

SURVEY PLAN

FINAL

Puget Sound Sediment PCB and Dioxin 2008 Survey

Submitted By:

Matthew Liebman

U.S. Environmental Protection Agency



July 23, 2008

SURVEY PLAN

1.0 GENERAL

Project Title: PCBs and Dioxins in sediments from background and ambient locations in Puget Sound

Survey Title: Puget Sound PCB and Dioxin Sediment Survey

BOLD Requested By: Richard Parkin, Acting Director

Organization: Office of Ecosystems, Tribal and Public Affairs, EPA Region 10

Project Managers: Michael Szerlog (Unit Manager), Erika Hoffman (biologist), Renee Dagseth (Community Involvement Coordinator)

Organization: Aquatic Resources Unit, ETPA, R10

Organization Address: USEPA R10 (MS-083), 1200 Sixth Avenue, Suite 900, Seattle, WA 98101-3140

Organization Telephone No.: (206) 553- 0279 [MS], (360) 753-9540 [EH], (206) 553-1889 [RD], FAX No.: (206) 553-1775

Survey Chief Scientist: Matthew Liebman

Organization: U.S. EPA Region 1

Organization Address: One Congress Street Suite 1100 (COP), Boston, MA 02114-2023

Organization Telephone No.: (617) 918-1626

FAX No.: (617) 918-0626

Support Organization: USACE Seattle District

Contact: Dr. David Kendall

Organization Phone: (206) 764-3768

Support Organization: WA Department of Ecology

Contact: Dr. Laura Inouye

Organization Phone: (360) 407-6165

2.0 SCHEDULE OF OPERATIONS

Mobilization Date: Thu, 07/31/08

Departure Date: Thu., 07/31/08

Allowable Weather/Breakdown Days: 2

Demobilization Date: Thu., 08/08/08

Contact: Rajiv Bhandari (Capt), Port Manager
1-206-380-1351(cell); 1-425-430-9800 (24 hrs)

ISS.Seattle@ISS-Shipping.com

Location: Terminal 91, Berth TBD, Port of Seattle,

Planned Survey Duration (Days): 8

Maximum Duration (Days): 8

Location: Terminal 91, Berth TBD, Port of Seattle

Inchcape Shipping Services, Inc., 947 Powell Ave SW, Suite: 101, Renton WA 98057

Comments:

1. Departure from the dock will occur following lunch on 7/31/08, at the discretion of the Captain, in order to allow for transit to the first sampling location.
2. Ship's crew should be prepared for 24 hour operations due to the number of sampling locations and the distances between each location. Four watches will work on a 4-hrs on 8-hrs off cycle to match the ship's schedule.

4. In the event that the cruise lasts for more than 6 days, three survey crew members (Lauran Warner and Ted Benson) will need to be dropped off in the evening of 8/5/08 at the closest accessible shore location (to be determined based on ship location).
3. All crew, scientists, support personnel and visitors will be required to be on an access list for security purposes. Renee Dagseth (EPA R10) is providing names and affiliations for all personnel to Mark Strout of Seaward Services by July 21.
4. Tim Siwiec (EPA R10) will synchronize the Hypack with the Bold's navigation system on the 7/30/08 Logistics day.

3.0 BACKGROUND INFORMATION

The Dredged Material Program (DMMP) agencies - comprised of EPA, the Army Corps of Engineers - Seattle district, the Washington State Department of Natural Resources and the Washington State Department of Ecology - are in the process of developing new procedures for evaluation of dredged material for the presence of persistent contaminants such as dioxins/furans and polychlorinated biphenyls (PCBs) to protect human health and the environment, support the Puget Sound Initiative's goals for Puget Sound, maintain the viability of the open-water disposal program, and ensure consistency with regulatory requirements. A number of alternatives are under consideration by the DMMP agencies (the "Agencies") to determine the suitability of dredged material containing dioxin (and dioxin-like compounds such as PCBs) for unconfined, open-water disposal. However, there are few dioxin/furan or PCB congener data for Puget Sound outside of certain Superfund and MTCA cleanup sites. Therefore, it is currently difficult to evaluate the practical, economic, environmental, and regulatory consequences of these alternatives.

4.0 SURVEY JUSTIFICATION AND RATIONALE

The DMMP agencies have determined that additional sampling is needed to provide data on concentrations of dioxins/furans and PCB congeners in Puget Sound sediment. In addition to being analyzed for dioxins/furans and PCB congeners, these samples will also be evaluated using cell/DNA assays as well as being analyzed for sediment conventionals (TOC, grain size, % solids) and the full suite of DMMP contaminants of concern (COCs) including semi-volatiles, PAHs, Aroclor PCBs, pesticides and trace metals. The breadth of characterization of these sediments will support the use of this data for the DMMP as well as other programs focused on sediment contamination in Puget Sound.

Being cognizant of the need for timely resolution of these procedures, the DMMP must complete this sampling by September 2008, in order to have results available to the agencies mid-winter.

5.0 OBJECTIVES

Project: The objective of this project is to assess concentrations of PCB congeners and Dioxins/Furans in surface sediments collected throughout Puget Sound at reference sites and locations that are distant from known sources of contamination. The following five sub-objectives were developed for this project:

- Objective 1. Identify the concentration distributions of dioxins/furans/PCB congeners in the existing DMMP reference areas.
- Objective 2. Identify the concentration distributions of dioxins/furans/PCB congeners in Puget Sound generally, away from known sources and cleanup sites.
- Objective 3. Compare the concentration distributions in the existing reference areas to general concentrations in Puget Sound away from known sources and cleanup sites to determine whether

they are statistically different.

- Objective 4. Evaluate whether there is a correlation between PCB/Dioxin concentrations in sediments and their grain size or total organic carbon (TOC).
- Objective 5. Conduct corroborative testing of two dioxin/furan and PCB congener toxic equivalent (TEQ) assays to determine whether they are well-correlated with standard methods, have low enough detection limits, and are cost-effective.
- Objective 6. Conduct simultaneous testing for the standard suite of DMMP Contaminants of Concern (COCs) in order to gain a better understanding of their concentrations throughout Puget Sound.

6.0 ENVIRONMENTAL MANAGEMENT QUESTIONS ASKED BY PROJECT/SURVEY

- Question 1. What are the concentrations of dioxins/furans and PCBs in the existing reference areas used by the DMMP
- Question 2. What are the concentrations of dioxins/furans and PCBs generally in Puget Sound, outside of the areas that have already been sampled?
- Question 3. Are the concentrations of dioxins/furans and PCBs in the existing reference areas different from those in Puget Sound that are also away from known sources?
- Question 4. Are these concentration distributions affected by TOC or grain size?
- Question 5. Are there reliable and less expensive methods for testing dioxins/furan and coplanar PCB toxicity that could be used to reduce the cost of testing for both agencies and applicants
- Question 6. What are concentrations of the standard suite of COCs in these sediment samples?

7.0 SURVEY LOCATION AND DESCRIPTION

A Survey Area Map is provided in Appendix A. A table with the lat/long coordinates for each survey station is provided in Appendix B. Matt Liebman will email a Nobeltec file with the coordinates to the ship, and provide one electronically on site.

Survey Area Name: Admiralty Inlet

Survey Area Locations: There are 5 target and 5 contingency stations¹ in this survey area.

Survey Area Boundary Coordinates:

Northern limit 48.195790; -122.764289

Southern limit 47.916343; -122.513550

¹ Contingency stations will be sampled at the discretion of the Chief Scientist and/or Principal Investigator and are intended to serve as alternative sampling locations in the event that sample can not be collected at a target station.

Survey Station Types: Surface Sediment Grabs (physical, chemical)
Number of Stations by Type: Target: 5; Contingency: 4; Contingency grain size²: 1
Survey Station Locations: See Appendix B
Survey Water Depths: 11-125 meters (35-410 feet)

Survey Area Name: Carr Inlet

Survey Area Locations: There are 5 target and 3 contingency stations in this survey area.
Survey Area Boundary Coordinates:

Northern limit 47.374243; -122.636240
Southern limit 47.233204; -122.672441

Survey Station Types: Surface Sediment Grabs(physical, chemical)
Number of Stations by Type: Target: 5; Contingency: 3
Survey Station Locations: See Appendix B
Survey Water Depths: 11-113 meters (35-370 feet)

Survey Area Name: Central Puget Sound

Survey Area Locations: There are 5 target and 5 contingency stations in this survey area.
Survey Area Boundary Coordinates:

Northern limit 47.748103; -122.438174
Southern limit 47.534222; -122.477740

Survey Station Types: Surface Sediment Grabs(physical, chemical)
Number of Stations by Type: Target: 5; Contingency: 4; Grain size contingency: 1
Survey Station Locations: See Appendix B
Survey Water Depths: 33-180 meters (110-590 feet)

Survey Area Name: Dabob Bay

Survey Area Locations: There are 5 target and 2 contingency stations in this survey area.
Survey Area Boundary Coordinates:

Northern limit 47.769133; -122.851855
Southern limit 47.680358; -122.834842

Survey Station Types: Surface Sediment Grabs(physical, chemical)
Number of Stations by Type: Target: 5; Contingency: 2
Survey Station Locations: See Appendix B
Survey Water Depths: 15-123 meters (50-400 feet)

Survey Area Name: Holmes Harbor

Survey Area Locations: There are 5 target and 3 contingency stations in this survey area.
Survey Area Boundary Coordinates:

Northern limit 48.110552; -122.553370
Southern limit 48.023633; -122.520458

Survey Station Types: Surface Sediment Grabs(physical, chemical)
Number of Stations by Type: Target: 5; Contingency: 3

² Contingency grain size stations were identified to facilitate achieving a representative distribution of grain sizes in each survey area. The decision to sample a contingency grain size station rather than a target station will be made in consideration of the wet sieving-derived grain size data from samples already collected in a given survey area and at the discretion of the Chief Scientist and/or Principal Investigator.

Survey Station Locations: See Appendix B
Survey Water Depths: 11-64 meters (35-210 feet)

Survey Area Name: Hood Canal

Survey Area Locations: There are 5 target and 5 contingency stations in this survey area.

Survey Area Boundary Coordinates:

Northern limit 47.817637; -122.674166
Southern limit 47.395863; -122.950929

Survey Station Types: Surface Sediment Grabs(physical, chemical)

Number of Stations by Type: Target: 5; Contingency: 3; Contingency grain size: 2

Survey Station Locations: See Appendix B

Survey Water Depths: 21-165 meters (70-540 feet)

Survey Area Name: North Central Puget Sound

Survey Area Locations: There are 5 target and 5 contingency stations in this survey area.

Survey Area Boundary Coordinates:

Northern limit 47.886134; -122.382194
Southern limit 47.784440; -122.453153

Survey Station Types: Surface Sediment Grabs(physical, chemical)

Number of Stations by Type: Target: 5; Contingency: 4; Contingency grain size: 1

Survey Station Locations: See Appendix B

Survey Water Depths: 11-177 meters (35-580 feet)

Survey Area Name: Port Susan and Possession Sound

Survey Area Locations: There are 5 target and 5 contingency stations in this survey area.

Survey Area Boundary Coordinates:

Northern limit 48.150435; -122.456142
Southern limit 47.902704; -122.329394

Survey Station Types: Surface Sediment Grabs(physical, chemical)

Number of Stations by Type: Target: 5; Contingency: 4; Contingency grain size: 1

Survey Station Locations: See Appendix B

Survey Water Depths: 11-165 meters (35-540 feet)

Survey Area Name: Samish Bay

Survey Area Locations: There are 5 target and 2 contingency stations in this survey area.

Survey Area Boundary Coordinates:

Northern limit 48.627423; -122.492978
Southern limit 48.600899; -122.497630

Survey Station Types: Surface Sediment Grabs(physical, chemical)

Number of Stations by Type: Target: 5; Contingency: 2

Survey Station Locations: See Appendix B

Survey Water Depths: 11-18 meters (35-60 feet)

Survey Area Name: San Juan Islands

Survey Area Locations: There are 5 target and 5 contingency stations in this survey area.

Survey Area Boundary Coordinates:

Northern limit 48.895844; -123.049165

Southern limit 48.388244; -122.736483

Survey Station Types: Surface Sediment Grabs(physical, chemical)

Number of Stations by Type: Target: 5; Contingency: 4; Contingency grain size: 1

Survey Station Locations: See Appendix B

Survey Water Depths: 24-177 meters (80-580 feet)

Survey Area Name: Saratoga Passage/Skagit Bay

Survey Area Locations: There are 5 target and 5 contingency stations in this survey area.

Survey Area Boundary Coordinates:

Northern limit 48.383986; -122.573772

Southern limit 48.088416; -122.433149

Survey Station Types: Surface Sediment Grabs(physical, chemical)

Number of Stations by Type: Target: 5; Contingency: 4; Contingency grain size: 1

Survey Station Locations: See Appendix B

Survey Water Depths: 11-116 meters (35-380 feet)

Survey Area Name: South Central Puget Sound

Survey Area Locations: There are 5 target and 5 contingency stations in this survey area.

Survey Area Boundary Coordinates:

Northern limit 47.501406; -122.431181

Southern limit 47.349586; -122.354801

Survey Station Types: Surface Sediment Grabs(physical, chemical)

Number of Stations by Type: Target: 5; Contingency: 4; Contingency grain size: 1

Survey Station Locations: See Appendix B

Survey Water Depths: 11-180 meters (35-590 feet)

Survey Area Name: South Sound

Survey Area Locations: There are 5 target and 5 contingency stations in this survey area.

Survey Area Boundary Coordinates:

Northern limit 47.314601; -122.817023

Southern limit 47.120918; -122.735566

Survey Station Types: Surface Sediment Grabs(physical, chemical)

Number of Stations by Type: Target: 5; Contingency: 4; Contingency grain size: 1

Survey Station Locations: See Appendix B

Survey Water Depths: 11-119 meters (35-390 feet)

Survey Area Name: Strait of Juan de Fuca

Survey Area Locations: There are 5 target and 5 contingency stations in this survey area.

Survey Area Boundary Coordinates:

Northern limit 48.373441; -122.986706

Southern limit 48.046926; -122.857203

Survey Station Types: Surface Sediment Grabs(physical, chemical)

Number of Stations by Type: Target: 5; Contingency: 4; Contingency grain size: 1

Survey Station Locations: See Appendix B

Survey Water Depths: 49-158 meters (160-520 feet)

8.0 SURVEY/SAMPLING METHODOLOGIES

Method Description: Surface (0-10 cm) sediment samples will be collected from the BOLD utilizing either a grab- or boxcore-type sampler. Stainless steel double van Veen samplers will be the primary sampling devices, although if sediments are particularly fine, the Bold's boxcore may be more successful in collecting undisturbed samples. The Bold's 0.1-m² Ted Young-modified van Veen grab will also be available as a backup to the primary sampler.

The sample will first be examined for any signs of leakage from the sampler following the protocols outlined in the QAPP. The grab should be full. The Watch Chief will determine if the sample is good. If not, the station will be resampled. Sub-sampling of the sediment collected in the grab will be utilized to collect sufficient sediment for the various analyses. Pre cleaned stainless steel spoons will be utilized for this task. Care will be taken to avoid taking any sample in contact with the grab. At 5 stations, a duplicate sample will be collected for QA purposes. The samples from each location will be homogenized in pre-cleaned stainless steel bowls and aliquoted into the following containers:

1. One 4-oz container for analysis of PCBs;
2. One 4-oz container for analysis of dioxins/furans and % solids;
3. Two 4-oz containers (filled to half the total volume) for use in cell and PCR assays;
4. One 32-oz container for analysis of grain size
5. One 4-oz container for analysis of total organic carbon;
6. One 4-oz container for metals analysis (including mercury)
7. One 8-oz container for SVOCs, PAHs, Aroclor PCBs, and Pesticides
8. Two 4-oz containers to be archived at Manchester Laboratory;
9. One 15-ml centrifuge tube for microbial analysis.

In the field, all sediment samples designated for chemical analysis, cell/PCR assays or archival will be labeled, placed in storage containers, and frozen at -18C. The 32-oz jars containing sediments for grain size analysis can be refrigerated at $4C \pm 2C$ or stored at room temperature. The 4-oz jars containing sediments for the TOC analysis should be refrigerated at $4C \pm 2C$. The centrifuge tubes with sediment for microbial analysis shall be frozen at -80C in the Bold's ultra-low temperature freezer.

Method Rationale: This method follows established sediment sampling procedures used by monitoring programs in Puget Sound. Use of a double van Veen increases the likelihood that a sufficient volume of sediment for analysis can be obtained with a single sample deployment.

Record Keeping:

EPA survey staff will provide and use a laptop with a Hypack system for logging station locations. This will be used for all surface sediment grab samples. The EPA Watch Chief or his/her designee will record a position fix in the automated electronic log book for each sample when the sampling device makes contact with the bottom. As a back-up for the position fixes recorded electronically by the navigation

system, a written sample log will be kept by the EPA Watch Chief or his/her designee. Information recorded in the electronic and field logbook includes the following:

General information:

- Date
- Observations on weather conditions, environmental conditions, or other pertinent observations
- Sampling Crew
- Time of arrival at vessel
- Time of survey commencement
- Time of survey conclusion
- Time departing vessel

At each sampling station:

- Date/Time of each sample (local)
- Latitude and Longitude of each sample
- Sample ID
- Water Depth
- Visual characterization of each sample (color, sediment type)

Details on record keeping and chain of custody are provided in the QAPP. Navigation files from EPA's navigation system will be backed up every 6 hours using an external hard drive provided by Region 10

Diving on Survey: YES: NO: X

9.0 SEQUENCE OF SURVEY TASKS/EVENTS

Date	Approximate Time	Activity
7/31	0800-1200hr	EPA Survey Crew Arrives, Mobilization in Seattle, vessel orientation, Safety Briefing, Survey Briefing
7/31- to 8/1	On station at 1400 Finish last station at 0400	Transit to and sampling at 11 stations in Central Puget Sound (CPS_3, CPS_5), North Central Puget Sound (NCPS_0, NCPS_1, NCPS_3, NCPS_4), and Admiralty Inlet (AI_1, AI_0, AI_3, AI_2, AI_4).
8/1	Finish last station at 1400	Transit to and sampling at 5 stations in the Straits of Juan de Fuca (SJF_1, SJF_2, SJF_0, SJF_3, SJF_6) **.

8/1 to 8/2	Finish last station at 1000	Transit to and sampling at 10 stations in the San Juan Islands (SJI_4, SJI_1, SJI_3, SJI_6, SJI_0) and in Samish Bay (R_SAM_3, R_SAM_4, R_SAM_1, R_SAM_5, R_SAM_0).
8/2		Transit to Hood Canal
8/3	Finish last station at 1200	Transit to and sampling at 10 stations in Hood Canal (HC_1, HC_3, HC_6, HC_0, HC_2) and Dabob Bay (R_DAB_2, R_DAB_3, R_DAB_0, R_DAB_1, R_DAB_5).
8/3		Transit to North Central Puget Sound Area
8/3	Finish last station at 2400	Transit to and sampling at 6 stations in North Central Puget Sound (NCPS_2), Port Susan and Possession Sound (PSPS_8, PSPS_2, PSPS_1, PSPS_9, PSPS_3).
8/4	Finish last station at 1800	Transit to and sampling at 10 stations in Saratoga Passage/Skagit Bay (SPSB_0, SPSB_2, SPSB_1, SPSB_6, SPSB_3) and Holmes Harbor (R_HOL_3, R_HOL_4, R_HOL_7, R_HOL_1, R_HOL_0)
8/4		Transit to Central Puget Sound
8/5	Finish last station at 1000	Transit to and sampling at 8 stations in Central Puget Sound (CPS_0, CPS_4, CPS_1) and South Central Puget Sound (SCPS_2, SCPS_1, SCPS_5, SCPS_3, SCPS_4).
8/6	Finish last station at 0200	Transit to and sampling at 10 South Sound (SS_6), Carr Inlet (R_CAR_1, R_CAR_5, R_CAR_2, R_CAR_0, R_CAR_4), and South Sound (SS_7, SS_1, SS_2, SS_0)
8/6	Arrive 1000	Transit to Seattle and demobilization
8/6		Sample shipment to the contract labs
8/6-8/8		Weather days

** Note that order of sampling locations in Straits of Juan de Fuca reflects likely substitution of a target station (e.g., SJF_6) with the SJF_12_C_GS contingency sample in order to get a broader distribution of grain size from this area.

10.0 NAVIGATION AND POSITIONING CONTROL

All aspects of navigation and positioning control will be handled by the Captain, with consultation from the Chief Scientist, as needed. The Chief Scientist or Watch Captain will be notified if the GPS signal is lost. For sediment grab stations, the stern of the OSV Bold will be navigated within 25 meters of the station. A laptop with the Hypack-Survey software will be located in the wet lab and connected to the GPS system for the ship. The software allows for you to offset the GPS reading to compensate for the sample location. Samples deemed too far off station by the Watch Chief will be resampled.

11.0 EQUIPMENT AND SUPPLIES

Equipment from OSV Bold : Positioning data (navigation and depth feed) will be collected on a laptop using the Hypack-Survey software, Innerspace 448 Depth Sounder (paper recorder not necessary), large Young modified VanVeen sampler, freezer, Ultra-low Temperature Freezer, and refrigerator.

Equipment from EPA:

Region 10: Laptop with the Hypack-Survey software, laptop with data label/chain of custody generation software (Forms2Lite), two or three double van Veen samplers (low and high weighting) and van Veen frames³, pre-cleaned metal spoons, steel brush, pre-cleaned stainless steel mixing bowls, glass sample containers (4-oz and 24-oz), sample coolers, paper towels, liquinox, custody seals, custody sheets, removable harddrive(s) for data storage, spare laptop(s), field log-book(s), maps/shape file information on sampling locations, latex gloves, sharpies, aluminum foil, dilute nitric acid and methanol (for decon). COE –Seattle: 15 mL polypropylene centrifuge tubes, dry ice⁴, cooler, one-gallon ziplock bags, ice pick. *Expendable Supplies from OSV Bold:* writeable CDs, tie-wraps, ice, paper towels, D.I. water.

12.0 QA/QC PROCEDURES

QA/QC Procedures for Collection Equipment: Fathometer will be calibrated according to OSV Bold SOP. Fathometer data will be corrected for tides using the local NOAA tide station (see section 8.0). Pre-cleaned spoons will be used to subsample the sediment collection equipment to avoid cross-contamination between stations.

QA/QC Procedures for Collection Methods: All survey personnel will be briefed by the Chief Scientist and spot-checked to ensure consistency in data recording (see QAPP).

QA/QC Procedures for Analytical Methods: All laboratory analysis will be performed by labs contracted by EPA Region 10. QA/QC procedures are provided in the project QAPP and the laboratory SOPs.

13.0 SCIENTIFIC PARTY

Table 1 - 2008 OSV Bold Science Team Puget Sound PCB and Dioxin Sediment Survey			
Name	Survey Responsibility	Organization	Berth
Matthew Liebman	Chief Scientist Watch Captain	EPA R1	02-36-2
David Kendall	Principal Investigator Watch Captain	COE-Seattle	
Laura Inouye	Watch Captain	WDOE	
David Fox	Watch Captain	COE- Seattle	
Lauran Warner	Survey Support	COE	
Mandy Michalsen	Survey Support	COE	
Ted Benson	Survey Support	WDOE	
Valerie Partridge	Survey Support	WDOE	

³Double van Veens are on loan from WA Dept. of Ecology. They will be delivered by EPA to the ship. The associated frames may need to be bolted to the deck of the Bold.

⁴Dry ice will be brought to the dock by COE staff at the end of the survey to transport samples for microbial analysis.

Jeff Rodin	Survey Support	EPA R10 ECL	
Jennifer Fitchorn	Survey Support	EPA R10 OCE	
Sean Standing	Survey Support	Environment Canada	
Korina Lane-Jones	Survey Support	EPA R10 OMP	
Erin Seyfried	Survey Support	EPA R10 OWW	
Alicia Boyd	Survey Support	Handford	
Laura Buelow	Survey Support	Handford	
Harry Craig	Survey Support	EPA R10 OOO	

14.0 PROPOSED REPORTING REQUIREMENTS

Debriefing Telephone Call: If Needed

No. of Days After Demob: 5

Survey Report Due Date (30 Days after demob): September 8, 2008

Final Report/Other Document Description: N/A

Final Report Due Date:

Project Summary/Status Report Due Date: N/A

15.0 DIVING OPERATIONS

N/A