

POINT THOMSON GAS CYCLING PROJECT

OCEAN DUMPING EVALUATION WORK PLAN

DRAFT REVISION 1

Prepared for

ExxonMobil

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1.0 INTRODUCTION

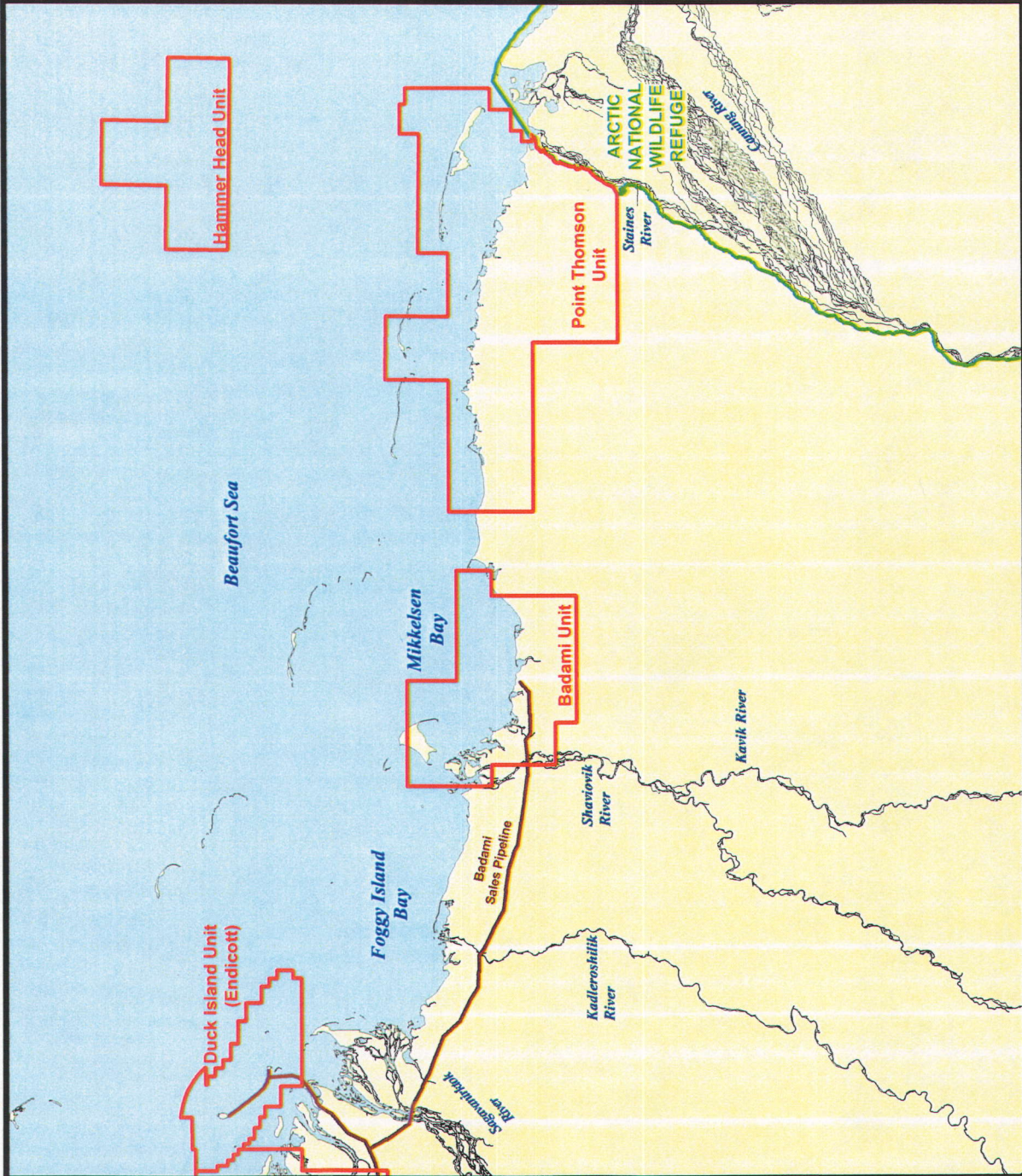
ExxonMobil Production Company (ExxonMobil) and the Point Thomson Unit Owners plan to develop the Point Thomson Gas Cycling Project for production and transport of sales-quality gas condensate to the Trans-Alaska Pipeline System. The Thomson Sands Reservoir will be developed from four gravel pads, an in-field road system, an airstrip, a gravel mine, and a 750-ft dock, all of which will be situated on the mainland between Brownlow Point and Point Hopson (Figure 1-1). As part of this development, camp and facility modules will be transported to the project site by sea-lift using oceangoing barges and tugs. The end of the Point Thomson dock will be located in relatively shallow waters; therefore, a channel adjacent to the end of the dock must be dredged to allow barges to access the dock.

The Marine Protection, Research, and Sanctuaries Act (MPRSA), otherwise known as the Ocean Dumping Act, specifies that prior to all proposed dumping of dredged material into ocean waters, the potential environmental impact of such activities must be determined. The U.S. Environmental Protection Agency (EPA), requests that ExxonMobil conduct baseline sediment sampling and analyses to support the dredging of a channel extending from the proposed 750-foot (ft) dock and the subsequent ocean disposal of channel spoils. This work plan was prepared to guide field personnel in the sampling and analysis of ocean sediments associated with dredging and dumping activities.

Figure 1-1
Point Thomson
Vicinity Map



Base maps provided by BPXA
Cartography.



2.0 OBJECTIVES

The goal of the ocean sediment sampling and analysis is to determine existing background concentrations and variability of selected physical and chemical parameters of sediment anticipated to be excavated and disposed of via ocean dumping, and to characterize surficial sediments within the general area or zone from which a specific ocean dumping site will be considered for designation. This sampling program has three objectives, which are based on the EPA and the U.S. Army Corps of Engineers, Alaska District (Corps) requirements:

- ◆ Collect representative samples of the proposed excavated material to ascertain the grain-size distribution, including silt and clay-sized particles to support a modeling effort that would be used to predict suspended sediment transport associated with ocean dumping activities.
- ◆ Collect representative sediment chemistry samples of the proposed excavated material to determine if any of the chemicals of concern (CoCs) identified by the EPA exceed regulatory screening levels as presented in the *Dredged Material Evaluation Framework, Lower Columbia River Management Area* (Corps et al. 1998a).
- ◆ Collect representative physical properties (i.e., grain-size distribution) and sediment chemistry samples of sediments within the zone from which a specific ocean dumping site will be considered for designation. This data will be used to determine compatibility with the spoil material to be dumped.

3.0 BACKGROUND INFORMATION

The *Point Thomson Gas Cycling Project Environmental Report* (URS 2001a) was submitted to the EPA, Corps and other interested regulatory agencies for review. The environmental report provides extensive background data on the Point Thomson area and should be referenced for information pertaining to meteorology, geomorphology, hydrology, oceanography, marine benthos, vegetation and wetlands, fish, birds, marine mammals, terrestrial animals, threatened and endangered species, cultural resources, and socioeconomic characteristics.

3.1 REGULATORY REQUIREMENTS

The Marine Protection, Research and Sanctuaries Act of 1972, as amended (MPRSA), also known as the Ocean Dumping Act, was passed in recognition of the fact that the disposal of material into ocean waters could potentially result in unacceptable adverse environmental effects. The MPRSA criteria state that final ocean-disposal-site designation must be based on environmental studies of each site and on historical knowledge of the impact of dredged material disposal on areas similar to such sites in physical, chemical, and biological characteristics. Related federal statutes applicable to the ocean-disposal-site designation process include the National Environmental Policy Act of 1969 (NEPA), as amended; the Coastal Zone Management Act of 1972, as amended; the National Historic Preservation Act and the Endangered Species Act of 1973, as amended.

In most dredging and disposal activities throughout the United States, a previously designated Ocean Dredged Material Dump Site (ODMDS) is typically available for use. For the Point Thomson Unit area and other areas across the North Slope, no designated ODMDS has been established in the Beaufort Sea. Therefore, in order to complete the proposed Point Thomson disposal activities, ExxonMobil must go through the regulatory process (40 Code of Federal Regulations [CFR] 228) that leads to the designation of an ODMDS.

General criteria and specific factors that must be considered prior to site designation are described and evaluated per 40 CFR 228.5-6. As required by Section 104(a)(3) of the MPRSA, ocean disposal of dredged material can occur only at a site that has been designated to receive dredged material. Pursuant to Section 102(c), the EPA has the responsibility for site designation. Section 103(b), while encouraging use of EPA-designated sites where feasible, does provide for alternative site selection by the Corps when a suitable EPA-designated site is not available. However, the same Ocean Dumping Criteria (40 CFR 228.5-6) are used in the evaluation process that leads to alternative site selection and the EPA must concur with the selection. To determine the potential environmental impact of ocean dredging and dumping, environmental evaluations must be conducted in accordance with the criteria set forth in these regulations.

3.1.1 Disposal Site Designation

To initiate the process that will ultimately designate an ODMDS for project use, an area or zone must first be established from which an ODMDS could be located within an operationally and economically feasible distance from the dredging activities. The economic and operational constraints near the Point

Thomson area were evaluated to determine a feasible working zone from which a disposal site could be designated. Separate summer and winter disposal zones (Figure 3-1) were established. Ocean sediment sampling, outlined in this work plan, will be focused within these zones.

3.2 SITE ACTIVITIES AND POTENTIAL SOURCES OF CONTAMINATION

3.2.1 Past Activities

Active petroleum exploration on the barrier islands and mainland shoreline occurred between 1970 and 1982. Available records are incomplete regarding the ocean disposal of drilling muds and cuttings, and sanitary and domestic wastewater for all exploration wells; however, permits at the time of drilling typically allowed for ocean discharge of these wastes. Records available for the Point Thomson #3 exploration well, located immediately south of the proposed dock, indicated that reserve pits were used to store drilling wastes; therefore, it is unlikely that wastes were discharged into the ocean.

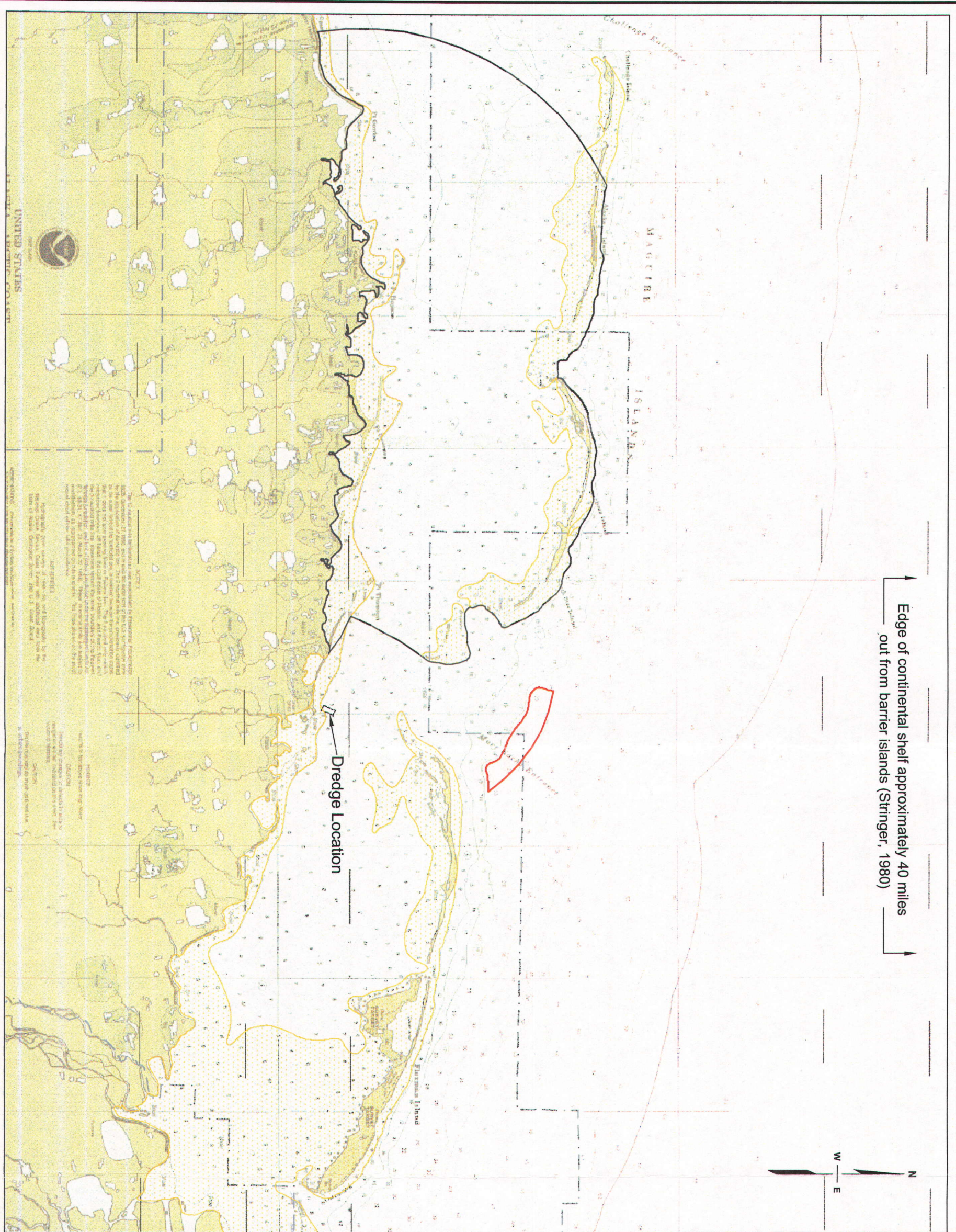
Past military activities along the Arctic coastal plain were typically associated with air defense radar and related communication systems. Technological improvements allowed the U.S. Department of Defense (DoD) to abandon several of the communication sites in recent years, including the Bullen Point facility located between the Point Thomson Unit and the Badami Development. There is no indication of any other DoD related activities conducted within the project area.

With the possible exception of drilling muds and cuttings, and sanitary and domestic wastewater discharged in the 1970s and the early 1980s during exploration drilling, there is no other known past potential sources of contamination.

3.2.2 Present Activities

Access to the lagoon system, known as Lions Bay, and the Point Thomson area is limited to marine vessels during the brief summer open-water season and tundra (ice road) travel vehicles during the winter. During autumn freeze-up and spring ice breakup there is virtually no surface accessibility. Prevailing currents produce a net westward drift, placing the Badami Development and the Prudhoe Bay coastal oil production facilities down current of Lions Bay. The local Native population occasionally uses Lions Bay as a pass-through area during subsistence hunting and fishing. With the exception of the 2001/2002 winter ice road, and occasional geophysical exploration surveys, there are no industrial activities operating within Lions Bay, its associated barrier islands, or along the immediate mainland shore. In the winter, an ice road can be constructed to connect ongoing activities within the Point Thomson Unit (including Flaxman Island) to the Badami Facility and the Prudhoe Bay in-field road system. To date, there is no record of spills occurring along the ice road route.

Edge of continental shelf approximately 40 miles out from barrier islands (Stringer, 1980)



ExxonMobil
Point Thomson Gas
Cycling Project

Figure 3-1
Ocean Dumping
Siting Zones

LEGEND

- Summer Zone of Siting Feasibility
- Winter Zone of Siting Feasibility
- Bottom-fast Ice (0-6 foot isobath)
- Unit Boundary



Source: Base map from the National Oceanic and Atmospheric Administration (NOAA) nautical chart No. 16045, revised in 1996

URS Anchorage, Alaska

4.0 PROGRAM DESIGN

4.1 SEDIMENT QUALITY RANKING

The EPA and Corps have not promulgated guidance for environmental evaluation of dredging activities specific to Alaska. However, such guidance does exist for the Lower Columbia River and other Pacific Northwest estuaries in the document titled *Dredged Material Evaluation Framework, Lower Columbia River Management Area* (Corps et al., 1998a). In this document, the EPA, Corps, and state participants developed a ranking scheme that classifies proposed dredged materials as a function of known chemical and physical properties (Table 4-1). EPA Region 10 directed that these classifications be used for the design of this sampling program.

Table 4-1. Management Area Ranking Definitions (Corps et al. 1998)

Ranking	Parameters
Exclusionary	Available data indicate coarse-grained sediment with at least 80 percent sand retained in a No. 230 sieve and a total volatile solids content of less than 5.0 percent. Locations sufficiently removed from potential sources of sediment contamination based on historical information and/or best professional judgment. Typical locations include the mouth and mainstream channel of the Lower Columbia River.
Low	Available data indicate low concentrations of CoCs and/or no significant response in biological tests. Locations with higher percentage of finer-grained sediments and organic material but few sources of potential contamination. Typical locations include adjacent entrance channels, rural marinas, navigable side sloughs, and small community berthing facilities.
Low-Moderate	Available data indicate a "low" rank may be warranted but data are not sufficient to validate the ranking.
Moderate	Available data indicate moderate concentrations of CoCs in sediments in a range known to cause adverse response in biological tests. Locations where sediments are subject to several sources of contamination, or where existing or historical use of the site has the potential to cause sediment contamination. Typical locations include urban marinas, fueling and ship berthing facilities, areas downstream of major sewer or stormwater outfalls, and medium-sized urban areas with limited shoreline industrial development.
High	Available data indicate high concentrations of CoCs in sediments and/or significant adverse responses in at least one of the last two cycles of biological tests. Locations where sediments are subject to numerous sources of sediment contamination, including industrial runoff and outfalls, or where existing or historical use of the site has the potential to cause sediment contamination. Typical locations include large urban areas and shoreline areas with major industrial development.

Application of these ranking definitions to the sediments proposed for excavation corresponds to the low ranking. The low rank is based on available site-specific sediment chemistry data collected by Battelle (1987) and A.D. Little (1990), and supported with recent findings from sediment quality studies for the Northstar (URSGWC 1999) and Liberty Developments (URS 2001). All of these studies indicated low concentrations of the CoCs.

HLA (1982) delineated surficial sediment deposits within Lions Bay and immediately seaward of Mary Sachs Entrance. Based on the HLA (1982) investigation, Holocene deposits of marine clay, silt and sand (QHi) characterize the surficial sediments at the proposed excavation site and within the lagoon system

(winter disposal zone). The summer disposal zone is located seaward (north) of Mary Sachs Entrance where the surficial sediments are characterized as Pleistocene marine clay, silt and sand (QPm). The age of the Holocene and Pleistocene sediments differ along with the percentages of clay, silt, and sand; however, the general compositions of the Holocene and Pleistocene units are very similar. Since the compositions of the Holocene and Pleistocene sediment units are very similar, sample distribution was not chosen based on sediment unit boundaries. For the purposes of this sampling program, the summer disposal zone and the winter disposal zone will be treated as a single unit of sediments.

4.2 SAMPLING APPROACH AND LOCATIONS

4.2.1 Sampling Approach

A phased approach is proposed to collect of the required samples. As such, the sampling will occur during two seasons. Initial sampling will be conducted during the 2002 summer season with follow-up sampling to be conducted during the 2002/03 winter sampling season. Specific schedule dates are presented in Section 6.0. The phased approach will result in the most efficient and cost-effective sampling program. Key benefits of this phased approach are as follows:

- Results from initial summer sampling can help to direct and potentially minimize or eliminate further winter sampling; and,
- A second attempt can be made to collect required samples not obtainable during the initial summer sampling phase.

4.2.2 Proposed Dredge Location

To satisfy the first and second objectives of this sampling program (i.e., obtain representative physical properties and chemistry data for the proposed excavated material), surface and subsurface samples will be collected from within and around the proposed dredge site. The *Dredged Material Evaluation Framework, Lower Columbia River Management Area* (Corps et al. 1998a) document prescribes that homogeneous sediments with a low ranking require one sample for every 100,000 cubic yards (cy) of excavated material within a sediment unit. The proposed project anticipates excavating approximately 30,000 cy; therefore, according to this guidance, at least one sample must be collected.

To obtain the most representative data set for the proposed excavation material, a total of five sample stations have been identified for this sampling program (Figure 4-1). Three of the sample stations are located within the proposed excavation area and two are located just outside of the area. Two primary surface samples will be collected from the two stations outside the proposed excavation area (one surface sample from each station). Three primary surface and six primary subsurface samples will be collected from the three stations inside the proposed excavation area (one surface and two subsurface samples from each station). Section 4.2.5 presents the required number of QA/QC and archival samples associated with these primary samples.

4.2.3 Proposed Dumping Zones

To satisfy the third objective of this sampling program, i.e., obtain representative physical properties and chemistry data for the proposed summer and winter dumping zones from which a specific ocean dumping site will be considered for designation, surface samples will be collected from within each proposed zone. In 1992 the EPA developed sampling design guidelines based on statistical methods summarized by Gilbert (1987). Both Gilbert (1987) and EPA (1992) provide a descriptive review of various sampling designs and their applicability for estimating chemical distributions and trends. The 1992 EPA guidance document developed standardized tables to quantify the statistical performance of a sampling program, in terms of:

- ◆ *Confidence Level*: The confidence level is 100 minus α , where α is the percent probability of taking action when no action is required (i.e., false positive result— α is the probability of a type I error)
- ◆ *Power*: Power is 100 minus β , where β is the percent probability of not taking action when action is required (i.e., false negative result— β is the probability of a type II error)
- ◆ *Minimum detectable relative difference (MDRD)*: MDRD is the percent difference required between site and background concentration levels before the difference can be detected statistically.

Grain-size distribution results from samples collected during earlier geotechnical investigations (HLA 1982; NORTEC 1984) were used to determine the sample size for this study. The sample population was constrained to the study area as defined by the zone of siting feasibility (Fig 4-1) and restricted to surficial (0-2 ft bss) sediments. The coefficient of variation was estimated to be 30 percent for material retained on the No. 200 sieve, which consists of sand and larger particles. Coincidentally, grain-size distributions from Foggy Island Bay (about 30 miles west of Lions Bay) resulted in a similar coefficient of variation value (URS 2001b: Liberty Development 2001 Sediment Quality Study). Following the example found in EPA (1992) for baseline sample design, and based on Lions Bay grain-size sample results, the minimum sample size is determined to be 15 samples based on:

- ◆ Coefficient of Variance = 30%
- ◆ Confidence Level = 80% (i.e., false positive error = 20%)
- ◆ Power = 95% (i.e., false negative error = 5%)
- ◆ MDRD = 20%.

A conservative approach will be used in this sampling design to assure that sufficient samples are collected from this remote site. Thus, it is proposed that 20 samples will be collected to characterize the area.

The 20 primary samples will be collected from the surface of the ocean floor at 20 sample stations that have been placed throughout the winter and summer zones so as to best represent differing water depths, ocean currents, and potential ice conditions (bottom fast vs. floating sea ice) that occur within the proposed dumping zones (Figure 4-1). Sample stations placed in less than 6 feet of water were positioned

to correspond with locations that could accommodate winter disposal of dredge spoils in long, thin lifts (required to avoid sediment mounding). Section 4.2.5 presents the required number of QA/QC and archival samples associated with these primary samples.

4.2.4 Additional Sample Stations

The EPA has directed that four additional sample stations be included in this sampling program from which four surface samples will be collected. The sample stations are located to represent the current conditions of the Flaxman Island reserve pit excavation sites and the former reserve pit excavation material hauling route from Flaxman Island to the mainland. This is the only recent activity that could have introduced hydrocarbon and metal pollutants into the study area.

4.3 NUMBER AND TYPE OF SAMPLES

As outlined in Table 4-2, a total of 29 sample stations will result in 35 discrete primary sediment samples (excluding archival and quality assurance/quality control [QA/QC] samples such as split and replicate samples) from within the proposed excavation site, the two proposed zones from which a specific ocean dumping site will be considered for designation, and the Flaxman Island area.

Table 4-2. Number of Primary Samples to be Collected

Sampling Area	Sample Stations†	Proposed Number of Surface Samples†	Proposed Number of Subsurface Samples†
Proposed Excavation Site	5	5	6
Proposed Dumping Zones	20	20	0
Flaxman Island Area	4	4	0
Total:	35	29	6

† The proposed number of samples does not include quality control/quality assurance sampling or archival sampling.
‡ Multiple grabs or step-out boreholes could be required to collect sufficient sample volume at a specific sample station

Primary, field replicate, and split samples will be collected as part of this sampling program. Table 4-3 summarizes the types of samples and field quality control (QC) samples and blanks to be collected for the subsurface and surface sediment quality sampling effort.

Table 4-3. Total Number of Samples to be Collected

Sample/Blank Type	Study Total	Proposed Excavation Site	Proposed Dumping Zones	Flaxman Island Area
Sediment				
Primary Sediment Samples	35	11	20	4
Field Replicates (initial analysis)	70	18	40	8
Field Split (Duplicate) Sample	6	3	2	1
Matrix Spike/Matrix Spike Duplicate	2	1	1	0
Archive Samples	55	7	40	8
Sub-Total: Sediment	168	40	103	21
Water				
Field Blank	10	2	6	2
Rinsate Blank	10	2	6	2
Sub-Total: Water	20	4	12	4
Total Samples	188	44	115	25

Table 4-4 presents sample IDs, depth intervals, and required analyses for each sample. Table 4-5 lists out each chemical constituent, and corresponding analytical method, that will be analyzed from each sediment sample.

Table 4-4. Sample ID, Depth Interval, and Analyses

Station ID	Sample ID	QA/QC Sample ID	Depth Interval	Suite of Analyses
1. Proposed Excavation Site				
PTCE-SB01	PTCE-SB01-A1	PTCE-SB01-A2	0.0 to 0.5 ft	Full EPA Suite
		PTCE-SB01-A3		
		PTCE-SB01-S1		
	PTCE-SB01-B1	PTCE-SB01-B2	1.0 to 2.0 ft	
		PTCE-SB01-B3		
	PTCE-SB01-C1	PTCE-SB01-C2	2.5 to 3.5 ft	
		PTCE-SB01-C3		
	PTCE-SB01-D1	--	3.5 to 5.0 ft	Archive
PTCE-SB02	PTCE-SB02-A1	PTCE-SB02-A2	0.0 to 0.5 ft	Full EPA Suite
		PTCE-SB02-A3		
		PTCE-SB02-B2		
	PTCE-SB02-B1	PTCE-SB02-B3	1.0 to 2.0 ft	
		PTCE-SB02-S1		
	PTCE-SB02-C1	PTCE-SB02-C2	2.5 to 3.5 ft	
		PTCE-SB02-C3		
	PTCE-SB02-D1	--	3.5 to 5.0 ft	Archive
PTCE-SB03	PTCE-SB03-A1	PTCE-SB03-A1 (MS/MSD)	0.0 to 0.5 ft	Full EPA Suite
		PTCE-SB03-A2		
		PTCE-SB03-A3		
	PTCE-SB03-B1	PTCE-SB03-B2	1.0 to 2.0 ft	
		PTCE-SB03-B3		
	PTCE-SB03-C1	PTCE-SB03-C2	2.5 to 3.5 ft	
		PTCE-SB03-C3		
	PTCE-SB03-S1			
PTCE-SB03-D1	--	3.5 to 5.0 ft	Archive	
PTCE-SG01	PTCE-SG01-A1	PTCE-SG01-A2	0.0 to 0.5 ft	Full EPA Suite
		PTCE-SG01-A3		Archive
	PTCE-SG01-A4	--		
PTCE-SG01-A5				
PTCE-SG02	PTCE-SG02-A1	PTCE-SG02-A2	0.0 to 0.5 ft	Full EPA Suite
		PTCE-SG02-A3		
	PTCE-SG02-A4	Archive		
	PTCE-SG02-A5			--
2. Proposed Dumping Zone - Summer				
PTME-SG01	PTME-SG01-A1	PTME-SG01-A2	0.0 to 0.5 ft	Full EPA Suite
		PTME-SG01-A3		
	PTME-SG01-A4	Archive		
	PTME-SG01-A5			--

Table 4-4. (Continued)

Station ID	Sample ID	QA/QC Sample ID	Depth Interval	Suite of Analyses
2. Proposed Dumping Zone – Summer (Continued)				
PTME-SG02	PTME-SG02-A1	PTME-SG02-A2	0.0 to 0.5 ft	Full EPA Suite
		PTME-SG02-A3		Archive
	PTME-SG02-A4 PTME-SG02-A5	--		Archive
PTME-SG03	PTME-SG03-A1	PTME-SG03-A2	0.0 to 0.5 ft	Full EPA Suite
		PTME-SG03-A3		Archive
	PTME-SG03-A4 PTME-SG03-A5	--		Archive
PTME-SG04	PTME-SG04-A1	PTME-SG04-A2	0.0 to 0.5 ft	Full EPA Suite
		PTME-SG04-A3		Archive
	PTME-SG04-S1	--		Archive
PTME-SG04	PTME-SG04-A4 PTME-SG04-A5	--		Archive
	PTME-SG05-A1	PTME-SG05-A2	0.0 to 0.5 ft	Full EPA Suite
		PTME-SG05-A3		Archive
PTME-SG05-A4 PTME-SG05-A5	--	Archive		
3. Proposed Dumping Zone – Winter				
PTLA-SG01	PTLA-SG01-A1	PTLA-SG01-A2	0.0 to 0.5 ft	Full EPA Suite
		PTLA-SG01-A3		Archive
	PTLA-SG01-A4 PTLA-SG01-A5	--		Archive
PTLA-SG02	PTLA-SG02-A1	PTLA-SG02-A2	0.0 to 0.5 ft	Full EPA Suite
		PTLA-SG02-A3		Archive
	PTLA-SG02-A4 PTLA-SG02-A5	--		Archive
PTLA-SG03	PTLA-SG03-A1	PTLA-SG03-A1 (MS/MSD)	0.0 to 0.5 ft	Full EPA Suite
		PTLA-SG03-A2		Archive
	PTLA-SG03-A3	--		Archive
PTLA-SG03	PTLA-SG03-A4 PTLA-SG03-A5	--		Archive
	PTLA-SG04-A1	PTLA-SG04-A2	0.0 to 0.5 ft	Full EPA Suite
		PTLA-SG04-A3		Archive
PTLA-SG04-A4 PTLA-SG04-A5	--	Archive		
PTLA-SG05	PTLA-SG05-A1	PTLA-SG05-A2	0.0 to 0.5 ft	Full EPA Suite
		PTLA-SG05-A3		Archive
	PTLA-SG05-A4 PTLA-SG05-A5	--		Archive
PTLA-SG06	PTLA-SG06-A1	PTLA-SG06-A2	0.0 to 0.5 ft	Full EPA Suite
		PTLA-SG06-A3		Archive
	PTLA-SG06-S1	--		Archive
PTLA-SG06	PTLA-SG06-A4 PTLA-SG06-A5	--		Archive

Table 4-4. (Continued)

Station ID	Sample ID	QA/QC Sample ID	Depth Interval	Suite of Analyses
3. Proposed Dumping Zone – Winter (Continued)				
PTLA-SG07	PTLA-SG07-A1	PTLA-SG07-A2	0.0 to 0.5 ft	Full EPA Suite
		PTLA-SG07-A3		
	PTLA-SG07-A4 PTLA-SG07-A5	--		Archive
PTLA-SG08	PTLA-SG08-A1	PTLA-SG08-A2	0.0 to 0.5 ft	Full EPA Suite
		PTLA-SG08-A3		
	PTLA-SG08-A4 PTLA-SG08-A5	--		Archive
PTLA-SG09	PTLA-SG09-A1	PTLA-SG09-A2	0.0 to 0.5 ft	Full EPA Suite
		PTLA-SG09-A3		
	PTLA-SG09-A4 PTLA-SG09-A5	--		Archive
PTLA-SG10	PTLA-SG10-A1	PTLA-SG10-A2	0.0 to 0.5 ft	Full EPA Suite
		PTLA-SG10-A3		
	PTLA-SG10-A4 PTLA-SG10-A5	--		Archive
PTLA-SG11	PTLA-SG11-A1	PTLA-SG11-A2	0.0 to 0.5 ft	Full EPA Suite
		PTLA-SG11-A3		
	PTLA-SG11-A4 PTLA-SG11-A5	--		Archive
PTLA-SG12	PTLA-SG12-A1	PTLA-SG12-A2	0.0 to 0.5 ft	Full EPA Suite
		PTLA-SG12-A3		
	PTLA-SG12-A4 PTLA-SG12-A5	--		Archive
PTLA-SG13	PTLA-SG13-A1	PTLA-SG13-A2	0.0 to 0.5 ft	Full EPA Suite
		PTLA-SG13-A3		
	PTLA-SG13-A4 PTLA-SG13-A5	--		Archive
PTLA-SG14	PTLA-SG14-A1	PTLA-SG14-A2	0.0 to 0.5 ft	Full EPA Suite
		PTLA-SG14-A3		
	PTLA-SG14-A4 PTLA-SG14-A5	--		Archive
PTLA-SG15	PTLA-SG15-A1	PTLA-SG15-A2	0.0 to 0.5 ft	Full EPA Suite
		PTLA-SG15-A3		
	PTLA-SG15-A4 PTLA-SG15-A5	--		Archive
4. Flaxman Island Area				
PTFI-SG01	PTFI-SG01-A1	PTFI-SG01-A2	0.0 to 0.5 ft	Full EPA Suite
		PTFI-SG01-A3		
	PTFI-SG01-A4 PTFI-SG01-A5	--		Archive

Table 4-4. (Continued)

Station ID	Sample ID	QA/QC Sample ID	Depth Interval	Suite of Analyses
4. Flaxman Island Area (Continued)				
PTFI-SG02	PTFI-SG02-A1	PTFI-SG02-A2	0.0 to 0.5 ft	Full EPA Suite
		PTFI-SG02-A3		
	PTFI-SG02-A4	--		Archive
	PTFI-SG02-A5			
PTFI-SG03	PTFI-SG03-A1	PTFI-SG03-A2	0.0 to 0.5 ft	Full EPA Suite
		PTFI-SG03-A3		
		PTFI-SG03-S1		
	PTFI-SG03-A4	--		Archive
	PTFI-SG03-A5			
PTFI-SG04	PTFI-SG04-A1	PTFI-SG04-A2	0.0 to 0.5 ft	Full EPA Suite
		PTFI-SG04-A3		
	PTFI-SG04-A4	--		Archive
	PTFI-SG04-A5			

Table 4-5. EPA Full Suite of Physical and Chemical Analyses

Parameter	Prep Method (Recommended)	Analysis Method (Recommended)	Sediment MDL ¹	Analytical Laboratory MDL Variance
Conventionals:				
Total Solids (%)	NA	160.3M	0.1	--
Total Volatile Solids (%)	NA	160.4M	0.1	--
Total Organic Carbon (%)	NA	ASTM D4129M	0.1	--
Total Sulfides (mg/kg)	NA	SW9030	1	2
Ammonia (mg/kg)	NA	Plumb 1981	1	--
Grain Size (%)	NA	ASTM D422	NA	--
Metals (ppm):				
Antimony	SW3050	SW6020	2.5	--
Arsenic	SW3050	SW6020	2.5	--
Barium ²	SW3050	SW6020	0.1	--
Cadmium	SW3050	SW6020	0.3	--
Chromium	SW3050	SW6020	0.3	--
Copper	SW3050	SW6020	15.0	--
Iron ²	SW3050	SW6010B	2.0	--
Lead	SW3050	SW6020	0.5	--
Mercury	NA	SW7471	0.02	--
Nickel	SW3050	SW6020	2.5	--
Silver	SW3050	SW6020	0.2	--
Zinc	SW3050	SW6020	15.0	--
Organics (ppb):				
LPAH				
Naphthalene	SW3550	SW8270SIM	20	--
Acenaphthylene	SW3550	SW8270SIM	20	--
Acenaphthene	SW3550	SW8270SIM	20	--
Fluorene	SW3550	SW8270SIM	20	--
Phenanthrene	SW3550	SW8270SIM	20	--
Anthracene	SW3550	SW8270SIM	20	--
2-Methylnaphthalene	SW3550	SW8270SIM	20	--
Total LPAH	--	--	--	--

Table 4-5. (Continued)

Parameter	Prep Method (Recommended)	Analysis Method (Recommended)	Sediment MDL ¹	Analytical Laboratory MDL Variance
HPAH				
Fluoranthene	SW3550	SW8270SIM	20	--
Pyrene	SW3550	SW8270SIM	20	--
Benzo(a)anthracene	SW3550	SW8270SIM	20	--
Chrysene	SW3550	SW8270SIM	20	--
Benzofluoranthenes	SW3550	SW8270SIM	20	--
Benzo(a)pyrene	SW3550	SW8270SIM	20	--
Indeno(1,2,3-c,d)pyrene	SW3550	SW8270SIM	20	--
Dibenzo(a,h)anthracene	SW3550	SW8270SIM	20	--
Benzo(g,h,i)perylene	SW3550	SW8270SIM	20	--
Total HPAH	--	--	--	--
Chlorinated Hydrocarbons				
1,3-Dichlorobenzene	NA	SW8260	3.2	--
1,4-Dichlorobenzene	NA	SW8260	3.2	--
1,2-Dichlorobenzene	NA	SW8260	3.2	--
1,2,4-Trichlorobenzene	SW3550	SW8270SIM	6	--
Hexachlorobenzene (HCB)	SW3550	SW8270SIM	12	--
Phthalates				
Dimethyl phthalate	SW3550	SW8270SIM	20	--
Diethyl phthalate	SW3550	SW8270SIM	20	--
Di-n-butyl phthalate	SW3550	SW8270SIM	20	--
Butyl benzyl phthalate	SW3550	SW8270SIM	20	--
Bis(2-ethylhexyl)phthalate	SW3550	SW8270SIM	20	123
Di-n-octyl phthalate	SW3550	SW8270SIM	20	--
Phenols				
Phenol	SW3550	SW8270SIM	20	--
2 Methylphenol	SW3550	SW8270SIM	6	--
4 Methylphenol	SW3550	SW8270SIM	20	--
2,4-Dimethylphenol	SW3550	SW8270SIM	6	15.1
Pentachlorophenol	SW3550	SW8270SIM	61	--
Miscellaneous Extractables				
Benzyl alcohol	SW3550	SW8270SIM	6	--
Benzoic acid	SW3550	SW8270SIM	100	--
Dibenzofuran	SW3550	SW8270SIM	20	--
Hexachloroethane	SW3550	SW8270SIM	20	--
Hexachlorobutadiene	SW3550	SW8270SIM	20	--
N-Nitrosodiphenylamine	SW3550	SW8270SIM	12	--
Pesticides				
Total DDT	--	--	--	--
p,p'-DDE	SW3540	SW8081	2.3	--
p,p'-DDD	SW3540	SW8081	3.3	--
p,p'-DDT	SW3540	SW8081	6.7	--
Aldrin	SW3540	SW8081	1.7	--
Chlordane	SW3540	SW8081	1.7	--
Dieldrin	SW3540	SW8081	2.3	--
Heptachlor	SW3540	SW8081	1.7	--
Lindane	SW3540	SW8081	1.7	--
Total PCBs	SW3540	SW8082	67	--

¹ Dry Weight Basis

NA Not Applicable

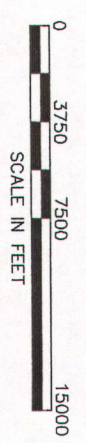
² Drilling waste related chemicals of concern

ExxonMobil

Point Thomson Gas Cycling Project

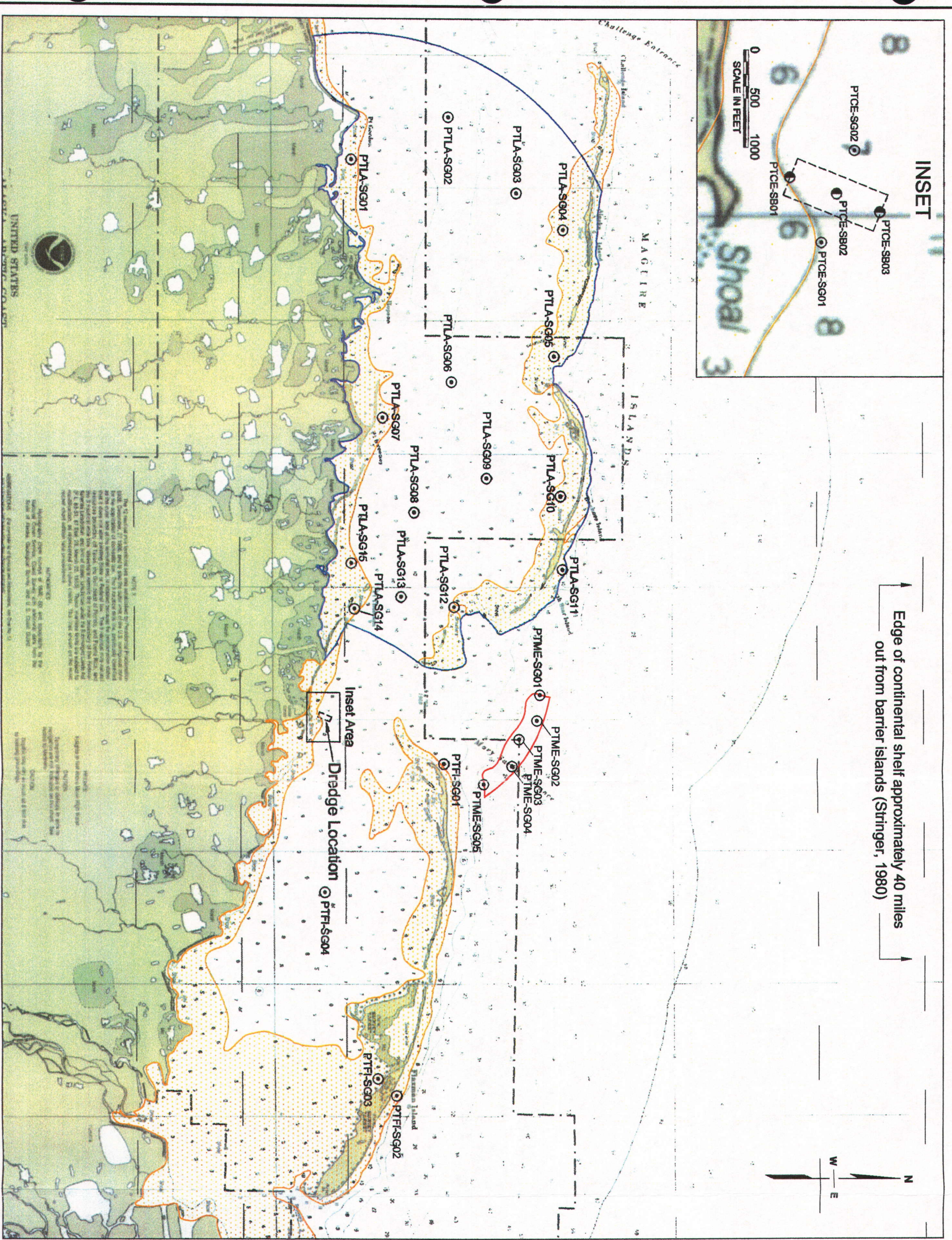
Figure 4-1
Proposed Sediment Quality
Sampling Locations

- LEGEND**
- Summer Zone of Siting Feasibility
 - Winter Zone of Siting Feasibility
 - Bottom-fast Ice (0-6 foot isobathn)
 - Potential Ocean Disposal Location
 - Dredge Material Location
 - Unit Boundary



Source: Base map from the National Oceanic and Atmospheric Administration (NOAA) nautical chart No. 16045, revised in 1996

URS Anchorage, Alaska



5.0 FIELD METHODS

5.1 NAVIGATION AND SAMPLE POSITIONS

The sampling vessels (boat in the summer and drill rig in the winter) will be equipped with an autonomous global positioning system (GPS) receiver used to navigate to each sample station. Horizontal positions will be based on the North American Datum of 1927 (NAD27), using either State Plane Coordinate System (in ft) or latitude/longitude coordinates. The position accuracy is anticipated to be approximately ± 30 meters.

5.2 SUMMER SAMPLING METHODS

The following sampling techniques can be employed during the summer phase of the sampling program. Water depth, current, sediment type, and desired sediment depth and quantity should be considered to choose the most appropriate technique.

5.2.1 Van Veen Sampler

The Van Veen sampler is used to collect surface grab samples. It is best used in marine environments in deep water or strong currents, as such, it is heavy and requires the use of a winch. It is useful for the collection of sand, silt and clay. It is adequate on most substrates that are not compacted and can obtain a large, intact sample, which permits subsampling. The Van Veen sampler can obtain samples up to 30 centimeter below seafloor surface (bss).

During deployment, the Van Veen grab sampler safety pin will be released (pulled) just after the device is clear of the vessel. The Van Veen grab sampler will be lowered at a controlled rate of approximately 4 feet per second with the line nearly perpendicular to the water surface. The Van Veen grab sampler will not be allowed to free fall to the bottom as this may result in premature triggering, an excessive bow wake, or improper orientation upon contact with the bottom. As the Van Veen grab sampler descends, water will be able to pass freely through the closed, upper-screened doors to minimize the bow wake. The rate of descent will be slowed to about 1 ft per second as the sampler nears the bottom to minimize disturbance of the surface sediments. The line operator will be supplied with bottom depth information to reduce the rate of descent. To improve the sample recovery, the line will remain taut (no slack) once the sampler reaches the bottom.

After the sampler has been tripped, it will be raised slowly off the bottom to allow for proper closure without spillage. Once clear of the bottom, the ascent rate can be increased to approximately 4 ft per second. Retrieval of the sampler will be continuous. While ascending, the design of the upper door flaps of the Van Veen grab should seal tightly to minimize sample disturbance. The Van Veen grab sampler will be handled carefully, especially during rough weather, to minimize sample disturbance.

During retrieval, one crewmember will watch for the appearance of the sampler, and alert the line operator and the vessel skipper when the sampler is first visible below the surface. The line operator will minimize swinging before the grab sampler is brought onboard. Hard hats, gloves, safety glasses, and all

other OSHA required personal protection equipment (PPE) will be appropriately worn and used during field sampling.

The depth to which surficial samples are collected will be from mudline (sediment surface – 0 inches) to approximately 4 inches (10 centimeters). The field sampler may choose to subsample a shallower depth within the Van Veen grab if the sediments appear to have been disturbed by the sampling device, such that the lower material comes into contact with the jaws of the Van Veen grab sampler.

After the grab sampler has been secured onboard, the upper doors will be opened and the sample examined for acceptability as follows:

- ◆ The sampler is not overfilled, which could be indicative of sample loss;
- ◆ Overlying water is present indicating sample integrity;
- ◆ The sediment surface appears to be relatively undisturbed; and
- ◆ The desired sample depth has been achieved (ideally, at least ½ to 1 inches [1 or 2 cm] should remain at the bottom of the sampler after the upper layer has been subsampled).

It should also exhibit minimal leakage when coming on board, which is a good indication that the sample was collected in its entirety. Grabs that exhibit leakage when the Van Veen reaches the water line will be discarded and another sample will be collected. If the Van Veen grab sampler is unable to collect sufficient sediment at a station, then the vessel will move approximately 100 ft (~30 meters) north or south of the original station position.

If sample acceptability criteria are met, overlying water is carefully siphoned off. During or before the sample material is removed, field observations will be noted and recorded. Observations include a determination of visual/textural soil characteristics, the presence of debris, and evidence, such as oil sheen, suggesting the presence of contaminants.

In accordance with United States Coast Guard regulations, sediment retrieved from grab samples that exhibits evidence of contamination such as a strong odor or visible sheen should not be disposed of overboard. The sediment should be contained and removed off site for proper disposal.

5.2.2 Ekman Sampler

The Ekman sampler is used to collect surface grab samples. It is best used in shallow marine environments but is restricted to low current conditions. The small Ekman is lighter than the Van Veen and handles easily without a winch or crane. The Ekman is useful for the collection of soft sediments such as silt and sand and is better suited to collect coarse gravelly material than the Van Veen sampler. The small Ekman can obtain samples up to 5 centimeters bss. Guidance for deployment of the Van Veen sampler should be followed when using the Ekman sampler.

5.2.3 Core Barrel and Slide Hammer

A core barrel and slide hammer is used to collect undisturbed subsurface samples. It can be used in shallow marine environments but is restricted to low current conditions. The core barrel and slide hammer can be operated by hand but can be cumbersome as additional extension rods are added. The core barrel and slide hammer is useful for the collection of soft to medium compacted sediments, but is restricted to sediments with smaller grain size. The core barrel and slide hammer can obtain an intact sample up to a maximum depth of about 90 cm from which subsamples can be collected. The depth of sample that can be obtained decreases as the sediment becomes more compact.

Based on the depth of sample desired, a 1 to 3 ft core barrel will be attached to extension rods of sufficient length to reach the sea floor. A slide hammer will then be attached to the top of the extension rods. The coring device will be lowered slowly by hand from the bow of the boat to the sea floor. A one-way valve at the top of the core barrel will allow seawater to flow through as the core barrel is lowered. The coring device will then be pushed or pounded into the bottom sediments to the desired depth. The extension rods will be marked so that the depth of the coring device can be determined from the bow of the boat. The coring device will then be pulled from the soil and brought up out of the water on to the boat. The bottom of the core barrel will contain a sand-catcher basket that will prevent sediments from falling out of the barrel as it is withdrawn from the seafloor.

Multiple boreholes may be necessary to collect adequate sediment volume for the required analysis at a specific location. Initial borings will be completed to 2.5 ft or 5.0 ft bss in order to record a visual log of each boring based on the USCS. To collect these visual samples, the core barrel may be lined with a transparent Lexan liner that can slide out of the core barrel. Grain-size samples will also be collected from this sediment core.

A second borehole will be completed approximately 5 to 10 ft away from the initial borehole, for collection of sediment chemistry samples. To collect undisturbed samples at discrete depths, the core barrel will be lined with brass or stainless steel sleeves or Lexan liners that, when removed from the core barrel, can be immediately capped and prepared for shipment to the laboratory.

5.3 WINTER SAMPLING METHOD

The following sampling technique can be employed during the winter phase of the sampling program.

5.3.1 Auger Drill

An auger drill is used to collect undisturbed subsurface samples. It can be used in marine environments and is not affected by current as it is operated from frozen sea ice. The auger drill can efficiently collect subsurface samples but is restricted to sediments with small to medium grain sizes (less than the diameter of the core).

A drill rig and working deck will be mounted on a sled and enclosed in a fabric structure for towing by a rollagon to each sampling location. Various coring methods are currently under consideration, including a continuous coring option that would use Lexan liners up to 5-inches wide by 2.5-ft long. If the

continuous coring method is ineffective or inefficient, hollow-stem auger and split-spoon sampler lined with sleeves or core liners will be considered.

Multiple boreholes may be necessary to collect adequate sediment volume for the required analysis at a specific location. Initial borings will be completed to 5.0 ft bss to provide a visual field description of the soils. Grain-size samples will be collected from this boring. A second borehole will be completed approximately 5 to 10 ft away from the initial borehole, for collection of sediment chemistry samples. It is hoped that continuous cores will be recovered. In the event that continuous coring is not effective, a split-spoon sampler lined with sleeves or core liners will be used to collect the samples. All of the cores will be capped, labeled, wrapped, and secured in the field. The cores will be allowed to freeze in ambient conditions and stored outside the enclosed sled. The sediment sample sleeves or liners will then be transported in a frozen state to a dry, warm work area (staging area) where core logging and sub-sampling will be performed.

Sub-sampling must be conducted in an area separate from the panachek sled because the interior of the sled contains lubricants and is warmed by propane heaters, and therefore presents the possibility that contamination of sediment chemistry samples could occur if the cores are sub-sampled in the sled. Consequently, sediment chemistry sub-sampling will be deferred until it can be conducted in a controlled environment. After the core thaw, the core will be removed from the liner. If sufficient sediment is recovered, sub-samples will be collected from material that was not in direct contact with the liner or within 1 inch from either end of the core.

5.4 SAMPLE COLLECTION AND HANDLING PROCEDURES

The following descriptions and procedures are based on guidance derived and adapted for use in the Beaufort Sea, Alaska from the following:

- ◆ *Dredged Material Evaluation Framework: Lower Columbia River Management Area* (Corps et al 1998a)
- ◆ *Recommended Guidelines for Sampling Marine Sediment, Water Column, and Tissue in Puget Sound* (PSEP 1997)
- ◆ *Dredged Material Evaluation and Disposal Procedures – A Users Manual for the Puget Sound Dredged Disposal Analysis (PSDDA) Program* (Corps et al 1998b)

5.4.1 General Sample Collection Procedures

To minimize the potential for cross-contamination, all samples will be collected using disposable or decontaminated tools. Sampling tools may include, but are not limited to, split spoons, mixing spoons, bowls, and trays. Disposable gloves appropriate for the site contaminants will be worn and changed between sample intervals. Samples will be placed in containers in the order of volatilization sensitivity as outlined in Table 5-2.

Table 5-1. Standard Order Of Preferred Sample Collection for Typical Baseline Studies

Order	Analyte to be Sampled
1	Volatile organics
2	Total organic halogens, total organic carbon, and total phenols
3	Extractable organics (e.g., semi-volatiles, pesticides, herbicides)
4	Anions, cations (e.g., CN ⁻ , SO ₄ ²⁻ , Cl ⁻ , NO ₃ ²⁻ , and NH ₄ ²⁺)
5	Metals (total and dissolved)
6	Radionuclides

5.4.2 Volatiles and Sulfides Sub-sampling Procedures

The goal of the sediment chemistry-sampling portion of this study is to describe the natural concentrations and variability of selected physical and chemical parameters within the study area. Samples collected for volatile analysis will be undisturbed. The sample material for volatile organic or sulfide compound analysis will be collected first from the soil core; no mixing will be performed. One 2-ounce unpreserved container with septa will be completely filled with sample sediment for volatiles. No headspace should be allowed to remain in the container. Jars should be filled as tightly as possible, eliminating obvious air pockets. Threads on the sample container and lid will be wiped clean prior to closure to prevent leakage. For sulfides sampling, sediment will be placed in a 2-ounce sampling container preserved with zinc acetate.

The volatiles and sulfides sampling containers will be clearly labeled with the project name, sample/composite identification, type of analysis to be performed, date and time, and initials of person(s) preparing the sample, and referenced by entry into the logbook. The sulfides sampling jars will indicate that zinc acetate has been added as a preservative. The sample containers will be refrigerated or stored on ice or blue ice until delivered to the analytical laboratory.

5.4.3 Compositing Procedures

Following the collection of soil samples for volatile analysis, the remaining portion of the sample will be transferred to a large container (i.e., a decontaminated stainless-steel mixing bowl) for homogenization before being placed into the remaining sample jars for extractable organics, metals, and conventional analyses. Sample material will be thoroughly homogenized prior to splitting into separate sample containers.

After compositing is performed, sediment will be placed in one 8-ounce unpreserved container for extractable organic analysis. One 16-ounce unpreserved sample container will be filled with sediment for metals and conventional analyses. Both containers will be completely filled to the top with sediment, and will be labeled with the project name, sample/composite identification, type of analysis to be performed, date and time, and initials of person(s) preparing the sample, and referenced by entry into the logbook. The sample containers will be refrigerated or stored on ice or gel ice until delivered to the analytical laboratory.

5.4.4 Field Decontamination Procedures

Field decontamination of sediment sampling equipment and associated utensils will be conducted between sampling intervals. The following sequence of activities will be used to decontaminate sampling equipment prior to use and between samples.

- ◆ Scrub with wire brush to remove large soil particles
- ◆ Wash with sodium triphosphate or Alconox[®] solution
- ◆ Rinse twice with potable water
- ◆ Rinse with deionized water
- ◆ Air dry in a hydrocarbon-free environment.

5.4.5 Field Quality Control (QC)

The following describes the field QC blanks and samples associated with this project.

Field Blank: A field blank is a sample of analyte-free water that is supplied by the laboratory. The field blank will be generated by opening the analyte-free water container at the sampling location and transferring an aliquot to another laboratory-supplied container. The field blank will be analyzed for polynuclear aromatic hydrocarbon (PAH) and metal analytes for which associated samples are being analyzed. Field blank results will be used to measure and document any possible on-site contamination.

Rinsate (Equipment) Blank: A rinsate blank is a sample of analyte-free water that has been used to rinse sampling equipment after prescribed decontamination. The analyte-free water will be supplied by the laboratory. The rinsate blank will be analyzed for PAH and metal analytes for which the samples are being analyzed. Analysis of the rinsate blank will be used to measure and document the effectiveness of field decontamination of sampling equipment and possible carry-over of contamination to samples collected after the rinsate blank.

Temperature Blank: A temperature blank is a plastic container of water that is kept in the sample cooler with analytical samples between sub-sample collection and delivery. The temperature of this water will be measured and recorded when samples are received at the analytical laboratory. Measurement of the temperature blank will be used to indicate whether proper sample temperature was maintained between sample collection and delivery to the analytical laboratory.

Field Split (Duplicate) Sample: A field split sample consists of an actual sample for which twice as much volume as necessary to fill the sample containers has been collected. Aliquots of this sample will be equally distributed in two sets of sample containers. This division results in two (theoretically) equivalent samples collected from one sampling location. The field split sample will be analyzed for the same set of analytes for which the original sample is being analyzed.

Field Replicate Sample: A field replicate consists of additional samples grab(s) that will be collected using the same sampling methods used to obtain the first sample. Two field replicates and a spare replicate sample will be collected at the same sampling station and as soon after the original sample as

possible. The field replicate samples will be analyzed for the same set of analytes as the original sample. Analysis of the field replicate is used to measure and document the repeatability of field sampling methods as well as the heterogeneity of the sample matrix. Statistical analysis of numerical analytical results (mean and standard deviation) of the original sample and multiple replicates may also be performed to calculate the likely range of analyte concentrations at a given sampling location.

Matrix Spike/Matrix Spike Duplicate (MS/MSD) Sample: A matrix spike is a solution of the target analytes at known concentrations that is spiked into a field sample before sample preparation and analysis. Two aliquots of the sample are spiked for the duplicate analysis. The results of the duplicate spiked samples are used to measure the percent recovery of each spiked compound and compare the recovery between samples, which provides estimates of the accuracy and precision of the method. The frequency for the MS/MSD analysis is five percent of samples analyzed for each method where spikes are performed (i.e., one MS/MSD per analytical batch of 20 samples).

5.4.6 Sample Containers and Labels Procedures

Soil samples will be collected in precleaned glass and/or plastic containers provided by the analytical laboratory. The containers will have screw-type lids to assure adequate sealing of the bottles. The lids will include Teflon[®] inserts to prevent sample reaction with the lid and to improve the quality of the seal. Table 5-3 summarizes the amount of sediment and types of containers required for different types of analyses. If the same laboratory is to perform a number of the analyses, it is not necessary for each type of analysis to have a separate sediment sample jar. Two or more sediment sub-samples from the same station may be combined in a single sample jar as long as the required container types are the same and the sample preservation methods and maximum holding times are compatible. Table 5-3 identifies which sub-samples are appropriate to combine in the same jar.

Self-adhesive labels will be attached to the outside of all sediment sample containers. The following information will be provided in waterproof ink on each sample label:

- ◆ A unique sample number which includes the station identification
- ◆ Sampling date and time
- ◆ Sampling personnel
- ◆ Preservative (if appropriate)

5.4.7 Sample Transport and Chain-of-Custody Procedures

Sample transport and chain-of-custody procedures will include the following guidelines:

- ◆ Samples will be packaged and shipped in accordance with U.S. Department of Transportation regulations as specified in 49 CFR 173.6 and 49 CFR 173.24
- ◆ Individual sample containers will be packed to prevent breakage and transported in a sealed ice chest or other suitable container
- ◆ Ice will be placed in separate plastic bags and sealed, or blue ice used to maintain an ambient sample temperature of approximately 4°C until delivery to the analytical laboratory

- ◆ Each cooler or container containing sediment samples for analysis will be shipped to the laboratory within 24 hours of being sealed
- ◆ A sealed envelope containing chain-of-custody forms will be enclosed in a plastic bag and taped to the inside lid of the cooler
- ◆ Signed and dated chain-of-custody seals will be placed on all coolers prior to shipping
- ◆ The shipping containers will be clearly labeled with sufficient information (name of project, time and date container was sealed, name of the person sealing the container, and consultant's office name and address) to enable positive identification
- ◆ Upon transfer of sample possession to the analytical laboratory, the chain-of-custody form will be signed by the persons transferring custody of the sample containers. The shipping container seal will be broken and the condition of the samples will be recorded by the receiver
- ◆ Chain-of-custody forms will be used internally in the lab to track sample handling and final disposition.

**Table 5-2. Holding Times and Minimum Container Sizes
for Physical and Chemical Analyses**

Sample Type	Holding Time	Minimum Sample Size ^b	Container Size	Preservative
Physical/Chemical Analyses				
Grain size	6 months	100-200 g (75-150ml)	32 oz wide-mouth glass jar	None
Total solids	14 days	125 g (100 ml)	8 oz wide mouth glass jar	
Total volatile solids	14 days	125 g (100 ml)		
Total organic carbon	14 days	125 g (100 ml)		
Ammonia	7 days/extraction 28 days/analyze	25 g (20 ml)		
Metals (except mercury)	6 months (28 days)	125 g (100 ml)		
Total sulfides	7 days	50 g (40 ml)	2 oz wide-mouth glass jar	Zinc Acetate
Volatile organic compounds	14 days	50 g (40 ml)	2 oz wide-mouth jar with septa ^c	None
Semivolatile organic compounds	14 days	150 g (120 ml)	8 oz wide-mouth jar ^d	None
Pesticides	14 days	150 g (120 ml)		
Polynuclear aromatic hydrocarbons	14 days	150 g (120 ml)		
Archive sample	6 months	300 g (250 ml)	8 oz wide-mouth jar ^e	None

^a During transport to the analytical laboratory, samples will be stored on ice. The archived samples will be frozen immediately upon receipt at the laboratory.

^b Recommended field sample sizes (wet weight basis) for one laboratory analysis. If additional laboratory analyses are required (e.g., laboratory replicates, allowance for having to repeat an analysis), the field sample size should be increased accordingly. For some chemical analyses, smaller sample sizes may be used if comparable sensitivity can be obtained by adjusting instrumentation, extract volume, or other factors of the analysis.

^c No headspace or air pockets should remain.

^d Container to be filled to the top.

^e Sample to be frozen at the laboratory. Freezing sample extends hold time for SVOCs, pesticides, and PCBs to 6 months.

5.5 FIELD DOCUMENTATION

The following descriptions and procedures are based on guidance derived from and adapted for use in the Beaufort Sea, Alaska from the following:

- ◆ *Dredged Material Evaluation Framework: Lower Columbia River Management Area* (Corps et al 1998a)
- ◆ *Recommended Guidelines for Sampling Marine Sediment, Water Column, and Tissue in Puget Sound* (PSEP 1997)
- ◆ *Dredged Material Evaluation and Disposal Procedures – A Users Manual for the Puget Sound Dredged Disposal Analysis (PSDDA) Program* (Corps et al 1998b)

This section provides guidance for documenting sampling and data gathering activities. Documentation of field activities provides important project information and data that can act as support to data generated by laboratory analyses. Project data validation may require reporting field data to verify sample identification, sampling locations, correct sampling techniques. It may also be necessary to validate results of field analyses and measurements.

Field Notes: Field notes will be maintained for all field activities, whether collecting samples or gathering environmental data. Field notes will be kept on water-resistant paper, all field documentation will be recorded in indelible black ink, and errors will be crossed out with a single line, initialed and dated by the data recorder. Information recorded in field notes include, but is not be limited to:

- ◆ Name of recorder
- ◆ Sample and station number
- ◆ Data or sample station locator information
- ◆ Sample elevation (water depth of the sampler bottle)
- ◆ Date and time of sample or data collection (all times should be recorded for multiple sampler deployments)
- ◆ Ambient weather conditions such as air temperature, cloud cover, and precipitation
- ◆ Sample elevation (water depth above the surface of the sediment)
- ◆ Sampling interval (i.e., 0 to 10 cm)
- ◆ Positioning information required to calculate the location of the station
- ◆ Physical characteristics such as gross particle size distribution, debris, odor, or evidence of contamination such as a visible sheen or discoloration
- ◆ Record of splits, duplicates and sub-samples taken

Other information that may be recorded in field notes includes sampling methods and any deviations from established sampling protocols. Additional anecdotal information pertaining to observations of unusual sampling events or circumstances may be recorded in field notes. A field book should be unique to the

project or, at the very least, to a class of field events, such as marine sediment sampling. It is also advisable to keep record of all personnel involved in each sampling event, including the time each individual boarded and departed the research vessel or rollagon.

6.0 FIELD SCHEDULE

6.1 SUMMER SCHEDULE

Summer field sampling is tentatively scheduled for early to mid-August and depends on the location of summer floating and pack ice. Near-shore heavy ice conditions and/or rough sea conditions could delay or prohibit summer sampling in the offshore area. It is unlikely that sampling would be prohibited in Lions Bay due to ice, however, rough weather conditions could delay or prohibit sampling. All summer field operations will be completed by August 31, 2002.

6.2 WINTER SCHEDULE

The field sampling program is dependent on the ability to deploy rollagons onto the floating landfast sea ice and grounded sea ice within Lions Bay. Thin ice and/or open water conditions could delay or prohibit sampling this winter. However, typical sea ice conditions allow heavy equipment deployment on or around February 1, lasting until approximately May 1. Winter sampling will be performed to collect any subsurface samples that were not able to be collected during the summer season, and to collect samples from any new locations that arise to fill data gaps. Sampling would begin around mid-February 2003 when land-fast ice has had time to reach maximum thickness.

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