Sediment Quality Assessment of San Francisco Bay Site on the 303(d) List: Pacific Dry Dock, Oakland, Calif.

Estimated Cost: $45,000

Oversight Group: RMP Exposure and Effects Workgroup (EEWG)

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Proposed Deliverables and Time Line

Deliverable	Due Date
Task 1: Project management	Throughout 2015 – Finalize study design, write and manage subcontracts, track budgets
Task 2: Sample collection and data analysis	June- July 2015
Task 3: Reporting	Draft Memorandum– March 2016 Final Memorandum– June 2016

Background and Justification

In August 2009, the State Water Resources Control Board (State Water Board) adopted the Sediment Quality Objectives for Enclosed Bays and Estuaries. These sediment assessment methods use the sediment triad approach to evaluate the ecological condition of sediments from a site, using measurements of sediment chemistry, toxicity tests, and benthic community condition (Bay *et al.*, 2009). The San Francisco Bay Regional Water Quality Control Board (Water Board) is interested in employing these SQO assessment methods to evaluate sediment condition at the Pacific Dry Dock and Repair Yards 1 and 2, Oakland, Calif., a site on the 303(d) list[1].

The proposed study will conduct Sediment Quality Objectives assessments (SQOs) at three locations within the Pacific Dry Dock site to support the Water Board's management decisions. The Pacific Dry Dock is located within the geographic region of the Estuary currently defined as the polyhaline benthic assemblage by the current SQO guidance documentation – between the Dumbarton Bridge in the south and the Richmond Bridge in the north (Bay *et al.* 2009).

This study will address RMP management questions (listed below) related to pollutant effects on benthic organisms including: evaluating the long-term persistence of benthic impacts at contaminated sites, and the utility of the SQO approach in evaluating sediment

[1] http://www.waterboards.ca.gov/water_issues/programs/tmdl/2010state_ir_reports/category5_report.shtml

condition. This study will provide the Water Board with SQO assessments of an important estuary margin site of concern in the Central Bay region of the San Francisco Estuary in support of managing contaminated sites and 303(d) listing decisions.

Study Plan

This study will limit its focus to a site that falls within the polyhaline benthic assemblage as defined by the current SQO guidance (Bay *et al.,* 2009). Benthos samples will be further evaluated to confirm they are placed in the right benthic assemblage using salinity measures and indicator taxa defined in the SQO guidance documentation. If samples do not fall within the expected polyhaline assemblage, alternative benthic assessments may be used to provide a basis for comparison of condition. The RMP and SCCWRP are currently working on revising and formalizing the mesohaline SQO benthic assessment methods and these new methods may be used to evaluate benthic community condition in samples if the resulting samples are determined to belong to the mesohaline assemblage.

This study will consist of three tasks:

1. Project management:
This task includes study design, logistics, and coordination among sample collection and laboratories. Three samples will be collected under the current budget, and the full suite of triad measures previously monitored as part of RMP Status and Trends will be analyzed. Sample locations will be selected after detailed review of previous sediment studies performed on behalf of Crowley Maritime Corporation, the current owners of the site, following remediation efforts. Re-assessing previously characterized locations will provide specific comparisons needed to determine if sediment condition has improved. Contracts for boat rental and laboratory analyses will be required.

2. Sample collection and analyses:
Previous experience collecting sediment samples along Bay margins indicates successful sampling will require use of a dedicated boat for a single day; attempts to collect margin sediment samples in conjunction with a Baywide sediment cruise are not often effective given the shallow margin waters and tidal constraints.

The same analytical laboratories and core analyte list as monitored by previous RMP Status and Trends sediment monitoring efforts will be used in this study in order to maximize the use of the data in other RMP studies (Willis-Norton *et al.* 2013).

Surface sediment will be sampled and analyzed for the full suite of RMP Status and Trends measures including:

- Sediment and water quality - grain-size, TOC, TN, and a CTD cast will be taken to record water quality conditions near the bottom.
- Trace metals
- Trace organics
- Toxicity to two test species (*Eohaustorius estuarius* and *Mytilus galloprovincialis*)
- Benthic macrofauna

3. Reporting:
Sediment assessment scores will be compared among locations and to existing RMP Status and Trends program scores (Willis-Norton *et al.* 2013). The Status and Trends program conducted SQO assessments from 2008 to 2012 at a subset of the long-term sediment monitoring sites (sampled annually on an alternating wet and dry season sampling period). Those sites are located throughout the Estuary and represent ambient conditions as they are not located near known sources of pollution. Comparing the study location scores to those in the Estuary will provide perspective about the respective ecological condition of sediments in the Estuary as a whole and in the Estuary margins - near pollution sources.

Applicable RMP Management Questions

EEWG benthic effects management questions:

1. What are the spatial and temporal patterns of impacts of sediment contamination on benthic biota?

   The proposed study will employ the SQO methods for Enclosed Bays and Estuaries to assess ecological condition, and if there is a potential concern of degraded conditions due to pollution. This Study will focus on an impaired site located in the Estuary margins and SQO assessment scores will be compared to the RMP Status and Trends scores from the ambient survey design. To evaluate temporal patterns, locations that were sampled previously may be re-assessed to investigate to what extent sediment condition has improved.

2. Are the toxicity tests, benthic community assessment approaches, and the overall SQO assessment framework we are using reliable indicators of impacts on benthic biota?

   The SQO methods for Enclosed Bays and Estuaries will be implemented to investigate sediment condition at a site considered impaired prior to a remediation effort, informing us regarding how sensitive these tools are and if they can detect changes in sediment condition over time or after remediation efforts have been completed.

Budget Estimate

Description	Cost Estimate ($)
Sediment Chemistry	**9,400**
Sediment Toxicity (Eohaustorius & Mytilus)	**6,000**
Benthos	**6,600**
Management, Sampling and Reporting	**17,000**
Other Expenses	**6,000**
Logistics contract, vessels, shipping, travel, etc.	
Total Cost Estimate	**$ 45,000**

References

Bay S., D.J. Greenstein, J.A. Ranashinghe, D.W. Diehl, A.E. Fetscher. 2009. Sediment Quality Assessment Draft Technical Support Manual. Technical Report 582. May, 2009. Southern California Coastal Water Research Project. Costa Mesa, CA.

Hunt, J.W., Anderson, B.S., Phillips, B.M., Newman, J., Tjeerdema, R.S., Taberski, K.M., Wilson, C.J., Stephenson, M., Puckett, H.M., Fairey, R., Oakden, J. 1998. Sediment Quality and Biological Effects in San Francisco Bay. Final Report for the Bay Protection and Toxic Cleanup Program. California State Water Resources Control Board.

Willis-Norton, E., Ranasinghe, J.A., Greenstein, D., Taberski, K., Feger, N. 2013. Applying Sediment Quality Objective Assessment Protocols to Two San Francisco Bay 303(d)-Listed Sites. RMP Contribution 699. August, 2013. San Francisco Estuary Institute, Richmond, CA.