Proposal #1

A) Title of proposed project: Methylmercury loading inventory for SF Bay

B) Proponent / study team: Lester McKee, Yee, Collins, Grenier, Zhang (SFEI), USGS Menlo Park (Windham, DiPasquale, Kuwabara), Batelle (Gill), MLML (Stephenson), R5 RWQCB (Foe), BACWA (Downing et al).

C) Objective/ Background / Need or Justification / time line (single year multi year): Methylmercury taken into the food chain of the Bay is likely the main cause for mercury impairment in San Francisco Bay. There is evidence that suggests that bottom dwelling organisms, and those that feed on them, are most contaminated. What is unknown is the ultimate source of this methyl mercury and how it cycles to the place where it is incorporated into the base of the food chain. Several hypotheses seem reasonable: 1. Less labile (inorganic) forms of mercury both in the Bay and entering the Bay from external sources are less easily methylated, and 2. Once methylated, Hg may cycle many times in and out of biota or be demethylated to a mineral form. Work to-date suggest that wetlands can be net sources or net sinks for methylmercury depending on wetting and drying (high marsh versus low marsh), and age (newer versus older). Data collected by the SPLWG show that watersheds supply a new input to the Bay, and other available data show that methylmercury is also sourced from wastewater, atmospheric deposition, and bottom sediments.

The objective of this study is to organize what is currently known about methylmercury sources to the Bay and use this to point to the need for more research where the error bounds are large, and help to point to management solutions where loads from one source dominate the mass input. We will collate the loads (with error bounds) of methylmercury associated with 1. Fringing wetlands, 2. small tributaries, 3. Sacramento/San Joaquin Rivers, 4. Guadalupe River, 5. Wastewater, 6. Atmospheric deposition, and 7. Bay sediments. This will then be compared to the standing stock in the Bay as a reality check on the magnitudes of the source terms. A comment will also be made on which sources might be more bioavailable. The most important outcome of the project will be a consensus on what we do and don't know about methylmercury with applications to directed research and immediate management solutions.

D) RMP Management Questions contributed to or answered (see below)? Addresses multiple management questions, including: 1a, 1c, 1e, 2e, 2f, 2g, 2h, 3b, 3c, 3d, 3h, 6.

E) Method: We will hold a two-day workshop with all the appropriate researchers (listed as collaborators above). During this workshop, we refine the framework of analysis, classify the fringing wetlands and determine areas, collate and tabulate all the data, and write a draft technical memo describing the methods, results, and recommendations for further work.

F) Expected cost (Rough - can be increased or decreased at a later stage): $22,000

Proposal #2

A) Title of proposed project: Cross-sectional variability at Mallard Island

B) Proponent / study team: Neil Ganju and Dave Schoellhamer, USGS

C) Objective/ Background / Need or Justification / time line (single year multi year): The sediment loads calculated by McKee et al. (2006) depend upon the continuous point measurement of suspended-sediment concentrations at the USGS Mallard Island site. One concern is the accuracy of that point measurement relative to the entire cross-section. Lateral and vertical variability may invalidate the point measurement, which is on the south side of the channel. In order to address this knowledge gap, we have conducted cross-sectional studies during high and low flow periods. During the largest flood studied (~300,000 cfs), the south-side SSC was lower than the cross-sectional, velocity weighted SSC by a factor

of two. This may skew the total load estimates of McKee et al. (2006) substantially, depending on the change in that relationship over the entire duration of a flood pulse. However, this measurement was made over one day, on a neap tidal cycle. Sampling must be conducted over the multi-day duration of a flood pulse, not just one day of the flood, to determine the temporal variability of the relationship between south-side SSC and cross-sectional, velocity-weighted SSC.

D) RMP Management Questions contributed to or answered (see below)?
Addresses multiple management questions, including 1c, 2b, 2f, 3a, 3b, 3c, 3d, 3g, 6.

E) Method: These studies would consist of acoustic Doppler current profiling and SSC profiling over several days of the first sediment pulse of the water year. In addition, we will deploy a water quality package on the north side of the channel over the duration of the flood pulse, to determine if a combination of the two sensors (north and south) give a better description of the cross-sectional, velocity-weighted SSC. This would improve the methodology utilized by McKee et al. (2006) for estimating sediment and contaminant loads to San Francisco Bay.

F) Expected cost (can be modified according to budgetary constraints):$ 54,000

Proposal #3

A) Title of proposed project: Analysis of PBDEs in sediment and biota adjacent to autoshredder waste storage facilities

B) Proponent / study team: AMS, SFEI, lab

C) Objective/ Background / Need or Justification / time line (single year multi year):
Automotive shredding facilities (autoshredders) form the important societal function of helping to dispose of and recycle waste associated with unwanted vehicles and small appliances. The shredder "fluff" is the product of the grinding up of the "soft parts" of appliances and vehicles such as insulation, plastics, foam, and upholstery. Much of the fluff is used as overnight capping in landfills on the Bay margin. Since flame retardants containing PBDEs are an integral part of paints, plastics, foam and upholstery, they also appear in the recycling wastes and fluff. The draft PBDE Conceptual Model / Impairment Assessment Report (Werme, et al., in prep) identified several key points related to PBDEs associated with autoshredder waste and its presence in the Bay Area:

- Seven facilities in California are estimated to produce 660 million pounds of waste annually;
- Three of these seven autoshredder facilities are located within the Bay Area;
- Autoshredder waste is estimated to contain total PBDEs at a concentration of 100 ppm.

The overall mass of PBDEs estimated to be contained within autoshredder waste is small relative to that mass estimated to be contained, for example, within waste associated with the electronics industry. However, it is possible that direct transport of fluff to the Bay could make these facilities important localized sources. At least two of the Bay Area storage facilities are located directly adjacent to the Bay. If the sediments and biota around these facilities are found to be enriched in PBDEs relative to elsewhere in the Bay, management measures could be considered that would limit the transport of these waste materials to the Bay. The proposed project is a single-year special study that would analyze concentrations in various media at the two Bay Area facilities with direct connection to the Bay.

D) RMP Management Questions to be answered:

1. Describe the distribution and trends of pollutant concentrations in the Estuary

d. Do pollutant concentration distributions indicate particular areas of origin of regions of potential ecological concern?

2. Project future contaminant status and trends using best understanding of ecosystem processes and human activities

b. Can potential impairment and degradation be better anticipated in the face of projected changes in land and water use and management, as well as product use and disposal?

h. Do pollutants show existing contributions that fit our current understanding or models of their origin, loads, and transport?

3. Describe sources, pathways, and loading of pollutants entering the Estuary

a. Where are/were the largest pollutant sources, in what context are/were these pollutants applied or used, and what are/were their ultimate points of release into the aquatic environment?

E) Method:
The project would include two tasks: a literature review and a field study. In the first task, a review of peer reviewed and gray literature would be conducted to assess two main questions: (1) in addition to PBDEs, what other pollutants are associated with autoshredder waste at potentially significant concentrations?; and (2) what is known about fate and transport of autoshredder waste and pollutants associated with the waste? Evaluation of fate and transport would include first-order estimates of the potential mass of PBDEs released from shredder waste (e.g., Charles et al. 2005) and the potential magnitude and areal extent of aquatic pollution. The literature review is anticipated to be limited in scope because much of the available literature has previously been compiled by SFEI and SPLWG members. The review would also include evaluation of aerial photographs and satellite images of the site and surrounding waterways to identify potential sampling locations likely to indicate greatest impact of PBDE release. The result of the literature review would be a brief memorandum submitted to the SPLWG that could potentially inform design of the monitoring plan for the field study.

The field study (Task 2) would evaluate whether local hotspots for PBDEs can be identified associated with the autoshredder facilities. Sediment and biota samples would be collected near autoshredder waste storage facilities in (1) Oakland Estuary and (2) Redwood Creek. A third Port area without autoshredder storage would be sampled as a control location. Surficial sediment samples (top 5cm) will be collected adjacent to and at varying distances from the facilities, targeting depositional areas. Biota samples will be collected at the three locations using similar sampling and handling methods to those employed for the RMP fish contamination study. All sampling locations will be selected based on results of Task 1 and will be presented to the SPLWG for feedback prior to beginning sampling. As available, three taxa will be targeted to assess local exposure to PBDEs: shiner surfperch, topsmelt, and resident bivalve mollusks. Data analysis will include statistical comparison among the shredder locations, the control location, and other sediment, biota, and water data collected by the RMP (e.g., Status and Trends, EEPS Small Fish Project, and the Contaminants in Sport Fish Program).

F) Expected cost: $73,000
AMS field work and reporting $30k
Laboratory analysis: $20k (Note: analysis of non-PBDE analytes are not included in the cost estimate, but the study team will archive sufficient sediments and biota for potential future analysis.)
SFEI management, QA, literature review, and assistance with field work and reporting $23k

REFERENCES

Charles, M.J., Groskova, D., and T.M. Cahill. 2005. Near-Source Ambient Air Monitoring of Polybrominated Diphenyl Ethers. Report to the California Air Resources Control Board. Project. # 01-407. 61 pp. October, 2005. Department of Environmental Toxicology, U.C. Davis.

Werme et al., in prep. PBDEs in San Francisco Bay, Conceptual Model /Impairment Assessment, Draft Report. Prepared by San Francisco Estuary Institute for the Clean Estuary Partnership.

Proposal #4

A) Title of proposed project: Guadalupe River Watershed Model Development

B) Proponent / study team: John Oram, Lester McKee, RMP staff (SFEI)

C) Background/ rational / need / time line: Through funding from the RMP, CEP, SCVWD, USACE, and SCVURPPP, we have collected 5 years of data on suspended sediments, 4 years of data on total mercury, 3 years of data on PCBs, 2 years of data on PBDEs, OC pesticides, and methyl mercury, and 1 year of data on bed load mercury (for a total cost of $608,000). Although this data has been interpreted and provides a fairly robust estimate of loads, there remain several uncertainties and additional interpretative possibilities that can only be resolved through the development of a numeric model. The main uncertainty is associated with how the source of water influences contaminant concentrations and loads estimates. An additional uncertainly is what component of the loads of each contaminant is derived from urban sources. Additional interpretative possibilities include quantifying sub-watershed /land use specific loads of suspended sediments and Hg and testing the magnitude of influence of proposed management scenarios. The Guadalupe River watershed is ideal for model development. In addition to sediment and containment data, SCVWD has been collecting rainfall and runoff data at literally dozens of locations for decades, there is a large data set on Hg in sediments and water collected by other groups and agencies over the past 20 years, the Water District has cross section data, CSJ has urban concentration data for multiple contaminants, and the will be considerable effort over the next decade to control mercury and PCB sources. Extra benefits from the model include the potential to link the model to other models being developed to inform salt pond restoration and the potential for match funds from SCVWD if further funding is provided to do loads monitoring.

This project aims to develop:

- a numerical model of the Guadalupe River Watershed to support implementation of the Guadalupe River Hg TMDL
- to improve Guadalupe loading estimates to the Bay
- to provide model code to allow better extrapolation of Guadalupe loads to other watershed areas (SF Bay Hg and PCB TMDLs and PBDE conceptual models)
- to provide the basis for the testing for various BMP scenarios
- to provide a direct model output to link to South Bay Salt Pond Restoration questions such as what is the concentration and timing of water, sediment and contaminated sediment in relation to proposed levee breaches, sedimentation rates, and biological impacts

D) RMP management questions answered:

Q1. Describe the distribution and trends of pollutant concentrations in the Estuary.

Q2. Project future contaminant status and trends using best understanding of ecosystem processes and human activities.

Q3. Describe sources, pathways, and loadings of pollutants entering the Estuary.

E) Method: Select either EPA BASINS (HSPF) model or the SPARROW model as the platform (after reviewing a paper by Mike Stenstrom (UCLA) that discusses the pros and cons of each model). Compile existing data for model input: land use maps, precipitation, topography, flow diversions, etc. Develop, calibrate, and validate model using existing monitoring data.

F) Expected cost: $85,000, rough estimate with potential match funds from SCVWD

Proposal #5

A) Title of proposed project: Watershed specific sediment loads – a new estimate for predicting sediment quality

B) Proponent / study team: Lester McKee and RMP staff

C) Objective/ Background / Need or Justification / time line (single year multi year): TMDLs have proposed sediment targets for watersheds of 0.2 mg Hg/kg of sediment and perhaps 0.002 mg PCB / kg of sediment. The other target options include demonstrating loading trends, or demonstrating mass removed (loads avoided). In some watersheds (such as Coyote Creek), the 0.2 Hg target is already being achieved. In other watersheds such as Guadalupe River and perhaps some of the more heavily industrialized areas, the PCB and Hg targets are not met. At this time BASMAA has no data to determine where it might be most appropriate to apply limited resources to achieving a mass loading target, a loads avoided target, or a sediment concentration target. The need for this project is described in the draft language for the municipal regional permit (MRP). Permit language asked for BASMAA agencies to quantify sediment loads on a watershed by watershed basis (a difficult undertaking). This project would provide an estimate of loads from each watershed and provide input into prioritization of which ones to focus empirical observations on in the first and second terms of the permit.

The objective of this project is to develop an estimate of watershed specific suspended sediment loads and combine this with land use / source area knowledge as a tool for classifying watersheds as likely meeting sediment targets. This will provide a rational for BASMAA to focus effort to watershed areas where loads reduction or mass removal (loads avoided) will be the best management tools. An additional bonus of this project will be a new estimate of small tributaries sediment loads for input in the sediment budget for the Bay (needed to inform salt pond restoration and drive our understanding for the mechanisms for the observed net erosion) and contaminant fate (biological uptake).

D) RMP Management Questions contributed to or answered (see below)? 1c, 1d, 2d, 2e, 2f, 2h, 3a, 3c, 3g, 6.

E) Method: Thanks to efforts over the past 15 years by Oakland Museum of California, William Lettis and Associates, SFEI and Trish Mulvey, we now have a 24inch storm drain map and watershed area GIS for almost the entire Bay Area. We also have USGS and SFEI measurements of suspended sediment loads, and world literature on urban sediment processes. We also have literature describing statistical techniques for estimating loads (e.g. Walling; Milliman), and an extensive GIS data base on land use and PCB and Hg use characteristics. We will incorporate this extensive set of information to derive new watershed specific sediment loads entering SF Bay from local tributaries.

F) Expected cost (Rough - can be increased or decreased at a later stage): $32,000