Jay Davis questioned why the Berkeley Marina area exhibited a significantly higher concentration than other sites. Lester McKee observed that high concentrations of mercury and PCBs in that same area might correlate with the compounds identified in Sally's study. Additionally, Anne Cooper Doherty mentioned that some of these compounds are present in skin lightening products, which have recently been banned. Tom Mumley emphasized that since the study only covers one fish species, he would like to see evaluations of other species, particularly at higher trophic levels. Tom expressed strong interest in identifying the source of the high concentrations in the Berkeley area, noting a nearby site with construction materials. In discussing the future direction of the study, Becky stated that the team will receive PFAS nontarget analysis data, and Ezra will subsequently review the findings from a toxicological perspective.

14. Information: Update on Nontarget Analysis of Urban Stormwater Runoff

Ezra Miller presented an update on the nontarget analysis (NTA) conducted on urban stormwater runoff during the previous wet season. Ze highlighted NTA as a core component for guiding the RMP’s emerging contaminants science and monitoring strategies. This approach allows the RMP to detect new potential contaminants of concern and ensures that unexpected, potentially toxic substances are not overlooked due to predictive occurrence limitations. In contrast to traditional targeted monitoring, which is restricted to a predetermined list of chemicals, NTA screens a much wider range of both known and unknown compounds. While NTA data can be tentative, it offers less-biased, critical insights into the chemicals present, helping to guide where targeted monitoring is most needed. Ze also traced the history of NTA use within the RMP, noting the first project conducted over 20 years ago and its subsequent expansion to various matrices since. Notably, a 2016 NTA study on Bay water across sites with distinct pathway influences established stormwater as a critical pathway for CECs, leading to a significant reallocation of RMP priorities. Additionally, a sediment NTA study completed this past year showed that current RMP initiatives successfully capture numerous priority emerging contaminant classes, serving as an effective model for other monitoring programs.

Ezra then outlined the current NTA project's timeline, which includes 4 samples collected in WY 2025, 8 in WY 2026 (analysis currently in progress), and a proposed continuation for WY 2027. These samples are analyzed by the Tom Young Lab at UC Davis using both GC and LC-QTOF-MS methods in multiple ionization modes to expand chemical identification as much as feasible, with structure annotations derived from the NIST17 (GC) and Mass Bank of North America (LC) spectral libraries. A total of 117 compounds were detected during the first year of the stormwater NTA study, with approximately 60% identified as synthetic, nearly one-third as likely naturally occurring, and 10% remaining unknown. While a large portion of the synthetic compounds correspond to existing classes within the RMP's tiered-risk framework, such as PFAS, OPEs, urban pesticides, bisphenols, personal care and cleaning product ingredients, pharmaceuticals, and tire- or vehicle-derived contaminants, novel detections of compounds from paints and coatings as well as several plastic additives highlighted two new areas for future investigation.

During the discussion of the results, Lee Ferguson pointed out that many of these compounds are found in solvents and paints, leaching out both before and after curing, as well as in other products like AFFF. Miriam Diamond highlighted that the potential for release from paints and coatings is remarkably high compared to other items, noting a general lack of literature on coating deterioration rates and reapplication frequency. Additionally, Derek Muir recommended cross-checking these compounds against the Plastichem report. The topic of wastewater pipe rehabbing also came up as a potential source of plastic chemicals to receiving waters from the wastewater pathway. Addressing future steps, Dan Villeneuve inquired if the RMP has a systematic approach or strategy for exploring these compounds further. Becky shared that additional bioassay information will be delivered by Tom Young's collaborator. Tom Mumley supported Dan's comments, asserting that the program should dedicate funding to formalize its approach to NTA and determine whether the documentation should take the form of a manuscript or a formal report. Ezra noted that this information will be incorporated into the next update to the CECs strategy. Dan emphasized the importance of establishing a structured strategy to define logical priorities and next steps. Lee Ferguson also mentioned a recent conference showcasing how NTA is being deployed, allowing specific matrices to be analyzed consistently over several years to produce fair and comparable data.

15. Summary of Proposed ECWG Special Studies for 2027 & 16. Discussion of Recommended Studies for 2027 - General Q&A, Prioritization

Rebecca Sutton provided an overview of the proposed special studies, detailing the rationale, methodology, budget, and expected outcomes for each. While clarifying questions were addressed immediately following each presentation, a more comprehensive discussion was deferred to the subsequent agenda item. After the meeting, expert advisors provided additional comments via email to refine study designs and proposal prioritization.

Stormwater CECs Monitoring (Multi-year)

The Stormwater CECs Monitoring proposal builds upon a sustained commitment to address critical data gaps through a comprehensive monitoring approach. Executed over three water years (WY2027–WY2029), the proposal includes a sampling strategy involving manual collection alongside both large and small automated samplers, along with data review, interpretation, and reporting. While the primary emphasis for WY2027 remains on PFAS, leveraging resources from the EPA's "PFAS Sources to Solutions" grant, future monitoring objectives will be refined during annual meetings of the Stormwater CECs Stakeholder Science Advisor Team (SST). Additionally, the proposal seeks the early release of funds to facilitate a project start this summer (2026).

Discussion between meeting participants began with clarifications regarding the study design and methods used for analysis. Lee Ferguson asked which PFAS methods were included, and Rebecca indicated that the monitoring would include the 40 analyte targeted method (EPA Method 1633) for all years, along with the TOP assay for all WY2027 samples and potential additional analyses (e.g., Extended List, Ultra-Short Chain PFAS, and/or Fluorotelomer Alcohols) for a subset of manually collected samples. All WY2027 analyses are funded by the EPA grant. Derek Muir inquired about the value of further sample collection for traditional PFAS analyses, and Rebecca noted that it would help address data gaps in the existing dataset, particularly concerning concentrations of PFAS in the larger of the small tributaries, and expanding the number of sites sampled for more than a single storm. Kelly Moran emphasized the need for large datasets to better understand stormwater variability. Tom Mumley remarked

on the need to document the overall stormwater monitoring strategy, including additional analysis beyond PFAS and the approach to the fixed monitoring stations. Kelly suggested that for PFAS, this would be at least partially addressed in the final report for the EPA grant.

Continuing the discussion, Maggie Monahan inquired about the absence of modeling, with Becky explaining that modeling proposals have recently been channeled through the Sources, Pathways, and Loadings Workgroup (SPLWG), and the upcoming meeting merging varying efforts. Lee Ferguson asked about the opportunity to reassess chosen analytical methods based on updated findings, such as inclusion of contaminants related to paints and coatings identified by NTA. Rebecca detailed the structure of the stormwater monitoring approach, which provides a platform to support both the focus contaminant class and recurrent monitoring analytes as well as additional contaminants of interest through separately funded special studies.

Stormwater CECs Monitoring (additional priorities; Tier 2)

Additional funds beyond the Tier 1 stormwater CECs monitoring plan could be used for recurrent monitoring of organophosphate esters (OPEs) and bisphenols, as well as a third deployment of the small automated samplers for PFAS. These activities are proposed to span three water years, from WY27 through WY29.

During the discussion, Becky queried whether both OPEs and bisphenols were priorities for monitoring, noting that OPEs are a High Concern class and the subject of recent management actions, while bisphenols are a Moderate Concern class that may be a lower priority for management. Mary Cousins highlighted draft bisphenols legislation, though she noted it is unlikely to pass. Dan Villeneuve argued for the cost-effectiveness of this expansion, noting that since field teams are already deployed for sample collection, increasing the number of samples improves overall efficiency. Rebecca Sutton cautioned that while collection efficiencies exist, significant costs remain tied to laboratory analysis, data management, and rigorous quality assurance. Anne Cooper Doherty observed that while DTSC is not currently prioritizing OPEs or bisphenols, this monitoring could provide the foundational data necessary to trigger future regulatory action. Lee Ferguson recommended a focus on OPEs and including a broader selection of analytes such as organophosphite antioxidants. Heather Stapleton noted new data being developed at the federal level on the toxicity of OPEs, and requested a detailed budget breakdown by analyte, while Derek Muir suggested the potential inclusion of a broader list of plastic additives. Rebecca indicated that addressing the extensive list of additives could be considered for a future proposal. Tom Mumley agreed with reduced focus on bisphenols, and emphasized that these efforts must be explicitly integrated into the broader program strategy.

PFAS in Precipitation (years 2 and 3)

This proposal details a multi-year extension of the pilot study on PFAS in San Francisco Bay Area precipitation. This project aims to continue monitoring rainwater for an additional two years to further establish a robust baseline of background data, clarify the contribution of wet deposition to stormwater concentrations, and provide estimates for direct deposition into the Bay. Analytical efforts will utilize targeted methods, specifically including ultra-short chain compounds, to allow for a direct comparison between rainwater and stormwater profiles. Ultimately, this monitoring is designed to complement ongoing and future PFAS investigations within the region.

During the discussion, Lee Ferguson inquired about including volatile or semi-volatile compounds. Chunjie Xia responded that while these are typically not detected in rain, they could be added to the study if desired. Tom Mumley and Miriam Diamond requested clarification on

the sites that would be included, and Becky noted the study design would include some less urban sites, some repeat sites, and some sites where stormwater samples would also be collected. Regarding sampling techniques, Derek Muir and Robert Budd suggested alternatives to the current bucket method to reduce volatile compound loss and sorption issues. Becky and Miguel noted that while advanced techniques could be explored, previous investigations into other receptacles found them to be significantly more expensive. Passive air monitoring was also briefly discussed.

Tom remarked that preliminary data had not yet shown enough interest to justify significant expansion with Becky noting the potential for a check-in after a year of monitoring. Tom also suggested re-engaging the Bay Area Air Quality Management Division to consider other contaminants beyond PFAS. Robert Budd also emphasized the potential value in expanding the analyte list to other chemistries to provide proof-of-concept for wet deposition as a transport route for various pollutants, and stressed the importance of targeting "first flush" events to evaluate contaminant buildup over dry periods.

Ultra-short Chain and Extended List PFAS in Bay Water

The proposed study aims to investigate ultra-short chain (USC) PFAS, with the potential inclusion of an extended PFAS list, in Bay water during both wet and dry seasons. High levels of USC PFAS have already been identified in stormwater and precipitation relative to other PFAS, representing a direct contribution to the Bay. Furthermore, recent stormwater monitoring has detected 6:2 diPAP from the extended list, and upcoming wastewater analyses this summer are expected to further inform the value of applying this expanded suite to Bay water samples. Establishing this baseline data for broader PFAS classes will facilitate critical comparisons between various pathways and the Bay. The proposal seeks the early release of funds to facilitate a project start this summer (2026).

During the discussion, Lee Ferguson asked about the feasibility of integrating TFSI from the extended list into the USC method. Richard Grace clarified that certain ultra-short analytes perform better within the extended list protocol and require specialized capture media to achieve optimal detection limits. Additionally, Derek Muir noted that the relatively high detection limit for trifluoroacetic acid (TFA), at approximately 100 ng/L, might result in it remaining undetected in the Bay. Tom clarified that we have available data for TFA in stormwater.

CECs in Bird Eggs

Utilizing the 2027 Status & Trends cormorant egg collection, this proposed study recommends targeted testing for organophosphate esters and a wider array of alternative brominated flame retardants. These contaminant classes, with members characterized by their toxicity, persistence, and tendency to bioaccumulate, currently lack data within San Francisco Bay bird eggs. This project would also employ nontarget analysis for both PFAS and hydrophobic halogenated compounds to detect unforeseen contaminants that may require subsequent targeted monitoring. Expected results include the identification of future priorities for bird egg monitoring and revisions to the tiered risk-based framework for all quantified contaminants.

During the discussion of the bird egg proposal, Heather Stapleton requested a list of the alternative brominated flame retardants under consideration. Becky responded that the analytical partner would provide this information. Miriam Diamond inquired about the specific management questions being addressed, and Becky indicated that the study would evaluate the presence of alternative compounds intended to replace PBDEs. Miriam further questioned whether other matrices, such as sediment, should be included in the scope, and Becky

indicated that sediment focused study proposals would be discussed at next year's meeting. Becky also noted that avian species may exhibit high sensitivity to brominated compounds, and that identifying a bioaccumulative compound could lead to further studies directed towards characterizing sources and pathways. Miriam pointed out potential concerns relating to connecting metabolites to parent compounds.

Derek Muir suggested utilizing archive samples to investigate these brominated alternatives, an approach Becky agreed to explore for feasibility. In response to Tom Mumley's query regarding previous monitoring on alternative flame retardants, Becky clarified that a 2013 study had examined ten samples of sediment and water, with OPEs present in water and brominated flame retardants found in sediment. Tom emphasized the value of bird eggs for trends and Becky indicated the higher likelihood of observing OPEs in bird eggs. Heather Stapleton observed an upward trend in alternative brominated flame retardants in indoor environments, especially Firemaster 550 components and DBDPE, though she noted these are often rapidly metabolized, making sediment a more suitable matrix for detection. Finally, Jay Davis provided context on the utility of different matrices, explaining that while sediment and water grabs offer comprehensive contaminant suites, they often produce noisy datasets. In contrast, bird eggs reflect contaminants entering the food chain where risks are most acute, allowing for the assessment of regional spatial and interannual trends with a limited number of analyses. Miriam indicated that prey fish might be a more suitable matrix.

Newly Identified Tire- and Vehicle-derived Contaminants in Bay Water and Stormwater (Year 2)

The next proposal represents the second year of a two-year study aimed at quantifying tire- and vehicle-related contaminants within stormwater runoff and Bay water samples following storm events. This study features a notably broader analyte list to facilitate a more comprehensive evaluation of this contaminant class. Additionally, the proposal includes a request for the early release of funds to allow the project to commence in the summer of 2026.

In response to an inquiry from Tom Mumley regarding wet season in-Bay sampling, Amy Kleckner clarified that these efforts will be coordinated with periodic USGS cruises. Tom Mumley expressed reservations regarding the necessity of near-shore monitoring, suggesting that existing data aligns with current modeling and may already be sufficient. Conversely, Becky emphasized the ongoing value of collecting near-shore data to assess acute exposure levels. Supporting this perspective, Don Yee noted that such data is instrumental in refining the model and effectively addressing the complexities of dilution. Anne Cooper Doherty emphasized the importance of this study to current management actions on tires.

HMMM Stormwater Conceptual Model

The proposed project involves development of a conceptual model for hexamethoxymethylmelamine (HMMM) to be conducted alongside approved quantitative modeling efforts, which utilize the Watershed Dynamic Model and available HMMM data. This study will incorporate a detailed literature review to examine the sources and transport mechanisms of HMMM in stormwater while identifying specific land uses or landscape features associated with higher contaminant loads. By investigating the factors that drive HMMM concentrations, the project aims to identify significant variables and minimize uncertainty in load estimates. Ultimately, this conceptual model will provide a necessary foundation for the numerical modeling exercise and improve the overall understanding of HMMM occurrence in stormwater.

The discussion on the HMMM conceptual model began with Miriam Diamond inquiring how this study would inform broader stormwater modeling efforts. Rebecca Sutton responded that the project would provide critical information identifying specific areas and conditions strongly associated with HMMM, including any potentially relevant non-vehicle sources. Miriam Diamond further questioned how this project fits into a broader modeling strategy, suggesting that an ideal regional model would be both general (not contaminant specific) and multi-matrix and would, therefore, be useful for modeling multiple contaminants. Tom Mumley noted that existing modeling tools are already capable of simulating sediment and that the current model, in its present stage, is valuable for interpreting empirical data.

Lester McKee clarified that the primary objective is to use the watershed model to scale up limited information, allowing for the extrapolation of current stormwater data to classify land-use impacts on water quality and explore temporal effects. He emphasized that it is up to the ECWG to determine priority uses for watershed modeling, such as selecting specific CECs, within allocated funding. In response to a query from Bill Arnold regarding the selection of HMMM, Rebecca clarified that it was chosen due to its high concentrations, high detection frequency, and established correlation with land-use classifications. Lee Ferguson expressed concern regarding HMMM transformations, to which Becky noted that the contaminant's half-lives are suitable for the duration of storm events. Lee Ferguson also suggested expanding the conceptual model to include other compounds, like DPG, if costs are comparable. Ezra Miller noted that HMMM has a 100% detection frequency, unlike DPG. Rebecca concluded by stating that the immediate goal is to establish a proof of concept for the modeling tools before exploring additional contaminants. Miriam Diamond recommended that the final write-up more explicitly detail how this proposal supports the program's larger strategic modeling goals for CECs.

<u>QACs in Wastewater and Upstream Sources</u>

This proposed study aims to continue the evaluation of quaternary ammonium compounds (QACs) across wastewater matrices, including influent, effluent, and biosolids. The project seeks to deepen the understanding of QAC contamination pathways into the Bay, the efficiency of removal during wastewater treatment, and evolving usage patterns over time. The initiative includes an interlaboratory comparison to align RMP methods with those accessible to wastewater treatment plants. Furthermore, the study will investigate upstream sources to identify major contributors of elevated QAC levels, which may interfere with treatment processes. Findings will be critical for developing source control strategies and directing future monitoring.

During the meeting, Tom Mumley inquired about the nature of WWTP involvement; Becky clarified that their participation consists of in-kind contributions, such as sample collection and support in identifying contamination sources.

<u>Nontarget Analysis of Bay Area Stormwater (Year 3)</u>

This proposal would cover the final year of this three-year study focusing on characterizing stormwater samples through NTA. This terminal year of collection leverages existing monitoring efforts and employs LC- and GC-based NTA to identify both polar and nonpolar compounds. Data interpretation would be added by ongoing NTA in Bay water. Funding would cover the final season of sample collection and analysis to complete the dataset and support comprehensive reporting via a scientific manuscript.

Tom Mumley requested clarification regarding the need for an additional year of funding. Becky explained that these funds cover leveraged sample collection and support the Tom Young lab,

which handles the majority of analysis, data interpretation, and final reporting for the full three-year period. Although Tom Mumley suggested concluding sample collection after two years and focusing solely on the report, Lee Ferguson cautioned that omitting the final wet season would compromise the study's publishability. He also brought up the idea of comparing these detections to the 2016 NTA study in Bay water and wastewater. The group reaffirmed the need for an overall NTA strategy.

Parabens and Related Transformation Products in Bay Area Wastewater Effluent (Tier 2)
This proposal describes a study of parabens and their transformation products in wastewater effluent entering the Bay. Although certain parabens are subject to California regulations for food and cosmetic use, comprehensive research on these substances within the state remains limited. A major concern involves the global prevalence of parabens in wastewater, where disinfection processes are known to facilitate their conversion into increasingly toxic compounds. This study will analyze wastewater effluent for 13 analytes including multiple parabens and their transformation products. By determining the significance and prevalence of these contaminants, the study's results will provide essential data to guide future monitoring and management strategies aimed at protecting Bay water quality.

During the discussion on the parabens proposal, Anne Cooper Doherty inquired about the specific transformation products identified in stormwater NTA, and Ezra Miller said they were detected and would follow up. Derek Muir asked if gas chromatography (GC) ion-negative technique would be employed, and George Cobb confirmed his laboratory would conduct that type of analysis. Tom Mumley asked if these compounds had been previously analyzed in Bay water, to which Rebecca Sutton responded that no previous monitoring had occurred. Lee Ferguson suggested asking Tom Young if any parabens have shown up in his NTA analysis of Bay water as well as a review of the 2016 Bay dataset their presence. Ezra noted previous NTA studies of Bay water did not show parabens. Miriam Diamond expressed support for studying parabens to contribute to pre- and post-regulation monitoring, and further adding on work for antimicrobial resistance. Anne Cooper Doherty concluded by noting that while some paraben regulations exist, additional regulatory measures are anticipated. She indicated environmental concentrations are a data gap, and that isothiazolinones are an alternative.

PFAS in Sturgeon Eggs (Tier 2)
A special study is proposed to conduct targeted PFAS analysis (utilizing EPA Method 1633) on white sturgeon eggs. This effort will leverage an existing collaboration with the California Department of Fish and Wildlife, which is already scheduled to collect North Bay samples for selenium monitoring in 2026 and 2027. The project timeline involves collecting and archiving egg samples from 10–15 gravid sturgeon in the spring of 2026 with data obtained from this initial set of samples to serve as a guide to determine the necessity of analyzing a subsequent set in 2027.

In response to Tom Mumley's inquiry regarding existing egg collection for selenium, Amy Kleckner verified that collections are underway but highlighted the distinct mass requirements necessary for PFAS sampling. Addressing Tom's concerns about the significant budget variations for this project, Amy explained that the proposed figures account for analysis of one year or both years of collection. During the discussion, Heather Stapleton questioned the relative contaminant burden of sturgeon compared to sport fish, given their longevity. Ezra Miller clarified that sturgeon are exceptionally long-lived and do not reach reproductive maturity until age 17, leading Miriam Diamond to observe that this provides a valuable time integration for exposure.

17. Closed Session - Decision: Recommendations for 2026 Special Studies Funding

			Within 2027 Planning Budget	Above Planning Budget		
Study Name	Proposed Budget	Science Advisor Rankings	Recommended Budget	Recommended Budget	Rank	Comments
Emerging Contaminants Strategy for 2027	$80,000	NA	$80,000	10,000	NA	All: Increase to include NTA strategy development, would be nice to start now. How much would this cost? $10k? $20k? CEC modeling strategy is also a priority. Detailed comments DV: I strongly favor adding some extra funds to the proposed budget for this project to develop a strategy for follow-up on NTA observations. Once a "new" contaminant has been identified, what are the systematic steps the RMP will take to follow up on these observations. Examples would include repeating the detection, possibly with a targeted method; orthogonal confirmation in additional sample types; broader targeted monitoring; screening level toxicity assessment to see if its even an issue of concern if it were more broadly present in the system., etc.
Tires Strategy for 2027	$10,000	NA	$10,000		NA	

			Within 2027 Planning Budget	Above Planning Budget		
Study Name	Proposed Budget	Science Advisor Rankings	Recommended Budget	Recommended Budget	Rank	Comments
Multi-year Monitoring of Contaminants of Emerging Concern in Stormwater	$1.2 - 1.6M over three years (Year 1: $338 - 451k) (Year 2: $427 - 543k) (Year 3: $440 - 560k)	1 (Tier 1 only) Tier 2 revised to incl OPEs but not BPs	$338,000	$113,000		ALL - High priority; future years baseline PFAS and OPEs funding is supported. LF, DV: Prioritize getting as much data as possible (incl Tier 2) OPEs only and looking at different analytical partners to expand analyte list. Add OPEs, additional PFAS is still a ? DM: Support additional PFAS, e.g., ultra-shorts; confirm preference for broader OPEs analyte list. BA: I'd like to see confirmation of a robust analytical partner for the Tier 2 studies (OPEs), so could see pushing those out a year if possible, especially given the already sizeable analytical costs in Tier 1. So my thought would be to fund Tier 1 and bring back Tier 2 next year. MD: Highest priority, full funding recommended.
Newly Identified Tire- and Vehicle-derived Contaminants in Bay Water and Stormwater - Year 2 of 2	$105,000	2	$105,000			LF, HS, BA: highest priority. DV, DM, MD: high.
Nontarget Analysis of Bay Area Stormwater - WY2027 (Yr 3 of 3)	$156,000	3	$156,000			LF, BA: high. DV, DM: supports finishing out the project and developing a strategy for NTA moving forward (see CEC strategy comment above).
QACs in Wastewater and Upstream Sources	$203,000	4	$203,000			ALL - high

			Within 2027 Planning Budget	Above Planning Budget		
Study Name	Proposed Budget	Science Advisor Rankings	Recommended Budget	Recommended Budget	Rank	Comments
Ultra-Short Chain and Extended List of Per- and Polyfluoroalkyl Substances in Bay Water	$96,000: USC Only $140,000: USC and Extended List	5	$140,000			LF, DM, BA: high but maybe too many extended PFAS right now, combining the compounds TFSI (subset of extended list) with USC HS, MD: USC only, USC and TFSI
PFAS in Precipitation: Year 2 and Year 3	$183,000 over two years (Year 2: $62k; Year 3: $121k)	6	$62,000			DV, DM: supports committing to 3 years. MD: Walks back prior sample collection concerns, now supports. HS: Supportive, notes potential importance with respect to ultra-shorts. BA, HS, DV: Higher priority than parabens.
Parabens and Related Transformation Products in Bay Area Wastewater Effluent	$94,000	7	$94,000			MD: high, complementary to the QACs, propose bumping up to Tier 1. DV: Less urgent, though worthwhile study. HS: Lower hazard concern; priority for DTSC.
~~HMMM Stormwater Conceptual Model~~	~~$46,000~~	~~8~~		~~$46,000~~		~~DM - low desire for a HMMM lit review, LF - rank low. concerns about HMMM and the why, still needs more work; Would like to see an integrated CEC modeling discussion. Rank should not indicate a low interest, but needs more substance. MD - wants to see a CEC modeling strategy to be shared with the group~~

			Within 2027 Planning Budget	Above Planning Budget		
Study Name	Proposed Budget	Science Advisor Rankings	Recommended Budget	Recommended Budget	Rank	Comments
Contaminants of Emerging Concern in San Francisco Bay Bird Eggs	$184,000	9		$9,000	SEP	DV: Fund archiving of 2027 samples, to allow for analysis in the future. MD, LF: Low. DM: Would include analysis of archived samples collected previously (not a viable project without the archives); supportive of NTA.
~~PFAS in Sturgeon Eggs~~	~~$48,000 - $64,000~~	~~10~~			~~SEP~~	~~DM - rank low, nice to do but not sure it should be done now, needs more info~~

18. Report out on Recommendations

Following the closed-door session, proposal authors rejoined the meeting to receive the final prioritization decisions. Margaret Monahan summarized the suggestions and recommendations that had been discussed, which were outlined in an earlier draft of the report-out table above (which has since been revised to include additional post-meeting feedback from the experts).

Margaret indicated that because the process was not entirely finished, there is a desire to rescope certain proposals. Regarding the HMMM stormwater conceptual model, she noted the necessity of detailing the overall CECs modeling strategy and explaining how HMMM integrates into the broader strategy. Tom emphasized that the workgroup strongly supports modeling initiatives.

Additionally, Margaret mentioned that a line item has been included to increase the CEC strategy budget to fund development of an NTA strategy. Regarding the stormwater CECs monitoring proposal, the recommendation is an approval for OPEs and a rejection for bisphenols. Lee strongly advocated for including TFSI in Bay water monitoring. Jay Davis inquired whether the studies that were not selected remain viable for the future. Bill Arnold and Derek Muir suggested that bird eggs are suitable for nontarget analysis since they can be archived. Dan Villeneuve agreed that these were worthwhile projects that could be re-evaluated at a later date.

Adjourn

ACKNOWLEDGMENT

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About the RMP

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 that 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 of 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 (see Organizational Chart, next page).

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 forward recommendations for study plans 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. The Steering Committee then considers this recommendation and makes the final decision on the annual workplan.

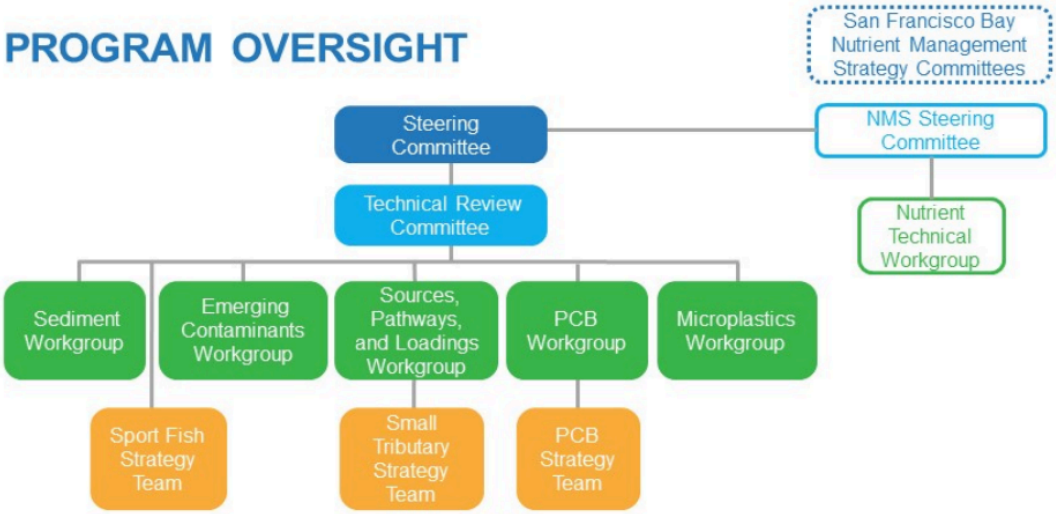
In order to fulfill the overarching goal of the RMP, the Program has to be forward-thinking and anticipate what decisions are on the horizon, so that when their time comes, the scientific knowledge needed to inform the decisions is at hand. Consequently, each of the workgroups and teams develops five-year 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 OF THIS DOCUMENT

The purpose of this document is to summarize the key discussion points and outcomes of a workgroup meeting.

Governance Structure for the
Regional Monitoring Program for Water Quality in San Francisco 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.