Cruise Report
Regional Monitoring Program
Water Sampling Cruise #2
May 24 - 27, 1993

1.0 INTRODUCTION

This report describes activities associated with the second estuary water sampling cruise of the Regional Monitoring Program for Toxic Contaminants in the San Francisco Estuary. Water sampling is one component of this program that is designed to provide long-term data on concentrations of trace elements and organic compounds, as well as toxicity, throughout the estuary. Also being measured are sediment concentrations of trace elements and organic compounds, and bioaccumulation in transplanted bivalves. Moreover, in addition to sampling in the estuary, water is also being collected from the Sacramento and San Joaquin rivers upstream of the delta.

Water samples were collected and distributed to four laboratories for analysis. Samples for the analysis of arsenic, mercury, selenium, and cyanide were sent to Brooks-Rand, Ltd. in Seattle, Washington at the mid-point and end of the cruise. Samples for the analysis of other trace elements (i.e., cadmium, chromium, copper, lead, nickel, silver, and zinc) and ancillary measurements (i.e., salinity, total suspended solids, dissolved organic carbon, chlorophyll a, ammonium, orthophosphate, NO$_2$, and NO$_3$) were retained by personnel of Dr. Russ Flegal's laboratory at University of California, Santa Cruz at the conclusion of the cruise. Samples for analysis of trace organics were delivered at the end of each day to Dr. Robert Riseborough at the Richmond Field Station, University of California, Berkeley. Samples for the measurement of toxicity were picked up at the end of each day by representatives of S.R. Hansen & Associates, Concord. Measurements of salinity, temperature, conductivity, pH, and dissolved oxygen were made at each station in the field. All sampling was conducted from the R/V David Johnston.

2.0 CRUISE REPORT

2.1 Objectives

The objectives of this cruise were:

1) Collect water samples from 16 stations for analysis of total and dissolved trace elements.

2) Collect water samples from 11 stations for analysis of particulate and dissolved organic contaminants.

3) Collect water samples from 16 stations for analysis of salinity, total suspended solids, chlorophyll a, nutrients (ammonium, orthophosphate, NO$_2$, and NO$_3$) and dissolved organic carbon.

4) Measure pH, conductivity, salinity, temperature, and dissolved oxygen.

5) Collect water samples from eight stations for measurement of aquatic toxicity.

2.2 Scientific Personnel

The personnel for this cruise and their responsibilities were:
<table>
<thead>
<tr>
<th>Name</th>
<th>Affiliation</th>
<th>Responsibilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Andy Gunther (5/24, 5/25)</td>
<td>AMS</td>
<td>Cruise Co-Manager, aquatic toxicity</td>
</tr>
<tr>
<td>Dane Hardin (5/26, 5/27)</td>
<td>MRS</td>
<td>Cruise Co-Manager, aquatic toxicity</td>
</tr>
<tr>
<td>Robert Ramer</td>
<td>Trace Organics Lab</td>
<td>Organic compounds</td>
</tr>
<tr>
<td>Jeff Stobaugh (5/27)</td>
<td>Trace Organics Lab</td>
<td>Organic compounds</td>
</tr>
<tr>
<td>Pepé Cid Montañes (5/24, 5/25)</td>
<td>Trace Organics Lab</td>
<td>Organic compounds</td>
</tr>
<tr>
<td>Geoff Smith</td>
<td>UCSC</td>
<td>Trace elements</td>
</tr>
<tr>
<td>Khalil Abu-Saba</td>
<td>UCSC</td>
<td>Trace elements</td>
</tr>
<tr>
<td>Jonathan Crick</td>
<td>UCSC</td>
<td>Ancillary data, trace elements</td>
</tr>
<tr>
<td>Gordon Smith</td>
<td>UCSC</td>
<td>Vessel Skipper</td>
</tr>
</tbody>
</table>

2.3 Activities

5/24/93

0700 - 0800  Mobilized R/V David Johnston at Berkeley Marina, departed for Oyster Point station (BB-30)
0940 - 1038  Sampled at Oyster Point station, departed for Dumbarton Bridge station (BA-30)
1200 - 1310  Sampled at Dumbarton Bridge station, departed for South Bay station (BA-20)
1320 - 1500  Sampled at South Bay station, departed for Redwood Creek station (BA-40)
1550 - 1650  Sampled at Redwood Creek station, departed for Yerba Buena Island station (BC-10)
1830 - 1930  Sampled at Yerba Buena station, departed for Berkeley marina
2000 - 2015  Demobilized R/V David Johnston

5/25/93

0800 - 0830  Mobilized R/V David Johnston at Berkeley Marina, departed for Richardson Bay station (BC-30)
0930 - 1030  Sampled at Richardson Bay station, departed for Golden Gate station (BC-20)
1122 - 1219  Sampled at Golden Gate station, departed for Point Isabel station (BC-41)
1330 - 1420  Sampled at Point Isabel station, departed for Berkeley Marina
1445 - 1500  Demobilized R/V David Johnston
1500 - 1730  Packed samples from 5/24 and 5/25 and shipped them to Brooks-Rand
5/26/93 0700 - 0730  Mobilized R/V David Johnston, departed for Petaluma River station (BD-20)
0915 - 1130  Sampled at Petaluma River station, departed for Pinole Point station (BD-30)
1202 - 1346  Sampled at Pinole Point station, departed for Davis Point station (BD-40)
1420 - 1611  Sampled at Davis Point station, departed for Napa River station (BD-50)
1640 - 1806  Sampled at Napa River station, departed for Pacheco Creek station (BF-10)
1904 - 1947  Sampled at Pacheco Creek station, departed for Martinez marina
2000 - 2015  Arrived at Martinez marina, demobilized R/V David Johnston
2015 - 2130  Shuttle vehicle from Berkeley Marina to Martinez
5/27/93 0800 - 0838  Mobilized R/V David Johnston, departed for Grizzly Bay station (BF-20)
0933 - 1155  Sampled at Grizzly Bay station, departed for Sacramento River station (BG-20)
1333 - 1439  Sampled at Sacramento River station, departed for San Joaquin River station (BG-30)
1525 - 1639  Sampled at San Joaquin River station, departed for Martinez marina
1840 - 1900  Arrived at Martinez marina, demobilized R/V David Johnston
1900 - 2230  Packed samples from 5/26 and 5/27 and shipped them to Brooks-Rand, returned home

2.4 Discussion

Station Locations

Samples were collected from locations used during the Water Sampling Cruise #1, in March. These sites were chosen for consistency with the Pilot Program, wherever possible. Sampling coordinates for Water Sampling Cruise #2 are presented in Table 1.

Sample Collections

Samples were collected from each station, as indicated in the Cruise Plan, except that only total organic compounds (as compared dissolved and particulate samples) were collected at the San Joaquin River site due to a particle filter breakthrough. In addition, triplicate cyanide samples were collected at Point Isabel, field blanks were obtained for toxicity at the South Bay and San Joaquin River stations, and field blanks for arsenic, mercury, and selenium were collected at the San Joaquin River station. The types of samples collected at each station are presented in Table 2.

General Comments

All cruise objectives were achieved, except for the partitioning of organic compounds into particulate and dissolved components at the San Joaquin River site. The cruise was completed on
schedule, although heavy rain and strong winds on May 26 and strong winds on May 27 hampered operations. The strong winds generated waves sufficiently large to stir bottom sediments into the water column at the Petaluma River station, creating very high suspended solids concentrations that required the use of 15 filters for sampling organic compounds. For comparison, one filter was required at the Golden Gate station.

An unexplainable shortage of electrical power on the vessel also slowed operations because the organic sampling pump could not be operated without use of the vessel’s generator on May 26 and May 27. Moreover, the wind and current conditions often caused the boat to be oriented so that the sampling ports were up-current from the boat and down-wind from the generator exhaust. The trace metal sampling is especially sensitive to airborne contaminants because sample containers are open on deck when they are being filled with water. Consequently, it was necessary at several stations (Pinole Point, Davis Point, Napa River, and Grizzly Bay) to sample trace elements and organic compounds consecutively so that the generator was not operating during trace metal sampling. Also, at Grizzly Bay, the Sacramento River, and the San Joaquin River the vessel’s main engines were operated during sampling to maintain the proper sampling orientation (sampling ports up-current or cross-current and generator exhaust down-wind). Sampling was not conducted for either trace elements or organic compounds if diesel exhaust could be smelled on the vessel’s rear deck. Gordon Smith, the vessel skipper, has given assurances that the vessel will be able to provide the necessary electrical power on the next cruise.

The use of only two locations (Berkeley and Martinez) for vessel mobilization and demobilization worked very well. Although there is a longer steaming time from Berkeley to the southern stations than from Redwood City on the first day, a net improvement occurred in convenience and efficiency because vehicle shuttles were not required.

While sampling for trace elements was being conducted at the Pacheco Creek site, a slick that smelled strongly of diesel flowed past the vessel from a westerly direction. The slick was approximately 50 meters by 0.5 nautical mile and contained patches of dark oil. The Coast Guard was notified and a helicopter responded. Fortunately, organic compounds are not sampled at this site, so a thorough cleanup of sampling apparatus was not required. Nevertheless, the effects of the surface slick on trace element concentrations is unknown. A sample of the slick, obtained by dipping a cleaned 4-liter jar into the water, is archived at the Richmond Field Station.
<table>
<thead>
<tr>
<th>Station/Number</th>
<th>Latitude (N)</th>
<th>Longitude (W)</th>
<th>Depth When Sampled (m)</th>
<th>Remarks</th>
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</thead>
<tbody>
<tr>
<td>South Bay/BA-20</td>
<td>37° 29.68'</td>
<td>122° 05.24'</td>
<td>5</td>
<td>200 m W of channel marker &quot;16&quot;</td>
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<tr>
<td>Dumbarton Bridge/BA-30</td>
<td>37° 30.93'</td>
<td>122° 08.10'</td>
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<td>20 m E of channel marker &quot;14&quot;</td>
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<td>Redwood Creek/BA-40</td>
<td>37° 33.67'</td>
<td>122° 12.60'</td>
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<td>100 m SSE of channel marker &quot;12&quot;</td>
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<td>Oyster Point/BB-30</td>
<td>37° 40.16'</td>
<td>122° 19.75'</td>
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<td>50 m W of channel marker &quot;4&quot;</td>
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<td>Golden Gate/BC-20</td>
<td>37° 51.81'</td>
<td>122° 32.20'</td>
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<td>Richardson Bay/BC-30</td>
<td>37° 51.81'</td>
<td>122° 28.66'</td>
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<td>30 m NW of channel marker 4</td>
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<tr>
<td>Yerba Buena Island/BC-10</td>
<td>37° 49.40'</td>
<td>122° 20.94'</td>
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<td>0.25 nmi N of Bay Bridge between bridge supports K and L</td>
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<td>Point Isabel/BC-41</td>
<td>37° 53.33'</td>
<td>122° 20.48'</td>
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<td>0.61 nmi from Brooks Island and 0.81 nmi from Fleming Point</td>
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<td>Petaluma River/BD-20</td>
<td>38° 02.97'</td>
<td>122° 25.17'</td>
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<td>100 m S of channel marker &quot;2&quot;</td>
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<td>Pinole Point/BD-30</td>
<td>38° 01.50'</td>
<td>122° 21.63'</td>
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<td>0.5 nmi from marker off end of pier and 0.7 nmi from channel marker &quot;7&quot;</td>
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<td>Davis Point/BD-40</td>
<td>38° 03.10'</td>
<td>122° 16.59'</td>
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<td>0.2 nmi SW from W end of barge pier</td>
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<td>Napa River/BD-50</td>
<td>38° 05.81'</td>
<td>122° 15.60'</td>
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<td>50 m off concrete seawall and E of NE corner of Mare Island Naval Shipyard building</td>
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<td>Pacheco Creek/BF-10</td>
<td>38° 03.09'</td>
<td>122° 05.80'</td>
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<td>122° 02.31'</td>
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<td>Sacramento River/BG-20</td>
<td>38° 03.56'</td>
<td>121° 48.62'</td>
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<td>San Joaquin River/BG-30</td>
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<td>121° 48.25'</td>
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<td>0.11 nmi E of channel marker &quot;8&quot;</td>
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<td>San Joaquin River</td>
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