

**Cruise Report**  
**2000 Regional Monitoring Program**  
**Winter Sediment Cruise**

A P P L I E D  
*ocean*marine  
S C I E N C E S

**February 9 - 11, 2000**

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## **1.0 Introduction**

This report describes activities associated with the first of two sediment sampling cruises to be conducted as part of the Regional Monitoring Program (RMP) for Trace Substances in the San Francisco Estuary. Sediment sampling is one component of this program that is designed to provide long-term data on concentrations of trace metals and organic compounds, as well as toxicity, throughout the estuary.

As a result of the RMP redesign, the 2000 wet season cruise differed from earlier cruises in that a total of five stations in the north bay and delta were sampled, as opposed to the standard set of 26 stations throughout the estuary. Arsenic and Selenium are still measured by Brooks Rand Ltd. (BRL), however, Mercury and Methylmercury are now measured by Dr. Rob Mason's laboratory at the University of Maryland Chesapeake Biological Laboratory (UMCBL). Sediment samples were collected and distributed to five laboratories for analysis under RMP protocols. Sample distribution is shown in Table 1.

## **2.0 Cruise Report**

### **2.1 Objectives**

The objectives of this cruise were:

1. Collect sediment samples at four stations for the analysis of:
  - Trace metals and trace organics by Bay Area Dischargers Authority (BADA)
  - As and Se by Brooks Rand, LTD (BRL)
  - Grain size, Total Organic Carbon (TOC) and total nitrogen by UC Santa Cruz (UCSC)
  - Pore water pH and ammonia by Applied Marine Sciences (AMS)
  - Pore water sulfides by Marine Pollution Studies Lab (MPSL)
  - Conductivity Temperature Depth (CTD) profiles by AMS
  - Mercury and Methylmercury by University of Maryland Chesapeake Biological Laboratory (UMCBL)
2. Collect sediment samples at one station for the analysis of:
  - Toxicity Identification Evaluation (TIE) by MPSL
3. Collect sediment samples at two stations for the analysis of:
  - Benthic infauna by City and County of San Francisco (CCSF)

## 2.2 Personnel

The personnel and work assignments for this cruise were as follows:

Name	Affiliation	Duties
David Bell (2/9-11)	AMS	Cruise Manager, sediment chemistry, pH; CTD
Sarah Lowe (2/10)	SFEI	Benthic sample collection
Paul Salop (2/9-11)	AMS	Sample collection, sediment chemistry, and CTD
Gordon Smith (2/9-11)	UCSC	Vessel skipper

## 2.3 Activities

Date	Time	Activity
Day 1 February 9, 2000	1500-1700	Mobilized gear aboard R/V David Johnston, Benicia Marina.
Day 2 February 10, 2000	0715-0812	Mobilized remaining sediment cruise gear and conducted safety briefing at Benicia Marina. Departed for Davis Point site (BD41).
	0845-1005	Sampled Davis Point, departed for San Pablo Bay site (BD22).
	104201107	Sampled San Pablo Bay, departed for Petaluma River site (BD15).
	1149-1226	Sampled Petaluma River site, departed for Napa River site (BD50).
	1412-1445	Sampled Napa River, departed for Benicia Marina.
	1545-1615	Arrived at Benicia Marina. Benthic infauna samples removed from vessel by Sarah Lowe. All other samples stored on dry or wet ice on the vessel.

### 2.3 Activities (cont.)

Date	Time	Activity
Day 3 July 26, 1999	0645-0710	Mobilized gear aboard R/V David Johnston. Departed for Grizzly Bay site (BF21).
	0749-0839	Sampled Grizzly Bay, departed for Benicia Marina.
	0945-1020	Arrived Benicia Marina, demobilized gear off of vessel. Samples for analysis of trace metals and trace organics were delivered to the EBMUD laboratory in Oakland. Toxicity samples were picked up by W. Vwpiekarski for delivery to MPSL. Cognates, archives, mercury, methylmercury, and As and Se samples were transferred to AMS for distribution to the appropriate facility.

### 2.4 Discussion

#### *Sample Collection and Handling Procedures*

Prior to sampling, all equipment was thoroughly cleaned. The cleaning process began with a two-day soaking of all sampling equipment in an Alconox<sup>®</sup> detergent bath. Following the detergent soak, all equipment was washed with Alconox<sup>®</sup> detergent, rinsed with tap water, followed by three rinses each with de-ionized water, 10% HCl, and petroleum ether. Cleaned utensils were sealed in Ziploc<sup>®</sup> bags until used in the field. Additional details about sample collection and handling may be found in the RMP's Field Operations Manual (FOM).

Sampling procedures ensured that samples were collected from a localized area at each site to reduce uncontrolled temporal and spatial variation. In the field, the vessel was anchored at the coordinates listed in Table 2. The coordinates were checked throughout sampling to ensure that the anchor had not dragged. Coordinates were recorded for two grabs from each site.

The first sampling operation at each site, where required, was the collection of the benthic samples with the Ponar grab. After being sieved, benthic samples were preserved in 10% formalin buffered with seawater according to the standard operating procedures used by the City and County of San Francisco.

After the benthic samples were collected, the Ponar grab was replaced with the Van Veen grab for collection of chemistry samples. When the Van Veen grab was brought on deck, the following procedure was followed. After any overlying water was drained off, sediments were acquired with cleaned glass cores for measurement of pH, ammonia, and total sulfides in pore water. Next, the remaining top 5-cm of sediment was scooped from each of two replicate grabs and mixed in the bucket to provide a single composite sample for each site for analysis of trace chemical analytes, TOC, and grain size. Portions of the composited sample were placed into containers provided by each laboratory. Duplicate chemistry samples were collected for archival. Cores collected for analysis of pore water were centrifuged onboard the vessel, and 5 ml of supernatant was preserved for analysis of sulfides by MPSL. The remainder of the supernatant was analyzed on-board for pH and ammonia levels.

The quality of the (Van Veen) grab samples was ensured by requiring each sample to satisfy a set of criteria concerning the depth of penetration and disturbance of the sediment within the grab. Samples were rejected when one or more of the following conditions occurred:

- There was a rock or shell fragment wedged between the jaws of the grab allowing the sample to wash out.
- The surface of the sample was significantly disturbed.
- The sample was uneven from side to side, indicating that the grab was tilted when it penetrated the sediment.
- The surface of the sample was in contact with the top doors of the grab, indicating over-penetration of the grab and possible loss of material around the doors.

Samples were collected from each site, composited in the bucket and placed into containers as indicated in Table 3.

### *General Comments*

All cruise objectives were met. MPSL was given 20 litres of sediment obtained from the Grizzly Bay station for conducting a TIE at this location where sediments have previously demonstrated toxicity.

**Table 1. Sample Distribution List for the winter 2000 Sediment Sampling Cruise**

Sample Type	Laboratory	# of Sites Sampled
Pore water ammonia, pH	AMS	4
As & Se	BRL	4
Trace elements	BADA	4
Organic compounds	BADA	4
Archive	AMS	4
Mercury, Methylmercury	UMCBL	4
Benthic infauna	CCSF	2
Toxicity, TIE	MPSL	1
Pore water sulfides	MPSL	4
TOC, total N, and grain size	UCSC	4

**Table 2. Coordinates of Regional Monitoring Program Sediment Sampling Sites**

Site Name/Code	Latitude	Longitude	Depth (m)	Sediment Description from 2/94
Petaluma River/BD15	38° 06.64'	122° 29.20'	3.5	soft light brown surficial sediment over dark gray mud/clay
San Pablo Bay/BD22	38° 02.88'	122° 25.34'	3.5	soft light brown surficial sediment over dark gray mud/clay
Davis Point/BD41	38° 03.05'	122° 16.78'	6.5	sandy silt with shell debris
Napa River/BD50	38° 05.31'	122° 15.66'	4	soft light brown silty mud with high density of Potamocorbula
Grizzly Bay/BF21	38° 06.92'	122° 02.37'	1.5	very soft light brown sediment

**Table 3. Sample Identification for 2000 RMP Winter Sediment Cruise**

Sample ID	Collection Date	Site Name	Site Code	Parameter	Lab
RMP00-SED-001	2/10/00	Davis Point	BD41	As, Se	BRL
RMP00-SED-002	2/10/00	Davis Point	BD41	Trace Elements	BADA
RMP00-SED-003	2/10/00	Davis Point	BD41	Organics	BADA
RMP00-SED-004	2/10/00	Davis Point	BD41	Archive	AMS
RMP00-SED-005	2/10/00	Davis Point	BD41	Cognates	UCSCDET
RMP00-SED-006	2/10/00	Davis Point	BD41	Hg, mHg	UMCBL
RMP00-SED-008	2/10/00	Davis Point	BD41	Sulfides	MPSL
RMP00-SED-009	2/10/00	San Pablo Bay	BD22	As, Se	BRL
RMP00-SED-010	2/10/00	San Pablo Bay	BD22	Trace Elements	BADA
RMP00-SED-011	2/10/00	San Pablo Bay	BD22	Organics	BADA
RMP00-SED-012	2/10/00	San Pablo Bay	BD22	Archive	AMS
RMP00-SED-013	2/10/00	San Pablo Bay	BD22	Sulfides	MPSL
RMP00-SED-014	2/10/00	San Pablo Bay	BD22	HG, mHg	UMCBL
RMP00-SED-015	2/10/00	San Pablo Bay	BD22	Cognates	UCSCDET
RMP00-SED-016	2/10/00	Petaluma River	BD15	Trace Elements	BADA
RMP00-SED-017	2/10/00	Petaluma River	BD15	Organics	BADA
RMP00-SED-018	2/10/00	Petaluma River	BD15	As, Se	BRL
RMP00-SED-019	2/10/00	Petaluma River	BD15	Sulfides	MPSL
RMP00-SED-020	2/10/00	Petaluma River	BD15	Cognates	UCSCDET
RMP00-SED-021	2/10/00	Petaluma River	BD15	Hg, mHg	UMCBL
RMP00-SED-022	2/10/00	Petaluma River	BD15	Archive	AMS
RMP00-SED-023	2/10/00	Napa River	BD50	Archive	AMS
RMP00-SED-024	2/10/00	Napa River	BD50	Trace Elements	BADA
RMP00-SED-025	2/10/00	Napa River	BD50	Organics	BADA
RMP00-SED-026	2/10/00	Napa River	BD50	As, Se	BRL
RMP00-SED-027	2/10/00	Napa River	BD50	Sulfides	MPSL
RMP00-SED-028	2/10/00	Napa River	BD50	Cognates	UCSCDET
RMP00-SED-029	2/10/00	Napa River	BD50	Hg, mHg	UMCBLS
RMP00-SED-030	2/11/00	Grizzly Bay	BF21	Toxicity, TIE	MPSL