PS/SS: Establishing a Reference Site for Bioassays

Estimated Cost: $ 27,000
Oversight Group: Exposure and Effects Work Group
Proposed by: Brian Ross (USEPA), Beth Christian (SF RWQCB), Ellen Willis-Norton, and Don Yee

Background

The Section 404(B)(1) of the Clean Water Act states that dredged materials may not be disposed of in U.S. waters if the discharge results in significant degradation of the aquatic ecosystem (Clean Water Act of 1972). The joint USEPA/USACE Inland Testing Manual (ITM) details testing requirements for evaluating dredged materials to ensure compliance with Section 404 of the Clean Water Act (EPA/USACE 1998). The ITM calls for a comparison of dredged material quality to that of the disposal site sediment. But it also notes that multiple discharges at a disposal site could adversely impact the point of comparison, and that adoption of a reference sediment that is unimpacted by previous discharges of dredged material will result in a more scientifically sound evaluation of potential individual and cumulative contaminant-related impacts. Identification of a common sediment reference site for the Bay will also benefit dredgers because they will no longer need to repeatedly test sediment at multiple disposal sites.

The goal of this study is to identify and potentially adopt a sediment reference site that can be compared to all San Francisco Bay dredged materials. The reference sediment should be characteristic of the Bay (e.g. fine-grained) and should be unimpacted by previous dredged material discharges and nearby industry. RMP staff will work with Brian Ross (USEPA) and Beth Christian (SF RWQCB) to locate a Bay reference site between Central and Suisun Bay in which benthic organisms thrive (consistently > 85% amphipod survival) and ambient sediment chemistry thresholds are not exceeded.

Study Objective and Applicable RMP Management Question
The objective of this effort is to develop a reference site to aid in the interpretation of toxicity bioassay results in San Francisco Bay. This study would address the following RMP management question (MQ):

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

- A: Which chemicals have the potential to impact humans and aquatic life and should be monitored?
- B: What potential for impacts on humans and aquatic life exists due to contaminants in the Estuary ecosystem?

Approach
This effort will involve the following steps:

1. Survey previous RMP Status and Trends sediment sites to determine if there are RMP sampling stations characterized by fine grains, amphipod survival that is greater than 85 percent, and low pollutant concentrations.

2. Choose one or two sites that fit the conditions described above and add the sites to the RMP's biennial Status and Trends sediment cruise. Toxicity tests at the potential reference sites should be conducted for the following species: 1) *Ampelisca abdita*, 2) *Rhepoxynius abronius*, 3) *Eohaustorius estuarius*, and 4) a benthic Polychaete.

3. If the percent survival is above 85 for the amphipods, work with Brian Ross and Beth Christian to determine what additional work may be required to adopt the location as a Bay-wide reference site. If the site is adopted, create and maintain an online database with the reference site's toxicity and chemistry listed to serve as a comparison to dredged sediment.

4. The RMP will produce a final report describing the rationale behind selecting the Bay reference site. The report will also present the toxicity test and sediment chemistry results for the reference sediment.

Schedule

To be most cost-efficient, this study will augment the summer 2014 RMP Status and Trends sediment cruise (July/August). Depending on the site(s) and the difficulty of obtaining a sample, we estimate that it could take an additional half day of the cruise. Samples will be collected using the same sampling equipment as the RMP S&T samples and shipped to RMP laboratories. Lab results are anticipated to be available in December 2014. A short summary report will be prepared by April 2015.

Budget

Fieldwork and ship time	$1,000
Laboratory Analysis	$18,000
Data formatting and analysis	$2,500
Report	$5,500
Total	**$27,000**

References

Clean Water Act of 1972, 33 U.S.C.§1251 et seq. (2002). Retrieved from http://epw.senate.gov/water.pdf

EPA/USACE. 1998. Evaluation of dredged material proposed for discharge in waters of the U.S. – Testing manual. EPA-823-B-98-004, Washington, D.C.

Preliminary Stage 1 Results:

Figure 1: Previously sampled RMP S&T sites with fine-grained sediment, low PCB, PAH, and Hg concentrations, and greater than 85 percent *Eohaustorius estuarius* survival

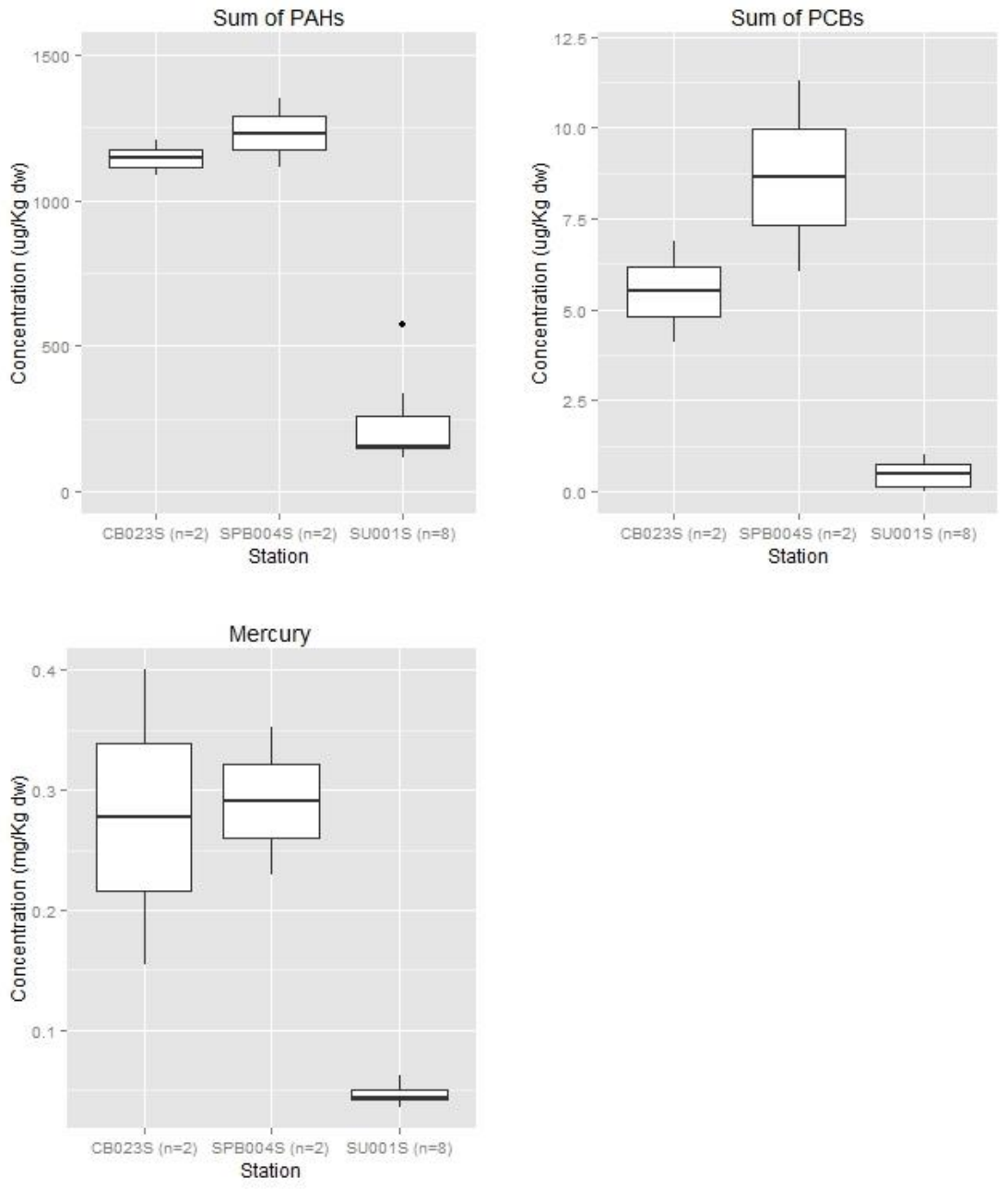

Figure 2: Sediment concentrations of PAHs, PCBs (sum of 40), and mercury in the three potential reference site locations

Stations	CB0023S	SPB004S	SU001S
% Survival (range)	88-91	93	88-96
% fines (range)	55-88	70-80	20-100
mean depth (m)	7.5	9.3	6.2

Table 1: Range of *Eohaustorius estuarius* percent survival, range of percent fines, and mean depth at the three potential reference sites