SAMPLING AND ANALYSIS PLAN

SEDIMENT CHARACTERIZATION FOR ASOTIN MARINA & BOAT LAUNCH

ASOTIN, WASHINGTON

Prepared for

The City of Asotin

Prepared by

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List of Tables

List of Figures

1 INTRODUCTION

The City of Asotin (City) proposes to restore the City's Chief Looking Glass Park (Marina) facility through dredging and dock re-construction. Sedimentation in the marina has made the marina unusable by the public.

The Marina is located in the West half of Section 16, Township 10 North, Range 46 East of the Willamette Meridian, County of Asotin, State of Washington. The marina is located at Snake River mile marker 145.4 (see figure 1). The Marina is approximately one hundred and sixty feet by three hundred and sixty feet with an eighty foot wide mouth to the Snake River and is located on the south side of the Snake river about eight hundred feet upstream from Asotin Creek. The Marina is located at the transitioning zone from a free flowing river to the slack water behind the Lower Granite Dam. Because of its location, the Marina receives a significant sedimentation load from the Snake River.

1.1 Project Description

The project includes three components: dredging of the marina area, constructing docks, and upgrading the marinas jetty with an extended barb. Dredging of the marina area consists of mechanical dredging of approximately 10,000 cubic yards (cy) of depositional material from the marina entrance and interior (see figure 2). Dock construction will follow the original dock layout with 4 boat docks, one ramp dock and a pump out dock. Extension of the barb at the marina entrance will consist of placing 900 cubic yards of rip-rap perpendicular to the river on the upstream channel entrance.

1.2 Site History

The Marina is owned by the US Army Corps of Engineers (USACE) and is leased to the City of Asotin. The Marina was originally built in 1974 and consisted of a boat launch, fuel dock, 1covered and 3 uncovered boats slips, and a sea plane dock. By the early 1990's the majority of the docks were in disrepair and were removed making room for the Steam Boat Jean, a historic vessel that was used as a restaurant. Throughout the years the City of Asotin removed significant amounts of sedimentation from the marina, however floods in both 1995 and 1996 deposited quantities of sediment that were not feasible to dredge with the

cities limited budget. The steam boat Jean was removed from the marina in 1997 and the marina has been unusable to the public ever since.

1.3 Previous Data

A thorough search of the City's records did not yield any sediment chemistry data from previous proposals and permits. A search for another applicable data base did not yield any previous sediment quality data associated with this section of the river. The dredged material management program (DMMP) has no record of sediment chemistry data.

There are no other known major industrial or wastewater outfalls near the marina and no known potential sources of contamination inside the marina. A small storm drain does enter the marina on the south eastern point of the marina.

1.4 Sediment Characterization Overview

The overall dredge footprint comprises a proposed dredge depth of -9 MLLW, with an allowable overdredge of 1 foot. The total volume of material estimated for removal is approximately 10,000 cy. The City will test and evaluate these sediments in accordance with the Dredged Material Management Program (DMMP) guidelines and the Interim Final Regional Sediment Evaluation and Testing guidance (RSET 2006).

Sediments will be tested in a tiered progression with samples initially screened for grain size and organic carbon. If the grain size and organic carbon results fail screening criteria sediments will be analyzed for chemistry.

A separate z-layer sample will also be collected for characterization. The z-layer is defined as the material comprises the new sediment surface after dredging is completed. This sample will be collected from the bottom 1 ft of the core (-10 to -9 MLLW) and analyzed for chemistry.

2 PROJECT TEAM AND RESPONSIBILITIES

This section discusses the proposed project team and their responsibilities for conducting the basin and channel sediment characterization and supporting the suitability determination.

2.1 Project Planning and Coordination

Shawn Hinz (Gravity) is the overall project manager responsible for developing and completing this SAP. Following approval of the SAP by DMMP agencies, Mr. Hinz will be responsible for administrative coordination to ensure timely and successful completion of the sediment characterization. He will provide a copy of the approved SAP, as well as the DMMP agencies' approval letter, to all sampling and testing subcontractors. Any significant deviation from the approved SAP will be coordinated with the Corps' Dredged Material Management Office (DMMO).

2.2 Field Sample Collection

Gravity will designate a Field Coordinator (FC) with proven field experience to provide overall direction for personnel assignments, logistics, and field operations. The FC will supervise field collection of the sediment core samples and will be responsible for ensuring accurate positioning and recording of sample locations, depths, and identification; ensuring conformity to sampling and handling requirements, including field decontamination procedures; conducting physical evaluation and logging the samples; and chain-of-custody of the core samples.

The FC, or a designee, will be responsible for documenting sample preparation, observations, and chain-of-custody up until the time the samples are released to a commercial shipper or delivered to the analytical laboratory for chemical analysis or the bioassay laboratory for toxicity testing. Gravity will ensure that archived sediments are stored under proper conditions until delivery.

2.3 Laboratory Preparation and Analyses

Dr. John W. Coddington of Anatek Laboratories (Anatek), Moscow, Idaho, will be responsible for physical and chemical analyses. He will handle and analyze the submitted samples in accordance with DMMP analytical testing protocols, quality assurance/quality

control (QA/QC) requirements, and requirements as specified in this or any subsequent revised SAP. He will prepare a written report of analytical results and QA/QC procedures, which will be included as an appendix in the final data report.

2.4 QA/QC Management

Ms. Susan Snyder of Gravity, or her designee, will serve as QA Representative for this project. She will perform QA oversight for both the field sampling and laboratory programs. She will be kept fully informed of field program procedures and progress during sample collection and laboratory activities during sample preparation. She will record and correct any activities that vary from this SAP. Upon completion of the sampling and analytical program, she will review laboratory QA/QC results and incorporate findings into the final sampling and analysis report. Any QA/QC problems will be brought to the attention of the DMMO as soon as possible to discuss issues related to the problem and to evaluate potential solutions.

2.5 Final Sampling and Analysis Results Report

Mr. Hinz, or his designee, will be responsible for preparation of the final sampling and analysis results report to support the suitability determination. This report will summarize the sampling effort, analytical methods, QA/QC narrative, and analytical and biological testing results.

3 CONCEPTUAL DREDGING PLAN

The sampling and analysis program was developed with consideration of site-specific project and environmental factors. A key requirement of the program is ensuring that the individual dredged material management units (DMMUs) do not have contaminants of concern (COCs) associated with them. Assessment of COC's within the DMMUs will follow a tiered process with samples initially screened for grain size and organic carbon and for chemical analysis only if the material fails the grain size and organic carbon screening. In the case of the z-layer sample, chemistry will be conducted by default to ensure that the new post-dredge sediment surface does not contain COC's.

3.1 Characterization Frequencies and Dredging Plan Specifics

The sediment quality ranking determines the number of DMMUs and the number of samples required to represent each DMMU. Currently, there is no ranking specific to the Asotin Marina. According to the DMMP User's Manual (PSDDA 2000), all existing marinas, except those listed as high ranked, are assigned a moderate ranking. The thickness of the proposed dredge prism, including overdepth, is 4 to 6 feet over most of the dredge area. The City proposes to characterize the entire dredge prism as one surface layer. The proposed sampling frequency will reflect the moderate ranking.

The DMMU will be represented by a composite sample consisting of three discrete sediment core samples. Z –layer samples will be collected in this same approach but composited separately.

3.2 Grain Size and Organic Carbon Screening

An initial screen of bulk sediment quality will be conducted using grain size and TOC results. The purpose of this initial screen is to characterize sediments likely to have minimal amounts of fine-grained sediment and sedimentary organic matter and therefore low potential for adsorption and retention of CoCs (RSET 2006).

If the results are less than 20 percent fines in the grain size analysis and less than 0.5 percent TOC no further testing of the dredge sediments for chemistry will be conducted. Z-layer samples will be analyzed regardless of TOC results.

4 SAMPLE COLLECTION, PROCESSING, AND HANDLING PROCEDURES

This section addresses the sample collection, processing, and handling procedures that will be used to ensure data quality.

4.1 Sampling Platform and Schedule

Sampling will occur after approval of this SAP by the DMMO, and is anticipated to begin within two weeks of approval of this SAP by the DMMP agencies. Collection of sediment cores will be conducted from the *R/V Newton* operated by Gravity Environmental LLC. It is anticipated that field sampling and sample processing will require approximately 3 days.

4.2 Station Positioning

Horizontal positioning will be determined by the onboard differential global positioning system (DGPS) based on target coordinates. Measured station positions will be converted to latitude and longitude (North American Datum [NAD] 83) to the nearest 0.1 second. The accuracy of measured and recorded horizontal coordinates will be within 2 meters.

Vertical elevation of each boring station will be measured using a fathometer or lead line.

4.3 Station and Sample Identification

Table 1 lists all the core and composite sample IDs for the sediment characterization in the DMMU. Each sediment sample was assigned a unique alphanumeric identifier using the format described below:

- The sample name starts with "AM" denoting the project location (Asotin Marina).
- Individual core samples are identified by 01, 02,or 03 (e.g., AMA-03).
- For filter wipe and filter blank samples, FW or FB, as appropriate, will be appended to the sample identification number.

Table 1
Proposed Sampling Coordinates, and Mudline Elevations

Core Station/ Sample ID	Latitude[a] (DD MM.mmmm N)	Longitude[a] (DDD MM.mmmm W)	Estimated Mudline Elevation (feet MLLW)	Core Length to Target Depth[b] (feet)
AMA-01	46 20 33.14	117 03 08.83	-3.5	5.5
AMA-02	46 20 32.13	117 03 09.24	-4.5	4.5
AMA-03	46 20 31.42	117 03 07.83	-6.5	2.5

4.4 Station Locations

Figure 3 shows the location of the proposed core sampling locations within the DMMU. Table 1 presents the coordinates and mudline elevations for proposed sampling locations.

A Bathymetric survey conducted in March 2008 was used to determine the DMMU size and layout and to assist in choosing core sampling locations. Station locations were chosen with the objective of representing, as accurately as possible, the physical and chemical characteristics of the sediments to be dredged. Stations were distributed to provide representative spatial coverage and were placed in locations where the proposed dredge prism would represent the bulk of material to be dredged.

4.5 Core Collection

Approximately 4 liters will be required for chemical analysis with an additional 0.5 liter sample container collected and archived from each DMMU for TCLP analysis, if required.

Sediment cores will be collected at each location identified in Table 1 using a vibracorer. The vibracorer will use polycarbonate liners inside a rigid external tube approximately 4 inches in diameter. The vibracorer will be lowered to the bottom, where the unit will then be energized and allowed to penetrate. The core will be driven to its maximum length of 8 feet or to refusal. Acceptance criteria for a sediment core sample are as follows:

- The core penetrated to, and retained material to, project depth or refusal
- Recovery was at least 75 percent of the length of core penetration
- Cored material did not extend out the top of the core tube or contact any part of the sampling apparatus at the top of the core tube

- There are no obstructions in the cored material that might have blocked the subsequent entry of sediment into the core tube and resulted in incomplete core collection

If core rejections require the core station to be relocated, three additional attempts will be made within a radius of 25 feet of the target. If relocation takes place, the FC will ensure that the revised location remains within the respective DMMU. If relocation attempts are not successful, the proposed station relocation will be coordinated with the DMMP through the DMMO.

The following procedure will be used to decontaminate sample tubes prior to use:

- Rinse and pre-clean with potable water
- Wash and scrub the tubes in a solution of laboratory grade, non-phosphate-based soap and potable water
- Rinse with potable water
- Rinse three times with distilled water
- Seal both ends of each core tube with aluminum foil

The core tube caps will be removed immediately prior to placement into the coring device. Care will be taken during sampling to avoid contact of the sample tube with potentially contaminated surfaces. Extra sample tubes will be available during sampling operations for uninterrupted sampling in the event of a potential core tube breakage or contamination. Core tubes suspected to have been accidentally contaminated will not be used. Logs and field notes of all core samples will be maintained as samples are collected and correlated to the sampling location map. The following information will be included in this log:

- Elevation of each station sampled as measured from MLLW
- Location of each station as determined by DGPS
- Date and time of collection of each sediment core sample
- Names of field supervisor and person(s) collecting and handling the sample
- Observations made during sample collection including: weather conditions, complications, ship traffic, and other details associated with the sampling effort
- The sample station identification

- Length and depth intervals of each core and estimated recovery for each sediment sample as measured from MLLW
- Qualitative notation of apparent resistance of sediment column to coring
- Any deviation from the approved SAP

4.6 Core Processing and Handling Procedures

Polycarbonate core tubes will be cut lengthwise with an electric nipper other suitable device. The cutter will be decontaminated between successive cores. After initial splitting of the core tube, subsampling for sulfides and volatile organic compounds (VOCs) will first be conducted, and then a qualified person will examine the core and log the presence of fine-grained lenses.

This section describes the equipment decontamination procedures, sample containers, core processing, and sample compositing procedures.

4.6.1 Equipment Decontamination Procedures

Sample containers, instruments, working surfaces, technician protective gear, and other items that may come into contact with sediment sample material must meet high standards of cleanliness. All equipment and instruments used that are in direct contact with the sediment collected for analysis must be made of glass, stainless steel, high-density polyethylene (HDPE), or polytetrafluoroethylene (PTFE), and will be cleaned prior to each day's use and between sampling or compositing events. Decontamination of all items will follow PSEP protocols. The decontamination procedure is:

- Pre-wash rinse with tap water
- Wash with solution of warm tap water and Alconox soap (brush)
- Rinse with warm tap water
- First rinse with distilled water
- Rinse three times with distilled water
- Cover (no contact) all decontaminated items with aluminum foil
- Store in clean, closed container for next use

4.6.2 Sample Containers for Analysis

The contract laboratory will provide certified, pre-cleaned, U.S. Environmental Protection Agency (EPA)-approved containers for all samples. Prior to shipping, the analytical laboratory will add preservative, where required, according to PSEP protocols. Sediment for bioassay testing will be placed in HDPE buckets that have undergone the decontamination procedures described in Section 4.6.1.

4.6.3 Core Processing Procedures

Sediment processing will be conducted aboard the sampling vessel. Filled sample containers will be stored in coolers containing ice to maintain the samples at 4°± 2°C until delivery or shipping to the analytical laboratories.

All working surfaces and instruments will be thoroughly cleaned, decontaminated, and covered with aluminum foil to minimize outside contamination between sampling events. Disposable gloves will be discarded after processing each station and replaced prior to handling decontaminated instruments or work surfaces.

Sample containers will be kept in packaging as received from the analytical lab until use; a sample container will be withdrawn only when a sample is to be collected and will be returned to a cooler containing completed samples.

The steps for processing the samples are provided below.

1. Extrude sample material from sample core tube onto a stainless steel tray using a vibrating core-extruder. Alternatively, the core may be cut longitudinally using a circular saw, taking care not to penetrate the sediment while cutting.
2. Using a clean, stainless steel spatula or spoon, fill a pre-labeled 2-ounce glass container from an unexposed inner portion (no contact with any work surface or equipment) of the sample core.
3. Fill container with sample as full as possible to eliminate air space in sample jar (it may be necessary to slightly overfill jar to reach a convex meniscus and slide the the cap liner, with PTFE side down, expelling the additional sample).
4. Screw cap on the container and tighten.
5. Repeat steps 2 through 4 for the second 2-ounce glass container.

6. Using a clean, stainless steel spoon, fill a pre-labeled 4-ounce glass total sulfides container (zinc acetate added previously, following the chemistry laboratory's instructions) leaving no headspace.
7. Place cap on sample container, tighten, and shake vigorously.
8. Record the description of the core sample on the core log form for the following parameters as appropriate and present:
   - Sample recovery (depth in feet of penetration and sample compaction)
   - Physical soil description in accordance with the Unified Soil Classification System (includes soil type, density/consistency of soil, and color)
   - Odor (e.g., hydrogen sulfide, petroleum, etc.)
   - Vegetation
   - Debris
   - Biological activity (e.g., detritus, shells, tubes, bioturbation, and live or dead organisms)
   - Presence and depth (in feet) of the redox potential discontinuity layer
   - Presence of oil sheen
   - Any other distinguishing characteristics or features
9. Using a clean spoon, place sample material from the core into a cleaned stainless steel bowl or HDPE bucket, homogenize using a stainless steel paddle and variable speed drill, cover with foil, and set aside for composite sample preparation (discussed in Step 12 below).
10. Repeat Steps 1, 8, and 9 for the remaining core tubes associated with the composite that is being prepared.
11. Collect and archive at least 16 ounces of material from the Z-layer of each individual sediment core (Kendall 2001).
12. To prepare the sample composite for a DMMU, place a representative volume of homogenized sediment from each of the individual core sections into a compositing container (stainless steel bowl or HPDE bucket), and mix thoroughly using a variable speed drill fitted with a stainless steel paddle.
13. Using a clean, stainless steel spoon, completely fill pre-labeled sample containers, as indicated in Table 2, for the remaining analyses.
14. Immediately after filling the sample container with sediment, place the screw cap on the sample container and tighten.

15. Repeat steps 13 and 14 for the remaining sample jars.
16. Thoroughly check all sample containers for proper identification, analysis type, and lid tightness.
17. Pack each container carefully to prevent breakage and place upright inside a cooler with ice for storage at the proper temperature (4°± 2°C for all samples).

Table 2
Guidelines for Sample Handling and Storage

Parameter	Sample Size	Container Size and Type	Holding Time	Preservative
Total metals	50 g	4-oz glass	2 years; 28 days for Hg	Freeze[a]
Tributyltin (TBT)	100 mL porewater	Two 32-oz glass	7 days until porewater extraction	Zero head space/ Cool/4° C
			7 days until TBT extraction	
			40 days after extraction	
VOCs	100 g	two 2-oz glass	14 days	Zero head space/ Cool/4° C
Semivolatile organic compounds (SVOCs)	150 g	16-oz glass	14 days until extraction	Cool/4° C
			1 year until extraction	Freeze
			40 days after extraction	Cool/4° C
Pesticides/polychlorinated biphenyls	from SVOC extract	from SVOC container	same as SVOCs	same as SVOCs
Total solids/total volatile solids (TS/TVS)	50 g	4-oz glass	14 days	Cool/4° C
			6 months	Freeze
Total sulfides	50 g	4-oz glass	7 days	5 mL 2N Zn acetate/dark/cool/4° C
Ammonia	40 g	from TS/TVS container	7 days	Cool/4° C
Total organic carbon	125 g	from TS/TVS container	14 days	Cool/4° C
			6 months	Freeze
Grain size	500 g	16-oz glass	6 months	Cool/4° C
Z-layer archive	-	32-oz glass	6 months	Freeze

a Samples will be analyzed for mercury before freezing.

4.6.4 Sample Compositing Procedures

The sediment collected from each individual core will be homogenized. A proportionate volume of each individual sample will be placed into a decontaminated stainless steel bowl or HDPE bucket for compositing as described in Section 4.6.3, step 12. For example, if a composite is made up of two samples, the composite container will receive a 50 percent contribution from each individual sediment sample. The material added to the composite container will be representative of the entire depth interval targeted for each individual sample. As an individual contribution becomes available, its proportionate sediment volume will be added to the composite sample container. When all of the desired material is placed into the compositing container, the material will be homogenized with a stainless steel paddle attached to a variable speed drill or stainless steel spoon until uniform in color and texture, then placed into the appropriate sample jars, as identified in Table 2, and stored/preserved. In order to satisfy the volume requirements for analyses, the composite must consist of approximately 10 liters of sediment. The homogenate will be mixed throughout the process of filling sample jars to ensure that each sample jar is representative of the homogenate mixture.

Filled sample jars will be labeled with the name of the project, sample number, type of analysis, date, time, and initials of the person preparing the sample. This information will be recorded on the chain-of-custody forms. Following proper sealing and labeling, all sample containers will be placed on ice in a cooler or container and maintained at 4°± 2°C.

4.7 Field Quality Assurance Samples

Field QA samples will be used to evaluate the efficiency of field decontamination procedures. All field QC samples will be documented in the field logs.

One equipment wipe and one filter blank will be collected. The equipment wipe will consist of wiping down the sampling equipment after sample collection and decontamination with a clean, ashless, Whatman Grade No. 541 filter paper and placing it into a sample jar. The filter blank will be prepared by placing a clean piece of ashless Whatman Grade No. 541

filter paper directly into a sampling container. The field equipment wipe blank and filter blank will be archived and will be analyzed only in the event of questionable data.

4.8 Sample Transport and Chain-of-Custody Procedures

All containerized sediment samples and core tubes (for archives) will be transported to the analytical laboratory after preparation is completed. Specific sample shipping procedures will be as follows:

- Each cooler or container containing the sediment samples to be analyzed will be delivered to the laboratory within 24 hours of being sealed.
- The shipping containers will be clearly labeled with sufficient information (name of project, time and date container was sealed, person sealing the container, and consultant's office name and address) to enable positive identification.
- Glass jars will be separated in the shipping container by shock absorbent material (e.g., bubble wrap) to prevent breakage.
- A sufficient amount of ice will be double-bagged in sealable plastic bags and placed within the cooler.
- 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 persons transferring custody of the sample containers and core tubes (for archives) will sign the chain-of-custody form upon transfer of sample possession to the analytical laboratory. The shipping container seal will be broken upon receipt of samples at the laboratory and the receiver will record the condition of the samples. Chain-of-custody forms will be used internally by the lab to track sample handling and final disposition.

4.9 Waste Management

All sediment remaining after sampling will be washed overboard at the collection site prior to moving to the next sampling station. Any sediment spilled on the deck of the sampling vessel will be washed into the surface waters at the collection site.

All disposable sampling materials and personnel protective equipment used in sample processing, such as disposable coveralls, gloves, and paper towels, will be placed in heavy duty garbage bags or other appropriate containers.

5 CHEMICAL/CONVENTIONAL ANALYSES

The DMMP process specifies sampling and testing protocols for the chemical and biological characterization of dredge material. The results of the testing will be used to assess the level of contamination of the sediments. Table 3 provides the Sediment Quality Guidelines, as updated under the RESET 2006 guidance document.

5.1 Quality Assurance/Quality Control

The frequency of analysis for laboratory QA/QC samples is summarized in Table 4, and project data quality objectives for precision, accuracy, and completeness are provided in Table 6. When analyzing VOCs, semi-volatile organic compounds (SVOCs), pesticides (PCBs), metals, and conventional parameters, DMMP requires that initial calibrations must be completed before any samples are analyzed, after each major disruption of equipment, and when ongoing calibration fails to meet acceptance criteria. Ongoing calibration is required before and after every 10 to 12 samples or every 12 hours (whichever is more frequent).

Surrogates are required (organics only) for every sample, including matrix spike samples, blanks, laboratory control samples (LCS), and standard reference materials. Matrix spike and matrix spike duplicates are required for VOCs, SVOCs, and pesticides/PCBs for every 20 samples received. Matrix spikes and laboratory duplicates will be analyzed for samples requiring metals analyses. Matrix triplicates will be analyzed for conventional parameters.

All samples will be diluted and re-analyzed if target compounds are detected at levels that exceed their respective established calibration ranges. Any cleanups will be conducted prior to the dilutions. Re-analyses will be performed if surrogate, internal standard, or spike recoveries are outside of the data quality objective parameters. QC samples may be re-analyzed if results are not within control limits and it cannot be determined that the sample matrix is the cause.

5.2 Laboratory Report

Anatek will prepare a detailed report that will be excerpted in an appendix in the final Sampling and Analysis Report documenting all activities associated with the sample analyses. Included in this report will be:

- Project Narrative: A detailed report that describes the samples received, analyses performed, and corrective actions undertaken.
- Chain-of-Custody Documentation: Laboratory policy requires that chain-of-custody documentation be available for all samples received. The chain-of-custody will document basic sample demographics such as client and project names, sample identification, analyses requested, and special instructions.
- Data Summary Form: A tabular listing of concentrations and/or detection limits for all target analytes. The data report will also list other pertinent information such as the amount of sample analyzed, dilution factors, sample processing dates, extract cleanups, and surrogate recoveries.
- QA Summary: Includes results of all quality control analyses, specifically recovery information. Laboratory control samples are reported with each batch. Additional QC analysis may include laboratory replicates, matrix spikes, and standard reference materials.
- Instrument Calibration Forms and Raw Data: Includes initial and continuing calibration summaries and instrument tuning data, laboratory bench sheets, and log book pages.

Anatek will also provide deliverables in electronic format.

6 SAMPLING AND ANALYSIS RESULTS REPORT

A final Sampling and Analysis Results Report will be prepared by Gravity documenting all activities associated with collecting, compositing, transporting, and chemically and biologically analyzing sediment samples. Portions of the laboratory reports will be included as appendices. At a minimum, the following will be included in the final report:

- Summary of all field activities including a description of any deviations from the approved SAP.
- Locations of sediment sampling stations in state plane coordinates (NAD 83) to the nearest foot, and in latitude and longitude in degrees and minutes to three decimal places. All vertical elevations of mudline and water surface will be reported to the nearest 0.1 foot relative to MLLW.
- A project map with actual sampling locations.
- A QA/QC narrative for chemical, and if appropriate, biological testing.
- Summary data results tables.
- Summary of comparison of chemical and toxicity test results with DMMP and SMS interpretive criteria.
- Hard copies of field data, laboratory analysis results, and associated QA/QC data will be available.

7 REFERENCES

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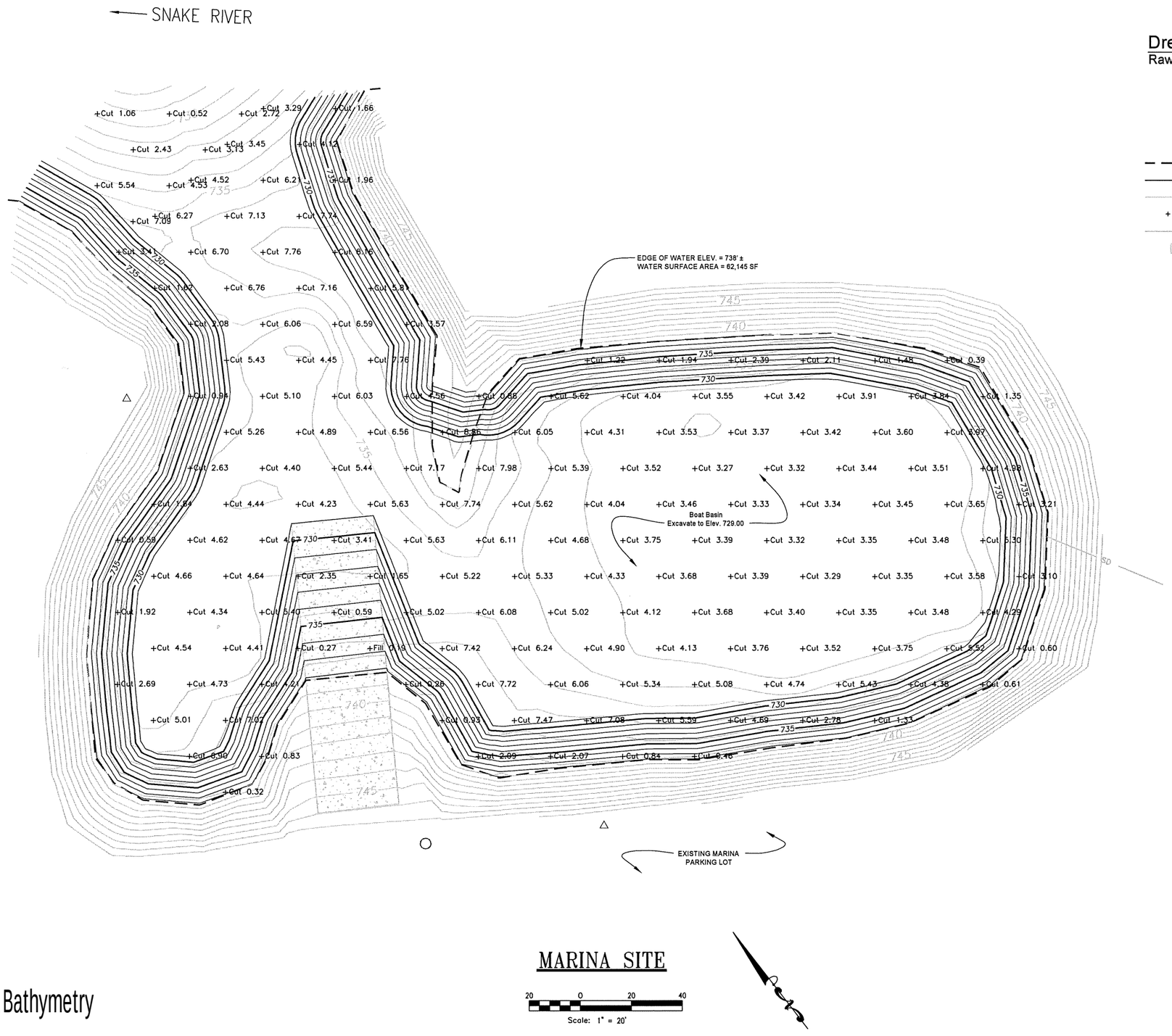
Figure 1 **– Asotin Marina 1986**



Dredging Volume

Raw Cut Volume: 10,000 cu yd

LEGEND

- EDGE OF WATER
- XXX — PROPOSED CONTOUR
- XXX — EXISTING CONTOUR
- + Cut x.xx — CUT DEPTH
- STORM DRAIN LINE
- EXISTING CONCRETE RAMP

Figure 2. Asotin Marina Bathymetry

No.	DATE	BY	DESCRIPTION

ASOTIN MARINA SITE PLAN

ASOTIN, WASHINGTON

KELTIC ENGINEERING, INC.
315 Adams Lane ◊ Lewiston, Idaho 83501 ◊ (208) 743-2135 ◊ (208) 743-2136 fax
1621 N Third Street, Ste 500 ◊ Coeur d'Alene, Idaho 83814 ◊ (208) 664-4836 ◊ (208) 664-4893 fax
Development ♣ Planning ♣ Design ♣ Construction Management

DRAWN BY: RGW	CHECKED BY: EFH
DESIGNED BY:	RGW
DATE:	04-04-08
LAST REV.:	04-04-08
PROJECT NO.	08-0030
SHEET NO.	1 OF 1

Figure 3. Sample Locations

Table 3. Sediment Quality Guidelines for Standard Chemicals of Concern

		Marine				Freshwater	
Chemical	**CAS (1) Number**	**SL1 (dry weight**	**SL2 (dry weight)**	**SL1 (3) (mg/kg-OC)**	**SL2 (3) (mg/kg-OC)**	**SL1 (dry weight**	**SL2 (dry weight)**
Metals (mg/kg)							
Antimony	7440-36-0	150	150				
Arsenic	7440-38-2	57	93			20	51
Cadmium	7440-43-9	5.1	6.7			1.1	1.5
Chromium	7440-47-3	260	270			95	100
Copper	7440-50-8	390	390			80	830
Lead	7439-92-1	450	530			340	430
Mercury	7439-97-6	0.41	0.59			0.28	0.75
Nickel	7440-02-0	---	---			60	70
Silver	7440-22-4	6.1	6.1			2.0	2.5
Zinc	7440-66-6	410	960			130	400
Polynuclear Aromatic Hydrocarbons (µg/kg)							
Total LPAH	---	5,200	5,200	370	780	6,600	9,200
Naphthalene	91-20-3	2,100	2,100	99	170	500	1,300
Acenaphthylene	208-96-8	560	1,300	66	66	470	640
Acenaphthene	83-32-9	500	500	16	57	1,100	1,300
Fluorene	86-73-7	540	540	23	79	1,000	3,000
Phenanthrene	85-01-8	1,500	1,500	100	480	6,100	7,600
Anthracene	120-12-7	960	960	220	1,200	1,200	1,600
2-Methylnaphthalene	91-57-6	670	670	38	64	470	560
Total HPAH	---	12,000	17,000	960	5,300	31,000	55,000
Fluoranthene	206-44-0	1,700	2,500	160	1,200	11,000	15,000
Pyrene	129-00-0	2,600	3,300	1,000	1,400	8,800	16,000
Benz(a)anthracene	56-55-3	1,300	1,600	110	270	4,300	5,800
Chrysene	218-01-9	1,400	2,800	110	460	5,900	6,400
Benzofluoranthenes (b+k)	205-99-2	3,200	3,600	230	450	600	4,000
	207-08-9						
Benzo(a)pyrene	50-32-8	1,600	1,600	99	210	3,300	4,800
Indeno(1,2,3-c,d)pyrene	193-39-5	600	690	34	88	4,100	5,300
Dibenz(a,h)anthracene	53-70-3	230	230	12	33	800	840
Benzo(g,h,i)perylene	191-24-2	670	720	31	78	4,000	5,200
Chlorinated Hydrocarbons (µg/kg)							
1,4-Dichlorobenzene	106-46-7	110	110	3.1	9		
1,2-Dichlorobenzene	95-50-1	35	50	2.3	2.3		
1,2,4-Trichlorobenzene	120-82-1	31	51	0.81	1.8		
Hexachlorobenzene	118-74-1	22	70	0.38	2.3		

Table 3. Sediment Quality Guidelines for Standard Chemicals of Concern (continued)

		Marine				Freshwater	
Chemical	**CAS[1/] Number**	**SL1 (dry weight)**	**SL2 (dry weight)**	**SL1[2/] (mg/kg-OC)**	**SL[2/] (mg/kg-OC)**	**SL1 (dry weight)**	**SL2 (dry weight)**
Phthalates (ug/kg)							
Dimethyl phthalate	131-11-3	71	160	53	53	46	440
Diethyl phthalate	84-66-2	200	200	61	110		
Di-n-butyl phthalate	84-74-2	1,400	1,400	220	1,700		
Butyl benzyl phthalate	85-68-7	63	900	4.9	64	260	370
Bis(2-ethylhexyl) phthalate	117-81-7	1,300	1,900	47	78	220	320
Di-n-octyl phthalate	117-84-0	6,200	6,200	58	4,500	26	45
Phenols (µg/kg)							
Phenol	108-95-2	420	1,200				
2-Methylphenol	95-48-7	63	63				
4-Methylphenol	106-44-5	670	670				
2,4-Dimethylphenol	105-67-9	29	29				
Pentachlorophenol	87-86-5	400	690				
Miscellaneous Extractables (µg/kg)							
Benzyl alcohol	100-51-6	57	73				
Benzoic acid	65-85-0	650	650				
Dibenzofuran	132-64-9	540	540	15	58	400	440
Hexachlorobutadiene	87-68-3	11	120	3.9	6.2		
N-Nitrosodiphenylamine	86-30-6	28	40	11	11		
Pesticides (µg/kg)							
p,p'-DDE	72-54-8	16					
p,p'-DDD	72-55-9	9					
p,p'-DDT	50-29-3	34					
Aldrin	309-00-2						
alpha-Chlordane	12789-03-6						
Dieldrin	60-57-1						
Heptachlor	76-44-8						
gamma-BHC (Lindane)	58-89-9						
Total PCBs	---	130	1,000	12	65	60	120
Tributyltin[3/]							
TBT pore water (µg/L)	56573-85-4	0.15	---				
TBT dry weight (µg/kg ion)		---	---			75	75

Notes:
1/ CAS = Chemical Abstract Service Registry Number
2/ Screening levels are normalized by the fraction of organic carbon, expressed as mg/kg-OC.
3/ Tributyltin is a Chemical of Special Concern, not a Standard List Chemical of Concern. See *Testing, Reporting, and Evaluation of Tributyltin Data in PSDDA and SMS Programs* at URL http://www.nws.usace.army.mil/dmmo/8th_arm/tbt_96.htm
--- = No numerical criterion for this chemical
µg/kg = micrograms per kilogram
µg/L = micrograms per liter
mg/kg = milligrams per kilogram

Table 4. Recommended Analytical Methods and Quantitation Limits for Sediment

Parameter	Prep Method	Analysis Method	Sample Quantitation Limit (SQL) [1/]
Conventionals:			
Total Solids (%)	---	EPA 2450-G	0.1
Total Organic Carbon (%)	---	EPA 5310B mod	0.1
Total Sulfides (mg/kg)	---	PSEP 1997	1.0
Ammonia (mg/kg)	---	Plumb 1981	0.1
Grain Size (%)	---	ASTM D-422 mod	1.0
Metals (mg/kg):			
Antimony	EPA 6010/6020 [2/]	EPA 6010/6020	0.5
Arsenic	EPA 6010/6020	EPA 6010/6020	5
Cadmium	EPA 6010/6020	EPA 6010/6020	0.5
Chromium	EPA 6010/6020	EPA 6010/6020	5
Copper	EPA 6010/6020	EPA 6010/6020	5
Lead	EPA 6010/6020	EPA 6010/6020	5
Mercury	EPA 7471	EPA 7471	0.05
Nickel	EPA 6010/6020	EPA 6010/6020	5
Silver	EPA 6010/6020	EPA 6010/6020	0.5
Zinc	EPA 6010/6020	EPA 6010/6020	5
Polynuclear Aromatic Hydrocarbons (µg/kg):			
LPAH			
Naphthalene	EPA 3550-mod	EPA 8270	20
Acenaphthylene	EPA 3550-mod	EPA 8270	20
Acenaphthene	EPA 3550-mod	EPA 8270	20
Fluorene	EPA 3550-mod	EPA 8270	20
Phenanthrene	EPA 3550-mod	EPA 8270	20
Anthracene	EPA 3550-mod	EPA 8270	20
2-Methylnaphthalene	EPA 3550-mod	EPA 8270	20
HPAH			
Fluoranthene	EPA 3550-mod	EPA 8270	20
Pyrene	EPA 3550-mod	EPA 8270	20
Benzo(a)anthracene	EPA 3550-mod	EPA 8270	20
Chrysene	EPA 3550-mod	EPA 8270	20
Benzofluoranthenes	EPA 3550-mod	EPA 8270	20
Benzo(a)pyrene	EPA 3550-mod	EPA 8270	20
Indeno(1,2,3-c,d)pyrene	EPA 3550-mod	EPA 8270	20
Dibenzo(a,h)anthracene	EPA 3550-mod	EPA 8270	20
Benzo(g,h,i)perylene	EPA 3550-mod	EPA 8270	20

Table 4. Recommended Analytical Methods and Quantitation Limits for Sediment (continued)

Parameter	Prep Method	Analysis Method	Sample Quantitation Limit (SQL) [1/]
Chlorinated Hydrocarbons (µg/kg):			
1,4-Dichlorobenzene	EPA 3550-mod	EPA 8270	20
1,2-Dichlorobenzene	EPA 3550-mod	EPA 8270	20
1,2,4-Trichlorobenzene	EPA 3550-mod	EPA 8270	20
Hexachlorobenzene (HCB)	EPA 3550/3540	EPA 8270/8081	10
Phthalates (µg/kg):			
Dimethyl phthalate	EPA 3550-mod	EPA 8270	20
Diethyl phthalate	EPA 3550-mod	EPA 8270	20
Di-n-butyl phthalate	EPA 3550-mod	EPA 8270	20
Butyl benzyl phthalate	EPA 3550-mod	EPA 8270	20
Bis(2-ethylhexyl)phthalate	EPA 3550-mod	EPA 8270	100
Di-n-octyl phthalate	EPA 3550-mod	EPA 8270	20
Phenols (µg/kg):			
Phenol	EPA 3550-mod	EPA 8270	20
2 Methylphenol	EPA 3550-mod	EPA 8270	20
4 Methylphenol	EPA 3550-mod	EPA 8270	20
2,4-Dimethylphenol	EPA 3550-mod	EPA 8270	20
Pentachlorophenol	EPA 3550-mod	EPA 8270	100
Miscellaneous Extractables (µg/kg):			
Benzyl alcohol	EPA 3550-mod	EPA 8270	50
Benzoic acid	EPA 3550-mod	EPA 8270	100
Dibenzofuran	EPA 3550-mod	EPA 8270	20
Hexachloroethane	EPA 3550-mod	EPA 8270	20
Hexachlorobutadiene	EPA 3550/3540	EPA 8270/8081	10
N-Nitrosodiphenylamine	EPA 3550-mod	EPA 8270	20
Pesticides/PCBs (µg/kg):			
DDE (p,p'-, o,p'-)	EPA 3540	EPA 8081	2
DDD (p,p'-, o,p'-)	EPA 3540	EPA 8081	2
DDT (p,p'-, o,p'-)	EPA 3540	EPA 8081	2
Aldrin	EPA 3540	EPA 8081	2
Chlordane	EPA 3540	EPA 8081	2
Dieldrin	EPA 3540	EPA 8081	2
Heptachlor	EPA 3540	EPA 8081	2
Lindane	EPA 3540	EPA 8081	2
Total PCBs	EPA 3540	EPA 8082	10
Tributyltin (µg/L) [3/]:			
TBT in pore water (µg/L Ion)	NMFS/Hoffman	Krone 1989	0.03
TBT in sediment (µg/kg)	NMFS	Krone 1989	5

Notes:
[1/] SQLs are based on dry sample weight assuming no interferences; site-specific method modifications may be required to achieve these SQLs in some cases.
[2/] Includes hydrochloric acid digestion per EPA 3050-B.
[3/] Tributyltin is a chemical of special concern; analysis of this constituent in pore-water or bulk sediment will be determined on a project-specific basis.
EPA Method 3550 is modified to add matrix spikes before the dehydration step, not after.
mg/kg = milligrams per kilogram; µg/kg = micrograms per kilogram; µg/L = micrograms per liter; % = percent;
ASTM = American Society for Testing and Materials

Table 4. Recommended Analytical Methods and Quantitation Limits for Tissue

Parameter	Prep Method	Analysis Method	Sample Quantitation Limit (SQL) [1/]
Conventionals			
Lipids (%)	Bligh/Dyer	Bligh/Dyer	0.01
Metals (mg/kg)			
Arsenic	EPA 3050B/ PSEP	EPA 200.8/ 6010/ 7060A	0.05
Cadmium	EPA 3050B/ PSEP	EPA 200.8/ 6010/ 7131A	0.05
Lead	EPA 3050B/ PSEP	EPA 200.8/ 6010/ 7421	0.10
Mercury	EPA 7471	EPA 7471	0.01
Polynuclear Aromatic Hydrocarbons (µg/kg)			
Fluoranthene	3540C, 3541 or 3550B	EPA 8270-SIM	1 - 5
Pyrene	3540C, 3541 or 3550B	EPA 8270-SIM	1 - 5
Miscellaneous Semivolatiles (µg/kg)			
Hexachlorobenzene (HCB)	3540C, 3541 or 3550B	EPA 8081	1
Pentachlorophenol	3540C, 3541 or 3550B	EPA 8270-SIM	25
Pentachlorophenol	3540C, 3541 or 3550B	EPA 8151	5
Pesticides (µg/kg)			
DDE (p,p'-, o,p'-)	3540C, 3541 or 3550B	EPA 8081	2
DDD (p,p'-, o,p'-)	3540C, 3541 or 3550B	EPA 8081	2
DDT (p,p'-, o,p'-)	3540C, 3541 or 3550B	EPA 8081	2
Chlordane (alpha, gamma)	3540C, 3541 or 3550B	EPA 8081	2
Oxy-chlordane	3540C, 3541 or 3550B	EPA 8081	2
Nonachlor (trans, cis)	3540C, 3541 or 3550B	EPA 8081	2
PCBs (µg/kg) [2/]			
PCB Aroclors	3540C, 3541 or 3550B	EPA 8082	5 - 10
PCB Congeners	3540C, 3541 or 3550B	EPA 8082	0.5 - 1.0
PCB Congeners (Low Level)	EPA 1668A	EPA 1668A	0.05 - 0.1
Dioxins/Furans (ng/kg) [3/]			
TCDD	EPA 8290/ 1613	EPA 8290/ 1613	1
Dioxins/Furans	EPA 8290/ 1613	EPA 8290/ 1613	1 - 5
Organotins (µg/kg) [3/]			
Tributyltin	EPA 3550B or NMFS	Krone	10

Notes:
[1/] All sample quantitation limits are expressed on a wet-weight basis
[2/] Selection of PCB analytical method will be determined on a project-specific basis
[3/] Dioxins/furans and tributyltin are chemicals of special concern; analysis of these constituents will be determined on a project-specific basis
mg/kg = milligrams per kilogram; µg/kg = micrograms per kilogram; ng/kg = nanograms per kilogram