ENGINEERING DESIGN REPORT
(DRAFT FINAL DESIGN)

SPOKANE RIVER UPRIVER DAM PCB SEDIMENTS SITE

Prepared for

Avista Development, Inc.

For Submittal to

Washington Department of Ecology

Prepared by

Anchor Environmental, L.L.C.

1423 Third Avenue, Suite 300

Seattle, Washington 98101

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1 INTRODUCTION

This Engineering Design Report describes the remedial design for cleanup of two polychlorinated biphenyl (PCB) sediment deposits denoted the Upriver Dam PCB Sediment Site (the site) located in Spokane County, Washington (Figure 1). Cleanup requirements at the site are more specifically described in the Consent Decree (CD) executed in August 2005 between the Washington State Department of Ecology (Ecology) and Avista Development, Inc. (Avista), which is included as an exhibit to the Final Cleanup Action Plan (CAP) prepared by Ecology for the site (Ecology 2005). Remedial design/remedial action (RD/RA) activities will be performed in compliance with the Washington Administrative Code (WAC), Washington's Sediment Management Standards (SMS) (Ecology 1995a; WAC 173-204), and the Model Toxics Control Act (MTCA) (Ecology 2001; WAC 173-340).

The work to be performed will also be consistent with the United States Environmental Protection Agency's (EPA's) September 2002 Record of Decision (ROD) for heavy metal contamination in the Coeur d'Alene Basin and Spokane River (EPA 2002). The CD and Final CAP do not provide complete remedies for contaminants other than PCBs identified within the Upriver Dam area. Rather, cleanup actions described in the CD, Final CAP, and this report are designed to mitigate risks associated with sediments containing PCBs and incidentally co-located contaminants. Heavy metal contamination in the upper reaches of the river and proposed remedial activities are discussed in the ROD. EPA is the lead agency responsible for the remediation of heavy metals originating in the Coeur d'Alene Basin and deposited in the sediments behind the Upriver Dam and elsewhere.

This report presents a concise narrative discussion of performance standards and the cleanup remedy design, and how the remedy meets standard professional engineering practices at the two PCB sediment deposits:

- Deposit 1 near Upriver Dam (Deposit 1)
- Deposit 2 near Donkey Island (Deposit 2)

1.1 Previous Investigations

As described in the Final CAP, multiple physical and chemical analysis surveys have been performed on the sediments deposits. These investigations include:

- Ecology's 1993-94 investigations (Ecology 1995b)

- Kaiser's 1994 Investigations (Hart Crowser 1995)
- Ecology's 1999 Survey (Johnson 2000)
- Ecology's 2000 Sediment Toxicity Tests (Johnson and Norton 2001)
- EPA's 2001 Coeur d'Alene Basin Remedial investigation/Feasibility Study (EPA 2001)
- Avista's and Kaiser's 2001 Investigation (Exponent and Anchor 2001)
- Avista and Kaiser's 2005 Focused Remedial Investigation Report (Anchor 2005a)
- Avista and Kaiser's 2005 Focused Feasibility Study (Anchor 2005b)

These events were analyzed to complete a characterization of the nature and extent of the PCB sediment contamination. Ecology selected 62 micrograms per kilometers (μg/Kg) total PCBs in the sediment as the cleanup level that will be protective of human health and the river ecological community. The remedy includes the placement of a minimum 13-inch cap over the identified PCB contaminated sediments at Deposit 1. For Deposit 2, the selected remedy includes excavation of two smaller deposits that contain PCB concentrations greater than 62 μg/Kg total PCBs, followed by the backfill of clean material to restore the site to its pre-construction conditions.

1.2 Description of PCB Deposits

1.2.1 Deposit 1

This fine-grained sediment deposit (Figure 2) is located within approximately 3.6 acres of the 17-acre Upriver Dam impoundment. Deposit 1 consists of relatively fine-grained (i.e., silty sand) and wood waste materials that have accumulated within deeper, lower energy portions of the former Spokane River channel immediately above Upriver Dam. Data collected during previous investigations indicate that PCB levels peak at depths well below the sediment surface, and PCB concentrations decrease steadily in shallower intervals.

1.2.2 Deposit 2

Located within an emergent wetland area within Spokane River north bank side channels near Donkey Island (River Mile [RM] 83.4), Deposit 2 (Figure 3) consists of fine-grained deposits of sediment that have come to reside in backwater channels in the Donkey Island area. These silty sand deposits overlie larger riverine materials (i.e., gravel and cobble) in these channels and are confined to low energy depositional areas. Deposit 2 is a relatively small area (approximately 0.25 acres) containing sediments with elevated PCB concentrations. The Deposit 2 area is characterized by a highly heterogeneous environment consisting of areas that are seasonally inundated as well as channels that have standing water throughout the year.

1.3 Report Organization

The report was completed in general conformance with WAC 173-340-400. The report is organized in the following sections:

- **Section 2 – Details of Deposit 1 Remediation**. This section presents the design, engineering analysis, and anticipated construction approach for Deposit 1.
- **Section 3 – Details of Deposit 2 Remediation**. This section presents the design, engineering analysis, and anticipated construction approach for Deposit 2.
- **Section 4 – Compliance Monitoring**. This section presents an overview of monitoring that will occur both during and after construction.
- **Section 5 – Construction Schedule.**
- **Appendix A** contains the draft final project design drawings.
- **Appendix B** presents the Construction Quality Assurance Project Plan (CQAP).
- **Appendix C** presents the Operations, Maintenance, and Monitoring Plan (OMMP) including any institutional controls.
- **Appendix D** presents Sampling and Analysis Plan (SAP) that accompanies the OMMP.

Also accompanying this report as a separate submittal are the draft final design specifications.

2 DEPOSIT 1 REMEDIATION

2.1 Basis of Design

Deposit 1 lies on the north side of the channel beginning approximately 150 feet upstream of Upriver Dam, and continuing approximately 2,100 feet upstream (Figure 2). Beyond the upstream boundary of Deposit 1, the river makes a slight bend that effectively directs river flow away from Deposit 1, thereby minimizing erosive forces on this sediment deposit. Deposit 1 is located in an old river channel that has retained its shape while the rest of the channel to the south of the Deposit has been subjected to lateral scour as the river turns past the bend.

The cleanup remedy for Deposit 1 includes placement of a clean cap system over relatively fine-grained surface (0 to 10 cm) sediments containing PCB concentrations exceeding 62 µg/Kg dry weight (dw). A three layer cap has been designed that provides an absorptive base layer of bituminous coal on top of the contaminated sediments. The second layer is a base cap designed to cover the coal and provide a buffer between layers. The final layer is a gravel armor layer designed to withstand reasonable worst-case erosive forces expected in this section of the river. In addition, cap placement methods have been designed to minimize mixing during cap placement and to further ensure successful construction of a protective cleanup remedy. General cap design considerations relevant to Deposit 1 are provided in the *Draft Final Focused Feasibility Study Upriver Dam PCB Sediment Site* (FS; Anchor 2005b) and the *Remedial Design Work Plan Spokane River Upriver Dam PCB Site* (RDWP; Anchor 2005c). This Engineering Design report further describes the basis of design that was presented in the *30 Percent Design Technical Memorandum* (Anchor 2006).

2.1.1 Horizontal Boundaries

Multiple surface and sub-surface sampling events have occurred in the vicinity of Deposit 1 (Figure 2) to determine the horizontal extent of surface sediments that contain PCB concentrations exceeding 62 µg/Kg dw. The results of these sampling events were presented in the FS (Anchor 2005b). The analysis of surface grabs 1SG through 9SG (Figure 2) defined the southernmost boundary of Deposit 1, as these grab samples all contained PCB concentrations below the 62 µg/Kg dw sediment cleanup standard. This southern boundary also coincides with coarser sand and gravel materials, based on visual observations during diving operations. As depicted in Sheet B1 of Appendix A, control points have been developed from these data that delineate the southern Deposit 1 sediment cleanup boundary.

The northern boundary of Deposit 1 rests against the slope of the Spokane River channel bank (control points F through O), the upper portions of which are armored with riprap. The horizontal extent of the northern edge of Deposit 1 was defined by calculating the maximum slope angle for cap placement.

Since the gradation of the coal material ranged from fine to medium sand to coarser sand, it will likely be placed at a porosity of approximately 40 percent. Material of this gradation and porosity is expected to have a friction angle of 26 to 30 degrees (Lambe and Whitman 1969). An infinite slope analysis was conducted to determine the maximum stable angle of the slope. Given the lighter weight of the coal, presence of currents, and limited uncertainty of the placement, a safety factor of 1.5 was used. The infinite slope analysis resulted in a slope angle of 18 degrees which equates to a slope gradation of 3 horizontal to 1 vertical (3H:1V). Therefore, the cap will be limited to areas flatter than 3H:1V on the northern extent.

To design the northern boundary on a construction drawing, a Geographic Information Systems (GIS) model was created to plot the slope of the northern bank of the channel near Deposit 1. The resulting data showed the various slope angles of the bank and allowed for an accurate design of the northern boundary where the slope reached 3H:1V.

The eastern extent of the Deposit 1 boundary was based on interpolated sampling data with PCB concentrations less than the 62 µg/Kg dw cleanup standard, also considering the geomorphology of the riverbed (Figure 2). Upstream of the eastern edge of the cap boundary, the river turns and coarser-grained sand and gravel deposits predominate in this area.

The western extent of the Deposit 1 boundary was also based on interpolated sampling data with PCB concentrations less than the 62 µg/Kg dw cleanup standard. The western edge of the boundary nearly extends to the Upriver Dam concrete apron (Figure 2).

2.2 Capping

2.2.1 Cap Design

As described in the RDWP (Anchor 2005c) and the *30 Percent Design Technical Memorandum* (Anchor 2006a) and summarized in the sections below, the Deposit 1 cap design follows current EPA and U.S. Army Corps of Engineers (Corps) cap design guidance (Palermo et al. 1998a and 1998b).

Detailed video, bathymetry, dive, and bottom profiling surveys of Deposit 1 were conducted during the RI (Anchor 2005a) to delineate debris (e.g., logs) that protruded more than 12 inches above the mudline. Relatively little debris was identified in Deposit 1, and no debris was identified that could potentially compromise the integrity of the cap.

The minimum thickness of the designed cap system for Deposit 1 is 13 inches. The coal layer will be placed first to a minimum of 4 inches above the starting surface mudline (Appendix A, Sheet B1). Due to its physical characteristics (e.g., specific gravity of approximately 1.3 grams per cubic centimeter [gms/cm$^{3]}$), placement of the coal layer as the initial lift of the cap will minimize mixing of the cap into the underlying sediments, concurrently minimizing potential resuspension of contaminated sediments into the water column. The coal layer will then be overlain with a minimum of 6 inches of base cap that meets design specifications. The base cap serves as a buffer between layers and provides a stable cap over the coal. The base cap will be required to contain less than 5 percent fines to minimize turbidity impacts during construction. An analysis of turbidity during construction can be found in section 2.2.8. The final gravel armor layer will be a minimum of 3 inches and was designed to withstand reasonable worst-case erosive forces expected in this section of the river. A detailed description of the erosion protection can be found in section 2.2.6. The complete cap system will have a minimum thickness of 13 inches.

Given the inherent difficulties in achieving accurate placement tolerances for in-water construction, an additional thickness ("over-placement allowance") is typically specified in capping contracts. For Deposit 1, the over-placement allowance is 6 inches for each of the three layers. The over-placement allowances are in addition to the minimum layer thicknesses summarized above, and are based on anticipated cap placement equipment (e.g., 2-cubic yard [cy] mechanical clamshell), experience at other similar capping projects, and considerations of likely contractor incentives to limit the amount of excess thickness. Therefore, the coal layer will consist of a 4-inch required minimum thickness with an over-placement allowance of 6 inches. The base cap layer will consist of a 6-inch minimum thickness with a 6-inch over-placement allowance, and the final gravel armor layer will be a minimum of 3 inches with a 6-inch over-placement allowance. The complete cap system will thus have a maximum thickness of 31 inches. Specification language includes a 6-inch average over-placement allowance per layer. The placed thickness will be verified in the field with detailed construction monitoring observations (e.g., piston core sampling) to ensure that the minimum thicknesses are attained. Cap thickness verification procedures are further discussed in the CQAP (Appendix B) and in section 2.2.10 of this report.

2.2.2 Remediation Area and Volume

The surface area of the designed cap for Deposit 1 is 151,150 square feet (sf). The coal layer has a required thickness of 4 inches with a 6-inch over-placement allowance. Thus, up to approximately 4,700 cy of coal material may be placed on the Deposit 1 cap. The base cap layer consists of a 6-inch minimum thickness with a 6-inch over-placement allowance, which equates to up to 5,600 cy of material. The final gravel armor layer will be a minimum of 3 inches with a 6-inch over-placement allowance for a total quantity of up to 4,200 cy of material. Combining all cap layers, a maximum of approximately 14,500 cy of material will be placed on Deposit 1.

2.2.3 Base Cap and Armor Layer Material

Several local potential sources of base cap and armor material are available in the Spokane area including Central Pre-mix and Rock Products, Inc. Both are potential suppliers of the appropriate grain size and quantity of material at regionally competitive prices. Once a source is selected by the contractor, assurance will be provided that imported base cap and armor material are natural, native, virgin materials and free of contaminants, including debris or recycled materials, and meet construction specifications (see CQAP; Appendix B). The contractor will inspect all materials and submit a report detailing the source, location, and date of material as well as the results of the following tests:

- Grain size distribution (American Society for Testing and Materials [ASTM] method D422-63)
- In-situ moisture content (ASTM method D2216)
- Priority Pollutant Metals (EPA publication SW846, the 6000/7000 method series)
- Volatile organic compounds (EPA publication SW846, method 8260 as modified by Puget Sound Estuarine Protocols [PSEP])
- Semivolatile organic compounds (EPA publication SW846, method 8270 as modified by PSEP)
- PCBs (EPA publication SW846, method 8082 as modified by PSEP)
- Pesticides (EPA publication SW846, method 8081 as modified by PSEP)
- Total organic carbon (Standard Methods [SM] method 5310B).

The base cap material will meet Ecology (2003) freshwater lowest apparent effects threshold (LAET) chemical guidelines and will also meet the following gradation limits:

Sieve Size	Percent Passing (by weight)
U.S. No. 4	100
U.S. No. 10	25 to 100
U.S. No. 40	20 to 60
U.S. No. 200	5 max

The armor layer material will be primarily igneous or metamorphic rock and also meet Ecology (2003) LAET chemical guidelines. The gradation limits are listed below:

Sieve Size	Percent Passing (by weight)
4-inch	100
1-inch	50 max
U.S. No. 40	20 max
U.S. No. 200	5 max

Earlier discussions presented in the *30 Percent Design Technical Memorandum* (Anchor 2006a) indicated that potential sources of gravel and sand could be found at the staging area. After inspecting the site further, these sources have been removed from consideration.

2.2.4 Bituminous Coal Material

An inventory of potential coal sources meeting the general design requirements outlined in the RDWP (Anchor 2005c) was performed as part of the initial remedial design activities, focusing on prospective sources located closest to Spokane. The results as well as detailed physical and chemical descriptions the coal source material can be found in the *30 Percent Design Technical Memorandum* (Anchor 2006a). Appendix A (Fall 2005 Coal Sampling and Analysis Data) of that report contains all of the raw data. Based on these results three acceptable coal sources were identified:

1. The Elk Valley Coal Corporation has several coal mining operations located in southern British Columbia near Cranbrook. Relatively fine-grained coal materials meeting the remedial design specifications are available from their wash plant operations and are stored submerged in a process pond.
2. The Spring Creek & Decker Mines located in the Powder River basin (Montana) provides a range of suitable coal products. The coal material is typically shipped as a sand and gravel-sized product, though finer materials are also available.
3. Palmer Coking Coal in Black Diamond, Washington provides a relatively fine-grained “buckwheat” coal product.

2.2.5 Chemical Leachability of the Coal Material

In order to assess potential short- and long-term water quality effects during and following placement of the coal in Deposit 1, representative samples were submitted for modified elutriate testing (MET; Palermo 1986) and porewater testing (Michelsen et al. 1998). Single extraction/batch tests, such as the MET, simulate the release of dissolved constituents from solid material into the water phase, and such tests commonly employ a liquid to solid ratio of 20:1 and a contact time of 24 hours to achieve steady-state or near-equilibrium conditions (Ecology 2003). Spokane River water was used as the leachant in all tests. Slurries of the different coal products were prepared for the MET and porewater tests at a concentration of 20:1 liquid to solid ratio by volume. The slurries were aerated for 1 hour (to simulate reasonable worst-case turbulence anticipated during placement), and allowed to settle for 24 hours. Water samples for

MET analysis were extracted from the midpoint of the water column. The elutriate samples were analyzed for standard water quality parameters (turbidity, total suspended solids [TSS], pH, dissolved oxygen, conductivity, and temperature), along with dissolved target metals (0.45-micron filter; arsenic, cadmium, chromium, copper, mercury, nickel, lead, and zinc). These results, along with an analysis of the Spokane River water used as the leachant, are summarized in the *30 Percent Design Technical Memorandum* (Anchor 2006a).

The coal materials that settled during the MET test were separated from the overlying elutriate and submitted for porewater extraction and testing. Porewater extractions were performed according to Puget Sound Dredge Disposal Analysis (PSDDA) protocols (Michelsen et al. 1998; http://www.nws.usace.army.mil/PublicMenu). The solids were extracted by double centrifuging and the extracted water was filtered (0.45-micron) for analysis of dissolved arsenic, cadmium, chromium, copper, mercury, nickel, lead, and zinc.

The results of the elutriate and porewater testing are presented in the *30 Percent Design Technical Memorandum* (Anchor 2006a). Most of the chemical parameters analyzed were not detected. The results demonstrate that all prospective coal products contain very low levels of potentially hazardous substances. All elutriate samples were below screening values and only one parameter (lead) exceeded the screening values for one sample (Palmer Coking Coal) in the porewater test. Because the exceedance was minor and was for one parameter, this material is still considered acceptable for use as cap material. The screening values are based on Ecology's WAC 173-201A surface water quality standards, incorporating updates promulgated under the National Toxics Rule and adopted under MTCA and WAC 173-201A. Based on bulk chemistry, elutriate, and porewater data, all three potential coal sources are considered potentially suitable for application at the site.

2.2.6 Chemical Isolation

The FS (Anchor 2005b) presented the results of remedial design level chemical transport modeling performed following current EPA and Corps cap design guidance (Palermo et al. 1998a and 1998b). The chemical isolation thickness required to ensure the long-term effectiveness of the cap systems was based on the results of one-dimensional chemical transport modeling. The model presented in Reible (1998) was used, which is an appendix to the EPA and Corps cap guidance (Palermo et al. 1998a and 1998b). The model applied to this cap design described advective/diffusive transport of PCBs through the coal layer of the Deposit 1 cap. By neglecting the additional attenuation properties of the overlying sand and armor layer, the model provides a conservative remedial design level estimate of the required thickness and material specification of the coal layer.

The one-dimensional chemical transport model revealed that long-term effectiveness of the Deposit 1 cap can be achieved by specifying a minimum coal thickness of 4 inches and a minimum carbon loading of the coal layer of 40 kilograms per square meter (kg/m^2), providing a minimum factor of safety of 4 to the overall cap design (Anchor 2005b). In order to achieve a carbon loading of 40 kg/m^2 with a minimum placed thickness of 4 inches, the coal placed in Deposit 1 must have a carbon content of at least 30 percent, assuming a coal density of 1.3 $grams/cm^3$. To ensure precision placement and optimal efficiency, the material must also be granular. Testing of the most promising coal materials identified for placement in Deposit 1 was discussed in the *30 Percent Design Technical Memorandum* (Anchor 2006a), and indicated that all three potential coal sources are potentially suitable for application at the site.

2.2.7 Erosion Protection

Cap armor design considerations relevant to Deposit 1 are provided in the FS (Anchor 2005b). Consistent with cap design guidance presented in Palermo et al. (1998a and 1998b), the surface of the Deposit 1 cap was designed to maintain its integrity under reasonable worst-case environmental and human use conditions (e.g., to resist shear stresses under a 100-year flood condition).

Stable sediment size was determined based on maximum predicted velocities that can occur at the site. These velocities were computed by dividing design flow value in the river by river cross-sectional area at the site. Avista (2004) conducted a flow analysis in the lower portion of the river and developed a 100-year flow value of 53,900 cubic feet per second (cfs) and was used as the design flow value for the analysis.

Based on this velocity, stable sediment size was computed using the following methods:

- Hjulstrom's diagram, as presented in Vanoni (1975)
- Plate B-28, entitled "Noncohesive Sediment Gradation and Permissible Velocity," as presented in the Corps' *Hydraulic Design of Flood Control Channel* (1994)
- Plate B-29, entitled "Stone Stability: velocity vs stone diameter," as presented in the Corps's *Hydraulic Design of Flood Control Channel* (1994)
- Shield's diagram, as presented in Shields (1936), based on bottom shear stress associated with channel average velocity. A Shield coefficient of 0.047 corresponding to gravel size material was used (Grindeland 2003). Bottom shear stress associated with design velocities was computed based on the following equation (WES 1998):

$$\tau = \frac{1}{2}\rho f_c U^2$$

Where:

τ represents the bottom shear stress

ρ represents the density of freshwater

f_c represents a friction coefficient

U represents the average velocity in the river

Using the four methods described above, the median stable sediment size computed for the Deposit 1 area is at or below 1 inch. The design specifications presented in section 2.2.3 were based on these calculations and should provide for sufficient stability and resistance to erosion in Deposit 1 for the following reasons:

- Deposit 1 is located in a deeper portion of the site, in a backwater area where fine sediments have accumulated.
- The bottom slope at the project area is very flat (approximately 1V:170H), and shear stress computed based on site slope and hydraulic radius (Henderson 1966) led to a relatively small size in the required erosion protection layer, indicating that finer material is theoretically stable in this region.

2.2.8 Turbidity Modeling

The Spokane River is classified as class A water under WAC 173-201A, which includes a project-related turbidity limit of less than a 5 nephelometric turbidity unit (NTU) increase over background if upstream turbidity is less than 50 NTU. If upstream background turbidity is greater than 50 NTU (which is relatively rare in the Spokane River), then up to a 10 percent increase in turbidity over the background reading is allowed. During construction, and consistent with the requirements of WAC 173-201A, turbidity standards must normally be met at a point 150 feet downstream of the Deposit 1 remedial action area, or approximately at the Upriver Dam spillway (Figure 2).

For the purposes of this remedial design, TSS mass balance and associated turbidity modeling was performed to evaluate reasonable worst-case turbidity releases that may be associated with cap placement actions in Deposit 1. The modeling was based on the following set of assumptions:

- Cap placement will occur during fall low flow conditions in the Spokane River (USGS 2006). Preliminary forecasts of river flow in the Upriver Dam area during the prospective in-water construction period (September and October 2006) range from roughly 1,000 to 3,000 cfs, consistent with historical records (Gary Stockinger, Avista; personal communication, January 2006). With an average cross-section area in the Deposit 1 vicinity of approximately 8,400 sf (Anchor 2005b), the stream velocity during the construction period may range from roughly 4 to 11 cm/sec (0.1 to 0.4 feet/sec). Given an average width in the Deposit 1 remedial action area of approximately 100 feet, and an average water depth of approximately 22 feet, discharge through the Deposit 1 remedial action area may range from 260 to 790 cfs during construction.
- Based on a review of site conditions in Deposit 1, evaluation of capping projects performed in similar environments, and discussions with regional contractors, cap placement by mechanical clamshell bucket is likely to be most efficient means of construction. Consistent with EPA and Corps cap design guidelines (Palermo et al. 1998a and 1998b), the following assumptions were made in calculating an average production rate for capping:
  - 2-cy mechanical clamshell bucket capacity
  - 75 percent bucket load efficiency

- 50 to 60 percent "up-time"
- Cycle time of 1.5 minutes
- Capping performed over one 12-hour shift per day

Based on these parameters, an average hourly cap placement production rate of 30 cy per hour is estimated for Deposit 1. This production rate includes down-time associated with movement and repositioning of the derrick barge.

- During placement, some of the fines present in the cap materials could potentially be released into the water column and may not readily settle onto the sediment surface (Palermo et al. 1998a and 1998b). These fines could potentially contribute to TSS concentrations in the downstream water column. To estimate reasonable worst-case turbidity during construction, it was assumed that up to half of the fines present in the coal and base cap could potentially be suspended into the water column and transported downstream. (However, careful placement of cap materials with a mechanical bucket would achieve considerably lower sediment suspension.) Thus, during coal placement (i.e., delivery of material with up to 38 percent fines—such as Elk Valley coal), up to 130 kg/hr of TSS could potentially be released to the water column. If the other prospective sources of coal are used (i.e., from Spring Creek & Decker Mines or Palmer Coking Coal), a lower amount of TSS (30 kg/hr or less) would be released. Similarly low TSS releases (30 kg/hr or less) are associated with sand cap placement. Based on mass balance calculations, these TSS loads equate to potential TSS increases during capping operations as follows:
  - Elk Valley Coal – TSS increases from roughly 1.6 to 4.7 mg/L
  - Spring Creek and Decker Mines or Palmer Coking Coal – TSS increases from 0.4 to 1.2 mg/L
  - Sand cap – TSS increases from 0.4 to 1.2 mg/L

- The relationship between TSS and turbidity can be variable. However, the average ratio of turbidity to TSS observed in the coal elutriate tests presented in the *30 Percent Design Technical Memorandum* (Anchor 2006a) was 3.2 NTU per mg/L. Based on this general correspondence, potential TSS increases during capping operations between 0.4 to 4.7 mg/L equate to estimated turbidity increases ranging from approximately 1 to 15 NTU. As discussed above, predicted turbidity increases will vary depending on the specific capping material used, as follows:

- Elk Valley Coal – turbidity increases from roughly 5 to 15 NTU
- Spring Creek and Decker Mines or Palmer Coking Coal – turbidity increases from 1 to 4 NTU
- Sand cap – turbidity increases from 1 to 4 NTU

These calculations reveal that if coal obtained from the Spring Creek & Decker Mines or Palmer Coking Coal is used for the Deposit 1 cap, expected construction-related turbidity increases will be below the 5 NTU increase allowed under the state water quality standards. In this situation, prospective compliance with the turbidity standard during construction is indicated without the need for further analysis. Turbidity monitoring will be performed during cap placement to verify compliance with water quality standards and to determine the need for any further operational controls (see Appendix B).

The calculations summarized above also suggest that that if Elk Valley coal is used for the lower section of the Deposit 1 cap, construction-related turbidity increases could potentially and periodically exceed the 5 NTU increase allowed under the state water quality standards. However, because of the conservative assumptions used, these calculations provide only an initial screening-level estimate of reasonable worst-case turbidity that may occur during construction. In any event, turbidity monitoring will be performed during cap placement to verify water quality compliance and to determine the need for any further operational controls (see Appendix B).

2.2.9 Access Routes and Staging Areas

Further site visits following the *30 Percent Design Technical Memorandum* (Anchor 2006a) identified that the most promising Deposit 1 staging area for this project is the western half of a currently vacant City of Spokane property located along the south shore of the river immediately upstream of Upriver Dam (Figure 4). This area is already graded and has limited vegetation and other obstructions that would preclude use of the site as a staging area. A formal right of entry request for the temporary use of the property will be submitted by Avista to the City of Spokane following submittal of this Draft Final

Design report. The prospective staging area has road access, is located in close proximity to the Burlington Northern Santa Fe mainline (Figure 1), and can be used as a platform to support mechanical (barge-based) or hydraulic (pipeline-based) methods of cap placement. Delivery trucks and construction equipment moved during the mobilization/demobilization phase will enter the site via E. Trent Road (State Road 290) to N. Waterworks Street, driving around the Police Academy to the vacant lot depicted in Figure 4. A short path may need to be built to provide access from N. Waterworks Street to the staging areas. The contractor will prepare the lot for use during construction and delivery of the specified capping material. The contractor will provide sufficient measures within the staging/stockpiling area to prevent mixing of the capping materials while also providing adequate space for loading of the material onto barges. The staging/stockpiling area will be sufficiently protected to resist erosion caused by wind and rain. Silt fences, ecology blocks, jersey barriers, and other items are examples of measures that may be used for environmental protection of the site and adjacent properties. A security fence may also be installed around the staging/ stockpiling area. A front-end loader will likely be stationed at the staging/stockpiling area to continually manage the stockpiles. Upon completion of the work, the contractor will remove all remaining capping material, barriers, liners, and other materials and clean up the site to the pre-project condition.

2.2.10 Cap Placement Methods and Quality Control

As discussed in section 2.2.2, in order to place the designed three layer capping system, up to approximately 4,700 cy of coal, 5,600 cy of base sand and 4,200 cy of gravel armor material will be purchased, delivered, and placed to the specified extents and thicknesses.

Several types of equipment and cap placement techniques have been successfully implemented on numerous capping projects in recent years, including the following:

- Direct placement with a mechanical clamshell bucket near the bottom
- Surface release from a bucket, barge, hopper, or skip box
- Spreading with hydraulic pipeline and diffuser box or plate
- Submerged diffuser or tremie
- Washing off barge with high powered jet

These potential cap placement techniques have been evaluated with respect to site conditions at Deposit 1 and relative to experience with other capping projects performed in similar environments. These techniques were also designed to minimize the mixing of the cap material with the existing sediments, thus preventing contaminated sediments from entering the water column. In addition, the physical settling characteristics of the proposed coal materials have been evaluated for their implications on construction methods.

Based on these considerations, placement by mechanical clamshell bucket is likely the most efficient means of cap construction. A pilot cap will be placed by the contractor prior to initiating the capping operations. The contractor will demonstrate their approach and techniques with a pilot cap. The pilot cap location is shown on the drawings in Appendix A. The intent of the pilot cap is to observe the contractor's proposed methods of capping for compliance with the performance criteria, assess the contractor's proposed quality control methods, and confirm successful placement of the required thickness and extent of capping material.

Subject to design refinements based on the pilot study, the following is a general description of the sequence of construction events envisioned for placement of the cap material:

- Capping material from the staging/stockpiling area will be loaded onto a scow barge most likely with a conveyor type system.
- A contractor's tug will then maneuver the scow and derrick from the docking position at the staging/stockpiling area into position at Deposit 1. To avoid surface tension and inadequate placement, the contractor will saturate the coal before placement.
- The derrick will unload the saturated coal material from the scow. Individual loads of coal material will be lowered through the water surface by a derrick using a small clamshell bucket to a depth within 2 feet of the riverbed prior to slowly releasing the material. The slow release of the coal capping material will allow the material to gently flow through the water column. The material is predicted to settle freely and evenly on the sediment surface.

- Water quality monitoring will be performed during cap placement to verify that turbidity standards are met at a point 150 feet downstream of the Deposit 1 remedial action area, or approximately at the Upriver Dam spillway. The background turbidity measurement will be made 300 feet upstream of the Deposit 1 remedial action area. Water quality monitoring at each location will target three depths: 1 foot below water surface, mid-depth, and 1 foot above the mudline. Routine ambient monitoring activities will be performed at these locations on two occasions immediately prior to the beginning of construction (to establish baseline water quality conditions) and while construction is in progress. Detailed water quality monitoring plans can be found in the CQAP (Appendix B). If turbidity above allowable limits is noted at either of the downstream locations during construction, the contractor may need to temporarily cease operations and/or develop alternate placement methods.
- At regular intervals during construction, the thickness of coal layer will be verified using piston cores or equivalent methods to ensure that the specified minimum thickness (4 inches) has been placed. Detailed verification sampling and associated quality control plans are included in the CQAP (Appendix B).
- After the coal layer has been verified as meeting the project specifications, the base sand cap layer will be placed.
- The scow will be maneuvered back to the staging/stockpiling area to receive the base cap layer material. As with the procedures for the coal material, the cap sand will be loaded onto the flat scow and maneuvered back into place next to the derrick.
- The base sand cap will be placed using a clamshell bucket opened within 5 feet of the water surface. The bucket will be opened slowly and concurrently swung from side to side. The slow release of the base sand cap will allow the material to gently flow through the water column. Because of the low percentage of fines (less than 5 percent), the material is predicted to settle freely and evenly on the coal surface.
- The base sand cap layer thickness will then be verified by cap placement quality control measures similar to those used to assess the coal layer prior to the placement of the final armor layer.

- In the same fashion as the base sand cap layer, the armor material will be delivered to Deposit 1 from above the water surface. The armor layer thickness will then be verified by cap placement quality control measures.

The clamshell bucket will be equipped with a global positioning system (GPS) to ensure accurate cap placement within the limits defined on the construction plans. In addition, a GPS grid in the derrick cab will likely be positioned in front of the cap placing derrick to provide the operator a visual guide and means of confirming placement volumes (i.e., spreading of a given bucket volume over a constant grid area).

3 DEPOSIT 2 REMEDIATION

3.1 Basis of Design

The sediment cleanup remedy for Deposit 2 includes removal of sediments containing PCB concentrations above 62 μg/Kg (representing approximately 95 percent of the total PCB mass present in sediments within the Donkey Island area), and backfilling the excavated areas and associated excavation residuals with clean sand. Design considerations relevant to Deposit 2 are provided in the FS (Anchor 2005b), RDWP (Anchor 2005c), and *30 Percent Design Technical Memorandum* (Anchor 2006a). The basis of design for Deposit 2 was primarily informed by three field efforts:

- Fall 2005 sediment sampling and chemical analysis
- March 2006 bathymetric survey
- April 2006 sediment probing

Incorporation of the 2005 and 2006 data did not substantively change the remedial design for Deposit 2 as originally described in the FS and FCAP. However, the recent data were used to refine design drawings and update excavation and backfill volumes. The new data supported development of more precise excavation designs (including overdepth allowances) for removal of contaminated sediments from Deposit 2, obviating the need for initial contractor surveys and post-excavation sediment verification sampling to determine the extent of required removal. The updated design thus improves certainty that the excavation action will achieve cleanup requirements within Deposit 2, while allowing excavation and backfill operations to proceed in a more timely and efficient manner.

3.1.1 Fall 2005 Sampling and Analysis

Sampling was conducted at Donkey Island in November 2005 to inform an appropriate remedial action in the Donkey Island area. Prior to this event, determination of the need for and scope of remedial actions in this area were based upon only a single data point (Station 40) exceeding the 62 μg/Kg dw cleanup level (sediments in nearby off-stream channels were also previously sampled and contained lower PCB concentrations).

Ten locations were sampled during the November 2005 sampling event. Sampling locations were selected in the field based upon the presence of fine-grained sediments. Although localized deposits of recently deposited soft sediments were delineated during this sampling event, the Deposit 2 area was primarily comprised of relatively coarse riverine materials (i.e., ½-inch or larger rock and gravel). Soft sediments were only observed in relatively low energy areas, and were generally located adjacent to the shoreline. The sole exception to this general shoreline distribution of soft sediment occurred within the Station 104 backwater channel, where soft sediments were found to extend roughly to the middle of the channel. Whenever the soft sediment thickness exceeded 1 foot, deeper sediments were also sampled using a hand auger. A summary of the fall 2005 sampling data is provided in Table 1 and Figure 5.

Table 1
Deposit 2 Sampling and Analysis Results

Station	Depth Interval (cm)	Total PCBs (µg/Kg dw)	Location	Field Grain Size Characteristics
100	0-7.5	**76**	Deposit 2A	43% fines; medium-fine sand and silt overlying gravel & cobble
101	0-10	**530**	Deposit 2A	1% fines; silty sand in upper 3cm, grades to gray sand
101	10-16	**160**		medium to fine sand with organic matter
101	16-56.64	31		gray to rusty sandy gravel
102	0-10	20	Deposit 2A	3% fines; medium sand with organic matter
102	10-26	**63**		medium sand with organic matter
102	26-61.56	19		medium sand with one clay layer
103	0-10	10	Deposit 2A	12% fines; organic matter with leaves
103	10-29	12		coarse to medium sand with organic matter, some cobble (2" rocks)
103	29-54.4	ND		coarse to medium sand with gravel
104	0-10	**155**	Deposit 2A	10% fines; silty organic matter
104	10-20	**221**		sandy silt and clay with organic matter
104	20-45.4	**596**		layer of clay with sandy silt
105	0-11	**96**	channel	15% fines; medium sand and silt with organic matter
105	11-29	12		medium sand, silt and some clay with organic matter
106	0-10	34	channel	11% fines; medium sand and organic matter
106	10-25	ND		fine sand and silt with organic matter
107	0-12	**275**	Deposit 2B	4% fines; medium sand with organic matter
107	12-29	**237**		fine sand and silt with organic matter and woody debris
108	0-10	13	channel	11% fines; medium to fine sand with organic matter
108	10-18	ND		coarse to medium sand and organic matter
109	0-10	ND	channel	6% fines; medium sand and silt with organic matter
109	10-19	15		coarse sand and gravel with organic matter

Bold = exceeds 62 µg/Kg dw criteria

3.1.2 March 2006 Bathymetric Survey

Scott Valentine Surveying was contracted in March 2006 to conduct a bathymetric survey of the Deposit 2 area. Their work included the following:

- Detailed bathymetric survey of the prospective Deposit 2 remedial action area, extending at least 20 feet past the edge of the water into the adjacent uplands.
- Placement of a survey control monument for use by the remedial action contractor during upcoming construction phases.
- Delineation of the edge of the wetted channel.
- Delineation of footpaths and improved trails in the area (i.e., Centennial Trail), along with fence lines, power lines, and utility poles.
- Confirmation that fence lines correspond to property lines within the survey area.

All survey data were recorded using State Plane North American Datum 1983 (NAD83), Washington North for horizontal positioning and North American Vertical Datum of 1988 (NAVD88) for vertical positioning.

Ice covering the side channels around Donkey Island prevented in-water surveying until March 2006. Once the ice thawed, the survey was completed and the data points and corresponding bathymetric/topographic map were provided to Anchor Environmental, L.L.C. (Anchor) in mid-on April 15, 2006. The data were incorporated into the design drawings provided in Appendix A.

3.1.3 April 2006 Sediment Probing Survey

Sediment probing was conducted within the two prospective Donkey Island excavation areas (Deposits 2A and 2B) on April 5, 2006. At Deposit 2A, the purpose of the probing was to more precisely delineate the vertical and horizontal extent of soft sediments within the excavation area. For Deposit 2B, the purpose of the survey was to define the horizontal extent of soft sediments and then to delineate the vertical extent of soft sediments within that area.

Sediment probing transects in Deposits 2A and 2B were delineated by laying a tape measure perpendicular to the shore and probing along the length of the tape. Observations were recorded every foot or whenever there was a change in substrate material. The soft sediment depth below the sediment:water interface was measured at each probing location by pushing a 0.5-inch diameter steel T-probe into the sediment until the soft sediment layer had been penetrated and encountered underlying compacted materials. Water depths, mudline elevations, and station positioning were determined at each location using a differential geographic positioning system (DGPS), and the data recorded in the field. The April 2006 survey results were consistent with depths of soft sediments observed during the earlier (November 2005) sediment characterization, and provided additional data to more precisely delineate the Deposit 2 excavation prisms, as discussed below. The data are summarized in a technical Memorandum presented to Ecology in May 2006 (Anchor 2006b).

3.2 Deposit 2 Excavation Prisms

3.2.1 Deposit 2A (Stations 100 to 104) Sediment PCB Concentrations

During the November 2005 field investigation, Stations 100, 101, 102, and 104 contained surficial concentrations of total PCBs above the 62 µg/Kg dw sediment cleanup level. At Station 100, the underlying clean cobble/gravel layer was observed at a depth of 3 inches below mudline. Station 101 contained low levels of PCBs (31 µg/Kg dw) in underlying sandy gravel beginning approximately 6 inches below mudline. Similarly, at Station 102, low concentrations of PCBs (less than 20 µg/Kg dw) were observed in underlying coarse sand beginning approximately 10 inches below mudline. Station 103 contained low levels of PCB (less than 20 µg/Kg dw) throughout the core, including at the sediment surface. Sediment PCB concentrations at Station 104 exceeded the 62 µg/Kg dw cleanup level throughout the depth of the core, to the maximum 18-inch depth of recovery above coarse underlying materials.

3.2.2 Basis of Deposit 2A Excavation Plan Design

The horizontal extent of Deposit 2A is bounded by the stations where previous analytical results showed non-detected or low (less than 62 µg/Kg dw) concentrations of PCBs observed to the southwest (Station 57) and to the southeast (Station 42) of Deposit 2A, and is bounded by adjacent uplands in other areas of the deposit (Figure 3). The soft sediment survey conducted in early April 2006 further refined the horizontal extent of contaminated sediments in Deposit 2A. Specifically, along the northwest bank of Deposit 2A adjacent to Stations 101, 102, and 103, an exposed nearshore cobble/gravel bed approximately 115 feet long was delineated within approximately 20 feet of the shoreline, with no overlying soft sediment. In contrast, at the southwest end of Deposit

2A (Station 100), the soft sediment surface layer was only present in nearshore areas within a 20 foot distance from the bank. On the northwest end of Deposit 2A (Station 104), 12-inch-minus rock with minimal interbedded silt and organics was present within 10 feet of the shoreline, transitioning into finer deposits further offshore. Within the vicinity of Station 104, which is located at the end of a depositional side channel, the boundary of the Deposit 2A excavation area was defined as the interface between the water surface and adjoining emergent vegetation. Restricting the excavation to this area will minimize construction-related impacts to habitat and native plants in this area.

The vertical limits of excavation within Deposit 2A were based the combined results of the fall 2005 core sampling and the spring 2006 bathymetric and poling surveys. In all cores and poling locations, the contact between the bottom of the surficial soft sediment deposit and the underlying coarse sand/gravel/cobble layer was observed between elevation 1,910.5 and 1,911.0 feet above mean sea level (MSL; i.e., within a relatively consistent elevation range of 0.5 feet). The thickness of soft sediments in this area ranged from roughly 0.25 to 1.5 feet (3 to 18 inches). Given the consistency in the elevation of the contact between the bottom of the surficial soft sediment deposit and the underlying coarse sand/gravel/cobble layer, the excavation plan specifies a required excavation elevation throughout Deposit 2A of 1,910.5 feet MSL. Due to the equipment tolerances discussed above, an additional 0.5 feet (6 inches) of over-excavation (i.e., to elevation 1,910.0 feet) will given to the contractor to ensure that they meet the required elevation (Figure 6).

3.2.3 Deposit 2B (Stations 105 to 109) Sediment PCB Concentrations

During the November 2005 field investigation, only two of the five sampling locations in Deposit 2B (Stations 105 and 107) contained surficial sediment concentrations of total PCBs above the 62 µg/Kg dw sediment cleanup level. At Station 105, the underlying clean sand layer was observed at a depth of 4 inches below mudline. Station 106 contained low levels of PCB (less than or equal to 34 µg/Kg dw) throughout the core, including at the sediment surface. Sediment PCB concentrations at Station 107 exceeded the 62 µg/Kg dw cleanup level throughout the depth of the core, to the maximum 11-inch depth of recovery above underlying gravel materials. Stations 108 and 109 contained low levels of total PCBs (less than or equal to 15 µg/Kg dw) in all sediment intervals sampled.

Because of difficult access, limited vertical and horizontal extent, and sediment concentrations that only marginally exceed the 62 µg/Kg dw sediment cleanup level, surficial sediments at Station 105 will not be removed. Surficial sediment deposits in the vicinity of Station 105 constitute less than approximately 4 percent of the total mass of PCBs delineated in the Donkey Island area. Without removal of sediments in the vicinity of Station 105, the remedial action will still achieve at least 95 percent removal of the PCB mass in Deposit 2, consistent with the Final CAP (Ecology 2005).

3.2.4 Basis of Deposit 2B Excavation Plan Design

The horizontal extent of removal near Station 107 is bounded by relatively low sediment PCB concentrations (less than or equal to 34 µg/Kg dw) observed west and east of Deposit 2B at Stations 106 and 108, respectively. The upland shoreline and the presence of relatively coarse-grained materials offshore of Station delineate the northern and southern boundaries of Deposit 2B, respectively. Soft sediments in Deposit 2B are confined to the lower energy depositional area found along the north bank. At Station 107, probing surveys performed perpendicular to the bank indicated that soft sediments extend approximately 15 to -20 feet offshore of the shoreline. Soft sediments are not evident at the eastern and western boundaries of Deposit 2B.

The vertical limits of excavation within Deposit 2B were based the combined results of the fall 2005 core sampling and the spring 2006 bathymetric and poling surveys. In all cores and poling locations, the contact between the bottom of the surficial soft sediment deposit and the underlying coarse sand/gravel/cobble layer was observed between elevation 1,913.0 and 1,913.5 feet MSL. Similar to Deposit 2A, the bottom of soft sediment deposits in this area occurred within a relatively consistent elevation range. Given the consistency in the elevation of the contact between the bottom of the surficial soft sediment deposit and the underlying coarse sand/gravel/cobble layer, the excavation plan specifies a required excavation elevation throughout Deposit 2B of 1,913.0 feet MSL. Due to the equipment tolerances discussed above, an additional 0.5

feet (6 inches) of over-excavation (i.e., to elevation 1,912.5 feet) will be given to the contractor to ensure that they meet the required elevation (Figure 6).

3.2.5 Excavation and Backfill Design

Sediments within the horizontal and vertical boundaries of the Deposits 2A and 2B excavation limits, as defined in Appendix A (Sheets C2 to C4), will be removed and the excavated area will be backfilled with clean sand such that it is returned to its near pre-excavation elevations. The excavation prism is horizontally delineated by control points that reference DGPS coordinates. These control points will be used by the contractor for the execution of the work. The vertical extent of excavation within Deposits 2A and 2B will be confirmed through post-excavation bathymetric surveys. The contractor will excavate to the required elevation as depicted on the Appendix A plans. Defining the excavation limits by control points and elevations is standard in the environmental dredging industry and the most efficient means to execute and pay for the work. The surface areas of the Deposits 2A and 2B excavation areas are 7,360 square feet (sf) and 1,340 sf, respectively. The estimated excavation volume including over excavation allowance in Deposits 2A and 2B are 550 (cy) and 50 cy, respectively.

3.2.6 Access Routes and Staging/Stockpiling Areas

During the November 2005 sampling event at Deposit 2 (described in the RDWP), prospective haul routes, access routes, and staging areas were identified (Figure 6 and Appendix A Sheets C1 and C6). In general, trucks will move along the truck haul route to and from the stockpiling/staging area. Because terrain is restrictive at Deposit 2, a front-end loader or similar equipment will be used to transport material from the excavation site to the staging/stockpiling area. This method provides the safest and most efficient means for construction at Deposit 2. Additionally, use of this method will help minimize damage to site wildlife habitat, and will limit equipment and truck traffic on the Centennial Trail.

Figure 6 depicts the truck access route that travels south from N. Raymond Road across a field owned by Centennial Properties, Inc. Use of this route would minimize impact to local neighborhoods, provide the most direct route to a major road, minimize impacts to existing habitat, reduce the construction necessary for site access, and reduce the impact and damage to the existing Centennial Trail. In addition to the backwater channel, there are also a considerable number of trees and a significant slope in the general vicinity of Deposit 2, which possibly makes driving trucks and heavy equipment closer to the site than the depicted access route dangerous and cumbersome.

Construction equipment including delivery trucks will proceed from N. Raymond Road along the access route to the traffic control point. Coordination by the contractor at the traffic control point will ensure that trucks and equipment move along the delineated road in a one-way fashion. This will minimize congestion and the need to buck up any of the larger pieces of equipment (i.e., delivery and disposal trucking).

A Deposit 2 staging/stockpiling area will be delineated in the vicinity of the truck access loop as shown in Figure 6 and will be located on the Washington State Department of Parks and Recreation property. The Deposit 2 staging/stockpiling area will be made suitable for use by the contractor by clearing any vegetation and debris. Trees that are 10 feet and higher will be left in place. Any tree that is between 2 and 10 feet and removed as part of construction will be replanted following construction activities (see Section 3.2.7 below).

The staging/stockpiling area will be sectioned to accommodate two functions. One section will be used as a staging area for delivery of the clean backfill material. This area will be sufficiently protected by the contractor from environmental conditions such as wind and rain. Ecology blocks, jersey barriers, and/or rain tarps are examples of measures that could be taken for environmental protection of the site.

The second section of the Deposit 2 staging/stockpiling area will be designated for the stockpiling of the contaminated sediments. This area will be enclosed by a suitable barrier (Jersey barrier, "ecology" blocks, or a similar method) and lined along the inside of the enclosure with an impermeable liner of polypropylene or similar material to minimize the discharge of water or sediment from the stockpile area (Appendix A, Sheet C1). The excavated material from Deposits 2A and 2B will be placed within this enclosure and allowed to passively dewater prior to shipment to the disposal facility. Because of the considerable sand content of the target sediments, passive dewatering is likely to proceed relatively quickly (within 2 days), and gravity should be sufficient to dewater the sediments. If additional dewatering is needed prior to transport, lime or Portland cement additives may be needed. Further details on sediment dewatering can be found in section 3.2.10.

A security fence will likely be installed in the staging/stockpiling area for safety precautions as well as security measures. The Centennial Trail will also be regulated by the contractor to allow safe public use during construction.

Upon completion of the work at Deposit 2, the contractor will remove all remaining backfill material, barriers (sandbags), liners, and other materials and clean up the site to the pre-project condition.

3.2.7 Habitat Protection

The area surrounding Deposit 2 is a unique ecological environment featuring various native vegetation communities of plants, bushes, and grasses. Several strands of mature trees also exist in the area, which provide cover and large woody debris habitat functions to the Spokane River. In order to practicably minimize disturbances to existing habitat in the vicinity of Deposit 2, the contractor will adhere to the requirements of a Habitat Protection Plan (HPP) to be prepared for the remedial action. The haul and access routes, staging and stockpiling areas and excavation boundaries of the HPP will be established in the final (100 Percent) design plans and specifications. A vegetative survey is ongoing and will be incorporated into the HPP provided as part of the final design submittal. The results of the survey will also serve as the baseline pre-construction condition at Deposit 2, and will identify native vegetative communities in the project area that could be impacted during construction. The HPP will detail the contractor's restoration requirements following completion of construction and provide guidance on bush removal, live storage, replanting, and tree protection.

Though care will be taken as practicable to preserve existing habitat in the Deposit 2 area, some construction related impacts are unavoidable and will be mitigated by reasonable restrictions, construction management practices, and restoration requirements to be detailed in the HPP. Table 2 lists some potential habitat impacts and the contractor actions that will limit disturbance and help ensure that Deposit 2 rapidly returns to its near pre-construction condition upon completion of the work.

Table 2
Mitigation Measures for Deposit 2 Areas Impacted by Construction

Impacted Area	Mitigation Measure
Delivery Truck Haul Route	Haul routes are restricted to existing trails. Base course or fabric may be used by the contractor to prevent major disturbance of the trail. Haul routes will be returned to near-existing grade and condition.
Access Routes to Deposits	Access routes will be limited to areas delineated on the drawings. Access routes will be along existing footpaths or in-water routes. Paths will be regraded and restored as practicable upon completion.
Staging/Stockpiling Area	The Engineer will mark designated areas prior to construction, which Impacted area is a grassy field that can be reseeded. Mature trees over 10 feet tall will be protected.
Excavation Areas	Contractor will submit work plan for approval prior to construction. Wheeled or low ground pressure vehicle may be used by the contractor. Contractor can excavate from the water.

3.2.8 Water Quality Controls in Backwater Channel

A turbidity containment system will be placed in the channel around the remediation areas of Deposit 2 (Appendix A, Sheet C1). Sand bags or a similar product will be placed in the channel to prevent turbidity releases outside of the work area. Except during extreme high flows and flood events, minimal flow exists in the backchannel surrounding Deposit 2 and the water depth ranges from 1 to 4 feet. No other water quality controls are anticipated.

3.2.9 Sediment Removal

The construction sequence for the removal of contaminated sediments at both Deposits 2A and 2B is generally described below:

- Once the turbidity containment system is in place, an excavator or similar equipment will remove the specified amounts of material from Deposit 2.
- Access between the staging/stockpiling areas and the deposits will be confined to in-water routes or upland routes delineated in Sheet C6 of Appendix A.

- Excavation will be conducted in the water or from the designated boundaries as depicted in Sheet C6 of Appendix A. These boundaries are designed to minimize impacts and disturbances, as practicable, to the valuable ecological habitat that exists in the vicinity of Deposit 2. Even while operating in these boundaries, the contractor will be encouraged to exercise great care to minimize construction impacts.
- The excavated material will be placed in an earthmover (such as a small front end loader) and moved to the Deposit 2 staging/stockpiling area via the access route depicted in Figure 6.
- Upon completion of the work at Deposit 2, the access routes and staging/stockpiling areas will be returned to the near pre-construction conditions, as described in section 3.2.7, the habitat protection section above.

Earthmoving equipment used by the contractor will conform to specifications concerning spillage and containment of the sediment as it is transferred to the staging/stockpiling area.

3.2.10 Sediment Dewatering

The excavated sediment will be stockpiled in the contaminated sediment containment area (Appendix A, Sheet C1) and allowed to passively dewater before transfer to disposal trucking. The free water and interstitial water in these sediments that drains off during this process will be collected in the containment facility. All of the entrained water will be discharged back to the excavation area.

In order to pass the Paint Filter Liquids Test that may be required at some disposal facilities, the contractor may elect to mix approved additives with the sediments to bind available water. However, several regional landfills currently do not require conformance with the Paint Filter Liquids Test, as free water is beneficial to landfill degradation processes at these locations. Upon completion of the work, the contractor will remove residual excavated sediments, barrier materials, liners, and other materials and clean up the site to the pre-project condition in accordance with the requirements outlined in the section 3.2.7 habitat plan described above.

3.2.11 Sediment Transport and Disposal

Depending on the facility utilized for disposal, the excavated material may be taken in trucks to the landfill operator's rail transfer station where it will be loaded on rail cars for shipment, or it may be transported by truck directly to the landfill site. The contractor will utilize appropriate controls, such as lining truck beds or rail containers, and/or covering loads, to prevent any loss of excavated material during transport. Special care will be taken to prevent spillage onto public roadways or adjacent property and any such spillage will be promptly cleaned up. Some regional disposal facility locations for the excavated sediment are listed below. This is not a complete list of locations and the contractor may elect to propose another location for approval:

1. Regional Disposal Company
   Roosevelt Regional Landfill
   Klickitat County, Goldendale, Washington
2. Oregon Waste Systems (Subdivision of Waste Management, Inc.)
   Columbia Ridge Landfill and Recycling Center
   Arlington, Oregon

The contractor will make arrangements for transportation and disposal or treatment of the excavated material with the upland disposal facility operator. However, the responsibility for satisfactory disposal or treatment will remain with the contractor.

3.2.12 Backfill of Removal Areas

Clean sand material meeting specifications will be purchased from a regional supplier and delivered to the Deposit 2 staging/stockpiling area. The backfill material will meet Ecology (2003) freshwater LAET chemical guidelines and conform to the following gradation specifications:

Sieve Size	Percent Passing (by weight)
U.S. No. 4	100
U.S. No. 10	25 to 100
U.S. No. 40	20 to 60
U.S. No. 200	10 max

Once the excavation of the contaminated material is complete, an earthmover will transport the clean sand to the Deposit 2 site where it will be placed by the excavator. The description of the construction sequence for Deposits 2A and 2B is generally described below:

- A clean bucket of backfill material will be placed just above the surface of the water.
- After the appropriate amount of backfill material has been placed, the sand surface will be verified to ensure the specified thickness is achieved.
- Because the site is small and the water is relatively shallow, the contractor will develop approved on-site backfill quality control measures. Staking a gauge on the edge of the deposit prior to the backfill material being placed and measuring the thickness once placed is one method that could be used.

Upon completion of the backfill, the deposit and excavation area will be restored by the contractor to its approximate pre-excavation condition as detailed in section 3.2.7 the habitat protection plan described above in order to preserve the shoreline and river riparian/backwater habitat surrounding Deposit 2.

4 COMPLIANCE MONITORING

4.1 Construction Monitoring

Based on successful cap placement approaches used at other similar sites (e.g., Anchor 2001), the contractor will subdivide the 3.6-acre Deposit 1 cap area into approximately 60 grid areas, each measuring approximately 50-feet by 50-feet, to ensure cap placement quality control. The following sequence generally describes the methods for verifying the cap thickness of each layer:

- The contractor will calculate the volume or tonnage of specific material for the first two layers (e.g., coal and sand base cap) required to be placed in each capping grid, and will monitor the delivered quantity of material to each grid.
- Once the target quantity of material has been placed within the grid, a piston core will be collected at a random position within the grid to verify the cap thickness. The piston core tubing will be made of a clear polycarbonate material that allows for efficient visual identification of the layers of the cap.
- If the minimum thickness of the cap has been achieved in that grid, then the contractor will proceed to the next grid. If the minimum thickness of the cap layer is not obtained, then additional material will be placed throughout the grid and the sector re-verified through additional random piston coring. The volume or tonnage of cap material placed during subsequent cap placements will be adjusted based on the preceding core observations.

This general method will be used for the first two layers of the cap to ensure that the specified thicknesses are placed. A detailed bathymetric survey will be used to verify the armor layer thickness. Additionally, a bathymetric survey of the capping area (with each survey meeting quality control requirements used for the RI; Anchor 2005a) will be completed prior to construction (baseline condition). The piston core observations and bathymetric surveys will together provide the as-built record of cap thicknesses placed in Deposit 1. Detailed cap placement quality control plans are discussed in detail in the CQAP (Appendix B).

4.2 Long-Term Monitoring

Long-term performance and confirmation monitoring activities are scheduled to be the basis of Ecology's 5-year review of the effectiveness of the remedial action at Deposit 1.

Scheduled monitoring events will occur in Years 2 and 4 following cap construction. Unscheduled monitoring events will occur following the occurrence of a 50-year or higher flood event. Remedial action will also be conducted at Deposit 2; however, long-term sampling and monitoring is not required in that area. The long-term physical performance monitoring of the cap surface will be conducted to verify that the cap maintains its integrity and does not substantially erode over time by natural and anthropogenic forces following construction. Confirmation monitoring of surface and subsurface sediments will also be conducted, including chemical (PCB) monitoring of the Deposit 1 cap, to verify that the 62 µg/Kg dw sediment cleanup level is maintained. Institutional controls, compliance monitoring, and contingency responses are described in the OMMP (Appendix C).

5 CONSTRUCTION SCHEDULE

Figure 7 presents a Gantt chart that depicts a likely schedule for the remedial design and remedial action activities. Figure 7 is consistent with the CD and represents Avista's best estimate of time frames, sequences, and submission dates based on the provisions of the CD. Since many of the key dates are dependent upon review and approval by Ecology or other activities (e.g., receipt of validated data), the dates in Figure 7 should not be considered firm dates.

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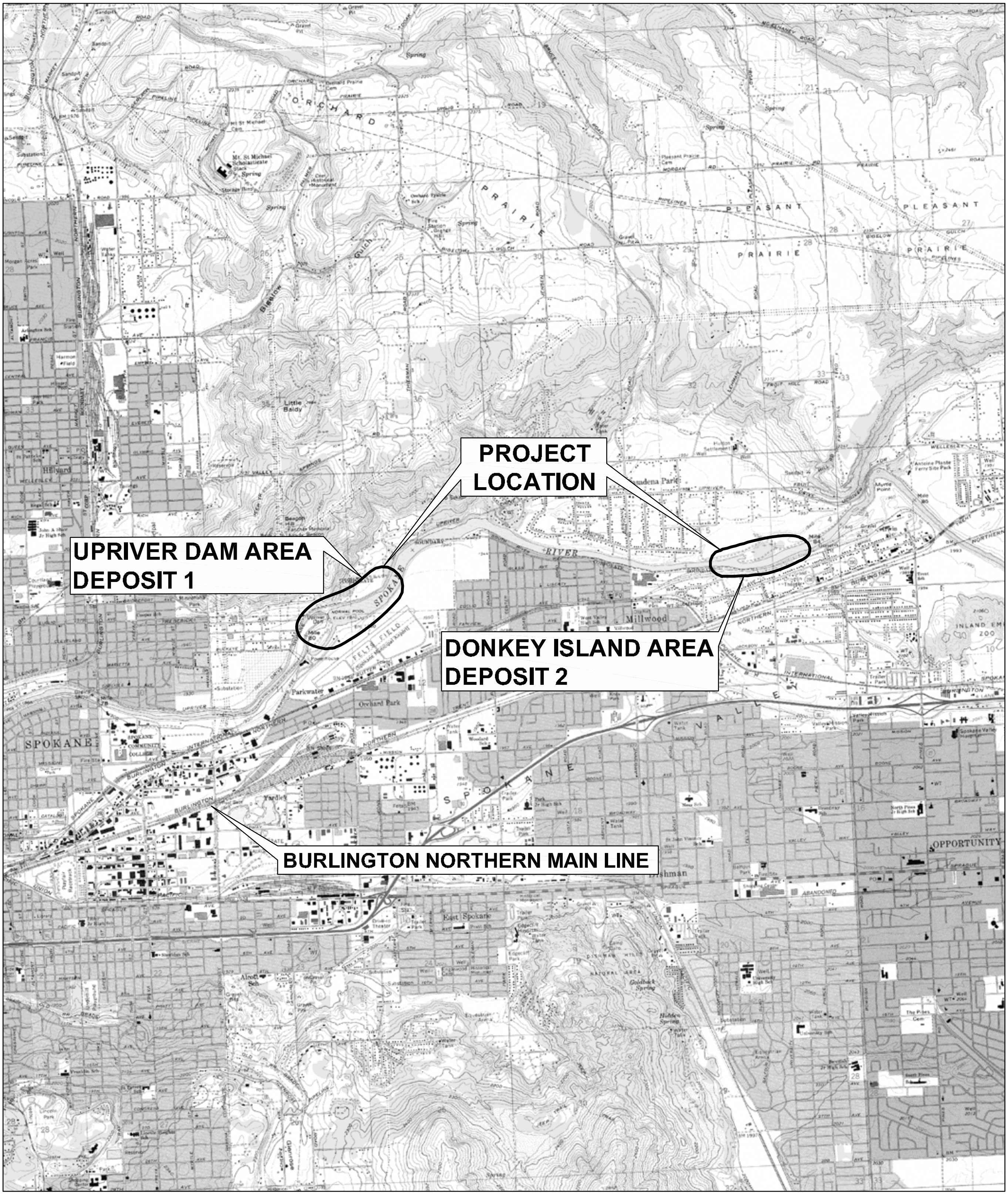
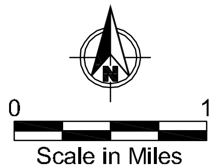
FIGURES



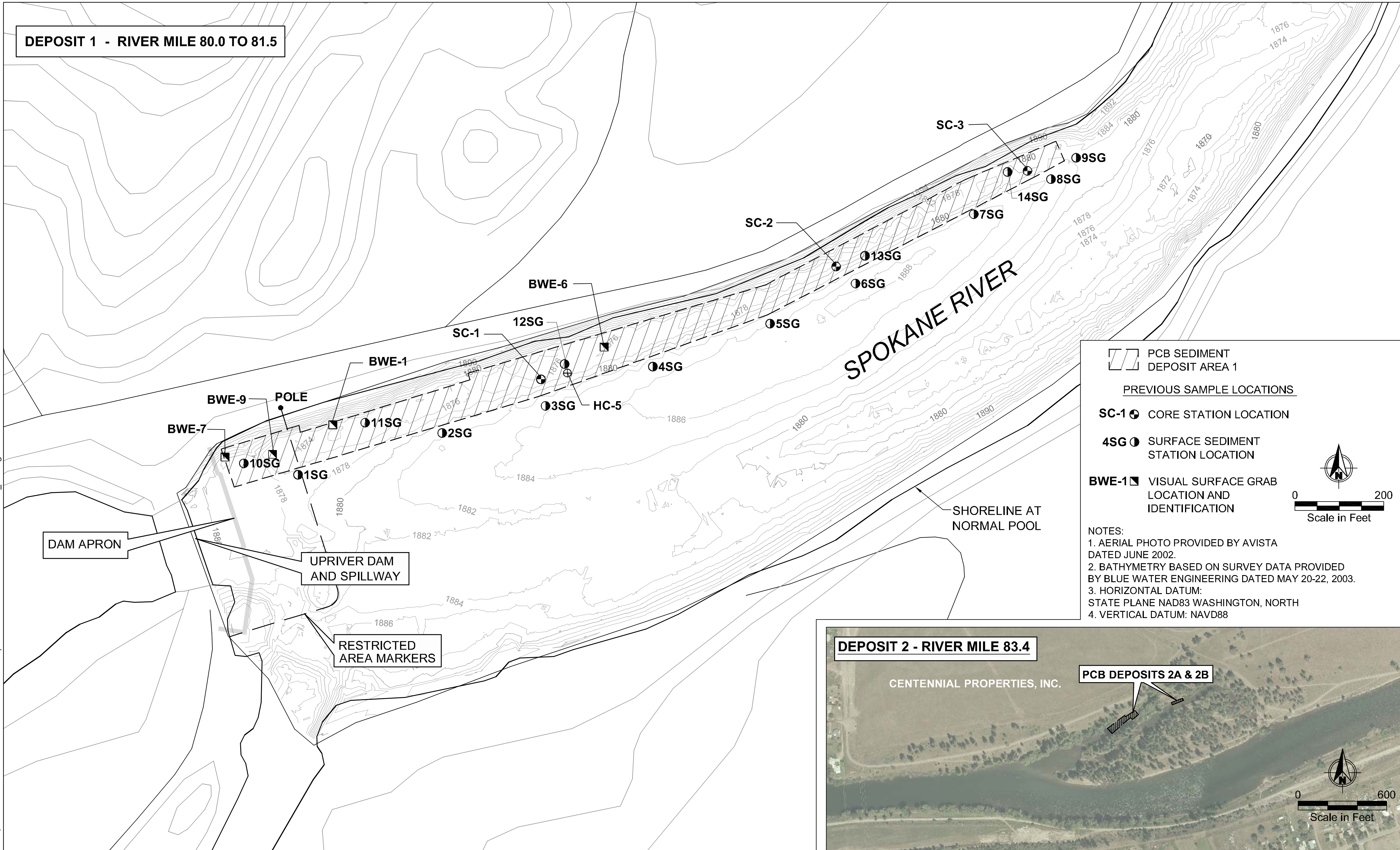
Note: Base map prepared from Terrain Navigator Pro USGS 7.5 minute quadrangle maps of Green Acres and Spokane NE, Washington.



Jun 05, 2006 11:41am cdavidson K:\Jobs\050306-Upriver\05030601\05030601-18.dwg FIG 1

Figure 1
Site Location
Upriver Dam PCB Sediment Site

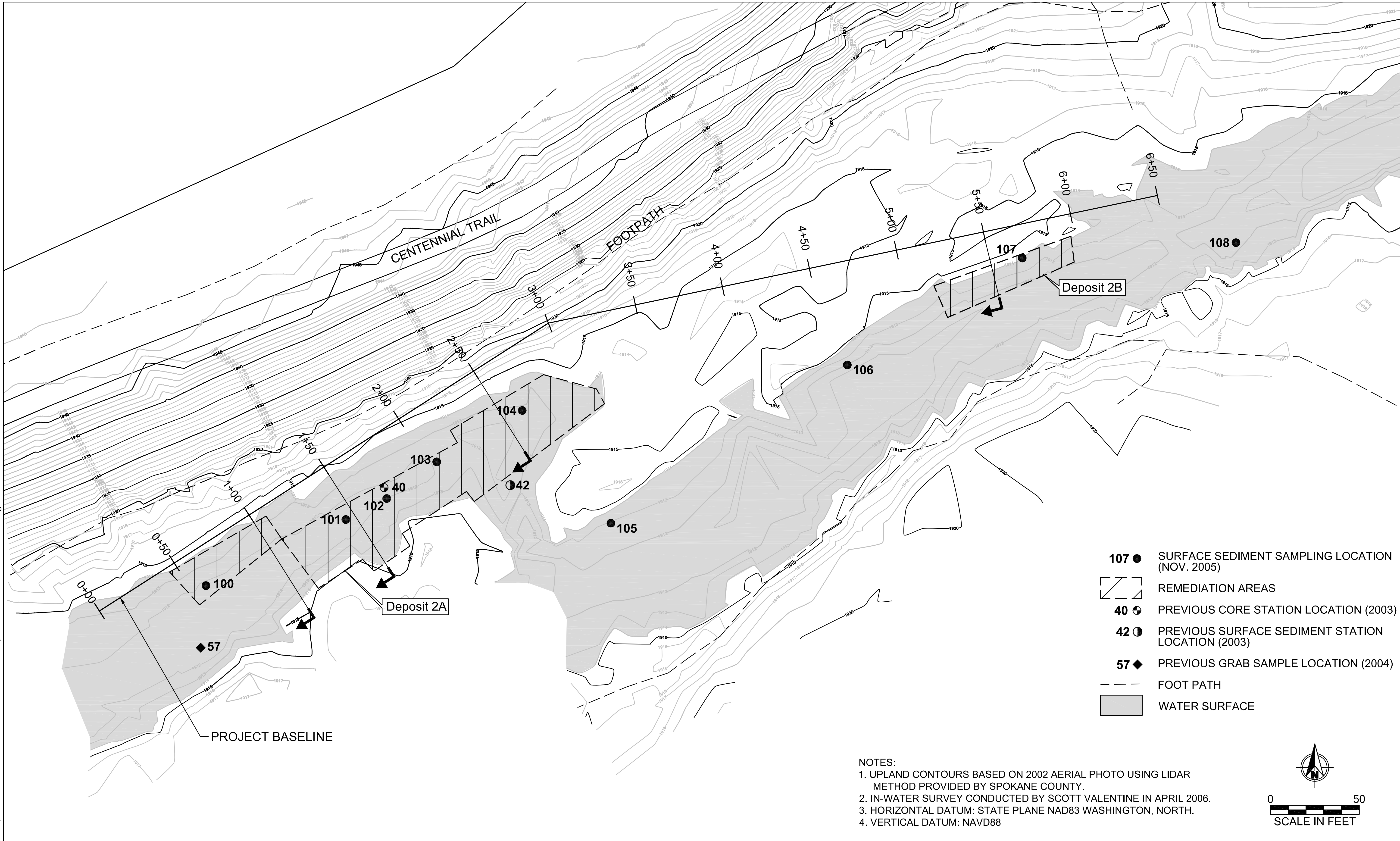
ANCHOR ENVIRONMENTAL, L.L.C.



Jun 05, 2006 11:44am cdavidson K:\Jobs\050306-Upriver\05030601190 Percent\0503060114_90.dwg FIG 2 EDR

ANCHOR ENVIRONMENTAL, L.L.C.

Figure 2
Deposit 1 Site Overview
Upriver Dam PCB Site Project



Jun 07, 2006 9:48am cdavidson K:\Jobs\050306-Upriver\05030601\05030601-30.dwg FIG 3

ANCHOR ENVIRONMENTAL, L.L.C.

Figure 3
Deposit 2 Sampling Locations and Remediation Areas
Upriver Dam PCB Sediment Site

•O CONTROL POINT LOCATION AND DESIGNATION

CONTROL PT.	NORTHING	EASTING
O	269240	2504211
P	269511	2504049
Q	269136	2504096
R	269200	2504152
S	269466	2504014
T	269381	2503961
U	267705	2502512
V	269307	2503956

NOTES:

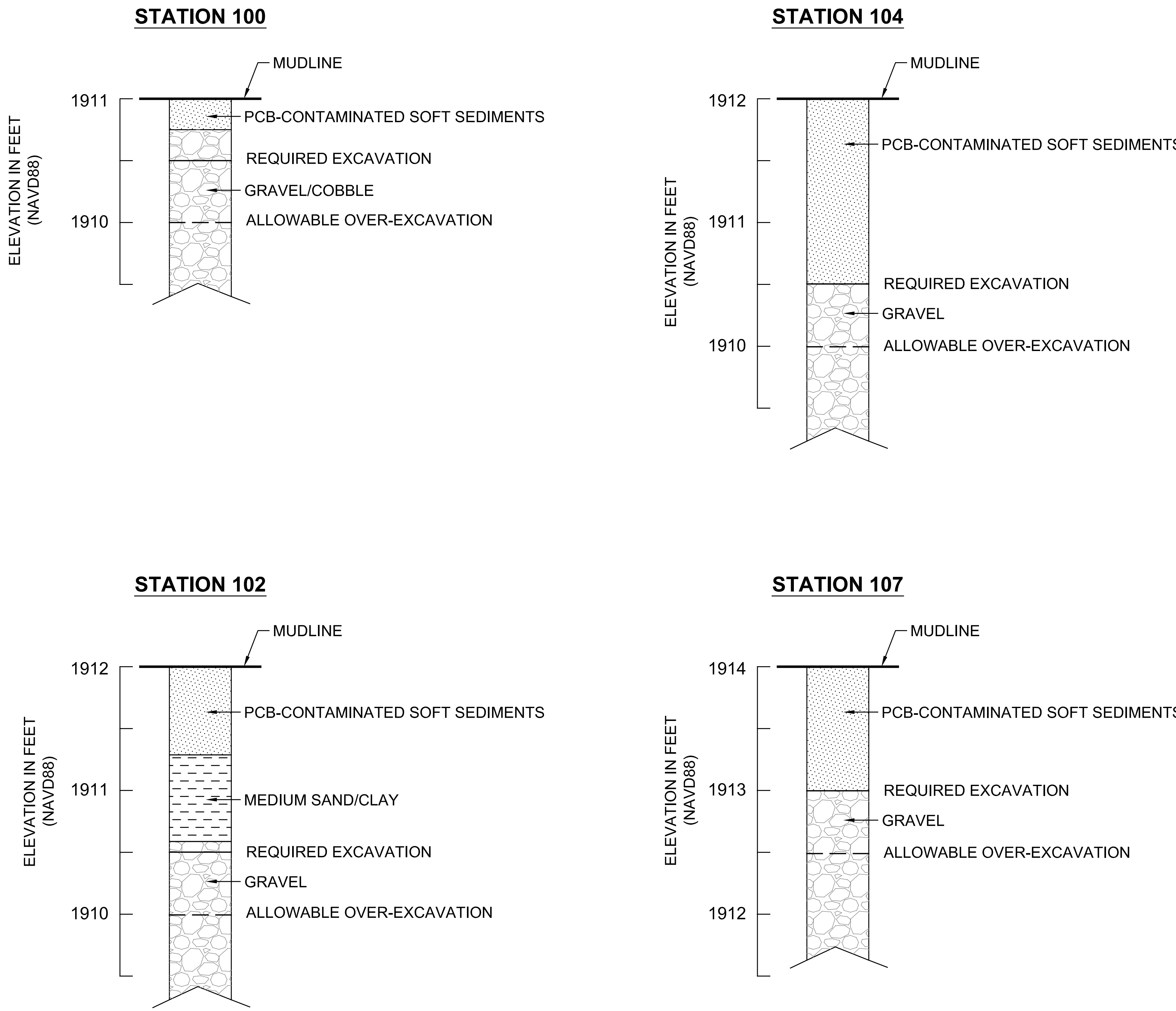
1. MINOR ROAD IMPROVEMENTS CAN BE MADE TO EXISTING ACCESS ROUTS. (I.E. GRADING GRAVEL)
2. STAGING/STOCKPILING AREA AND ACCESS ROUTE SHALL BE RETURNED TO PRE-CONSTRUCTION CONDITION UPON COMPLETION OF WORK.
3. CONTRACTOR SHALL CONFINE STAGING/STOCKPILING OPERATIONS TO DESIGNATED AREA.
4. CONTRACTOR SHALL MINIMIZE NOISE AND DUST POLLUTION DURING OPERATIONS.
5. EQUIPMENT HEIGHT RESTRICTED TO 56' ON ACCESS ROAD.
6. AERIAL PHOTO PROVIDED BY AVISTA DATED JUNE 2002.
7. BATHYMETRY BASED ON SURVEY DATA PROVIDED BY BLUE WATER ENGINEERING DATED MAY 20-22, 2003.
8. HORIZONTAL DATUM: STATE PLANE NAD83 WASHINGTON, NORTH
9. VERTICAL DATUM: NAVD88

0 300
Scale in Feet

Jun 07, 2006 10:21am cdavidson K:\Jobs\050306-Upriver\050306011\00% Final Draft\050306601-19_100.dwg FIG 4 EDR

ANCHOR ENVIRONMENTAL, L.L.C.

Figure 4
Deposit 1 Site Access Plan
Upriver Dam PCB Sediments Site



NOTES:
1. SAMPLING STATION DETAILS ARE GRAPHIC DEPICTIONS ONLY AND NOT INTENDED FOR CONSTRUCTION PURPOSES.
2. VERTICAL DATUM NAVD88.
3. STATIONS SAMPLED USING HAND-HELD SURFACE GRAB METHODS IN NOVEMBER 2005.
4. SOFT SEDIMENT SURVEY DATA COLLECTED IN NOVEMBER 2005 AND APRIL 2006.
5. MUDLINE ELEVATION FROM SURVEY CONDUCTED IN APRIL 2006 BY SCOTT VALENTINE SURVEYING.

ANCHOR ENVIRONMENTAL, L.L.C.

Figure 5
Deposit 2 Sampling Station Cores
Upriver Dam PCB Sediment Site

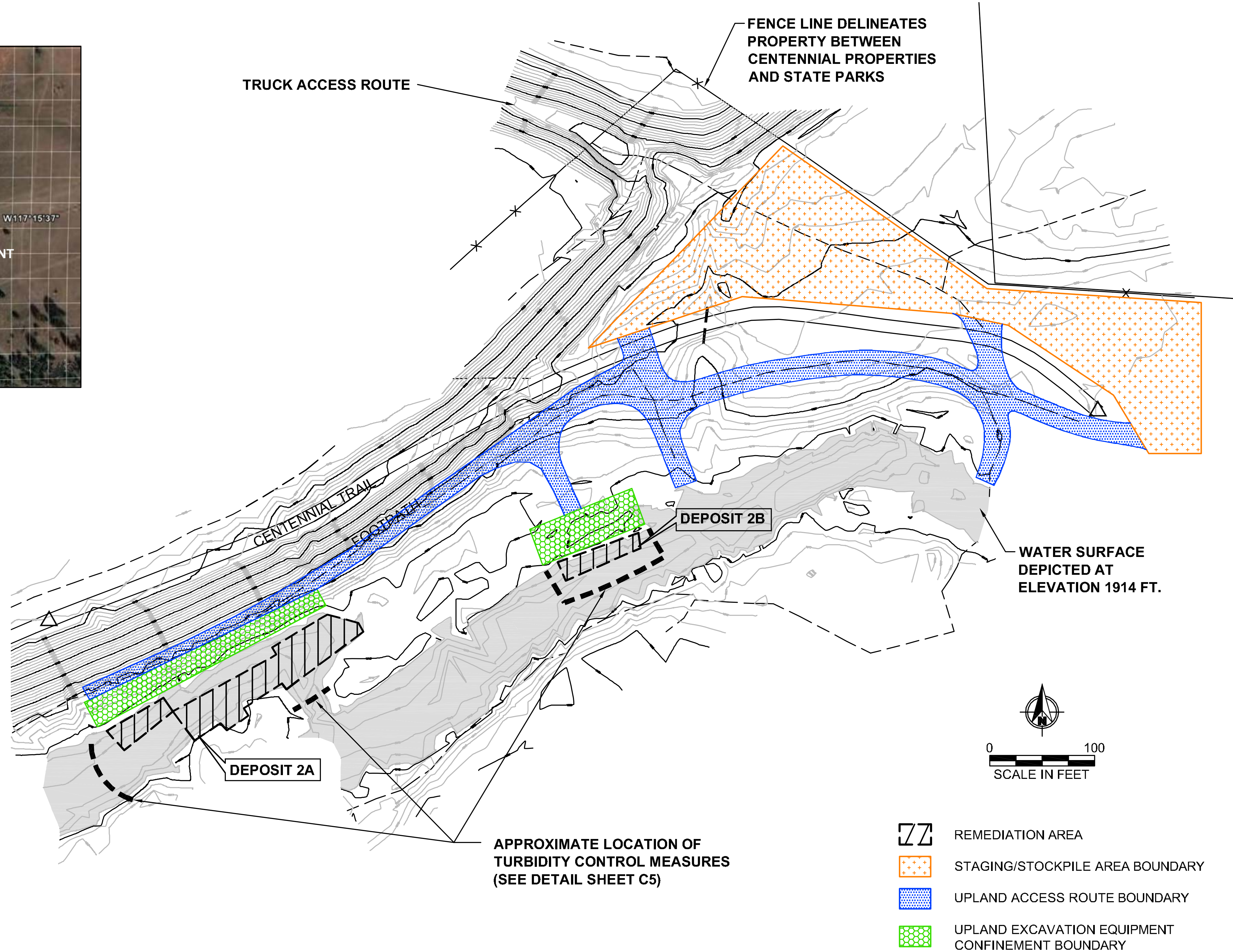
DEPOSIT 2 - RIVER MILE 83.4

NOT TO SCALE

HAUL ROUTE

NOTES:

1. UPLAND CONTOURS BASED ON 2002 AERIAL PHOTO USING LIDAR METHOD PROVIDED BY SPOKANE COUNTY.
2. IN-WATER SURVEY CONDUCTED BY SCOTT VALENTINE SURVEYING IN APRIL 2006.
3. HORIZONTAL DATUM: STATE PLANE NAD83 WASHINGTON, NORTH.
4. VERTICAL DATUM: NAVD88
5. ALL STAGING/STOCKPILING OPERATIONS SHALL BE CONFINED TO STATE PARK PROPERTY.
6. CONSTRUCTION SIGNAGE WARNING THE PUBLIC SHALL BE PLACED NEAR THE DESIGNATED LOCATIONS AND REMAIN IN PLACE UNTIL PROJECT COMPLETION.
7. THE CONTRACTOR SHALL ECERCISE GREAT CARE IN PROTECTING THE ECOLOGICAL HABITAT IN THE VICINITY OF DEPOSIT 2.
8. THE CONTRACTOR SHALL STAY WITHIN DESIGNATED UPLAND ACCESS ROUTE BOUNDARIES WHEN TRAVELING BETWEEN THE EXCAVATION AREAS AND THE STAGING AND STOCKPILING AREAS. CONCTRACTOR MAY CHOOSE ANY WATERBORNE ROUTE TO ACCESS DEPOSIT 2A AND 2B.
9. THE CONTRACTOR SHALL LIMIT EXCAVATION AND BACKFILL ACTIVITIES TO THE WATER OR THE DESIGNATED EXCAVATION AREAS.
10. THE CONTRACTOR SHALL LIMIT TRAVEL ON THE PAVED CENTENNIAL TRAIL TO THE EXTENT POSSIBLE.
11. A VEGETATIVE ASSESSMENT SURVEY OF THE DEPOSIT 2 AREA IS ONGOING. THE RESULTS OF THE SURVEY WILL COMPLETE THIS PLAN AND INCLUDE DETAILS ON TREE PROTECTION, LWD REMOVAL AND REPLACEMENT, AND ACCESS RESTRICTIONS IN SENSITIVE AREAS IMPACTED BY CONSTRUCTION ACTIVITIES IN ACCORDANCE WITH THIS PLAN.
12. THE CONTRACTOR SHALL BE RESPONSIBLE FOR RESTORATION OF AREAS IMPACTED BY CONSTRUCTION ACTIVITIES IN ACCORDANCE WITH THIS PLAN.
13. COMPLIANCE WITH THIS PLAN WILLL BE VERIFIED BY THE ENGINEER BOTH DURING AND UPON COMPLETION OF CONSTRUCTION.



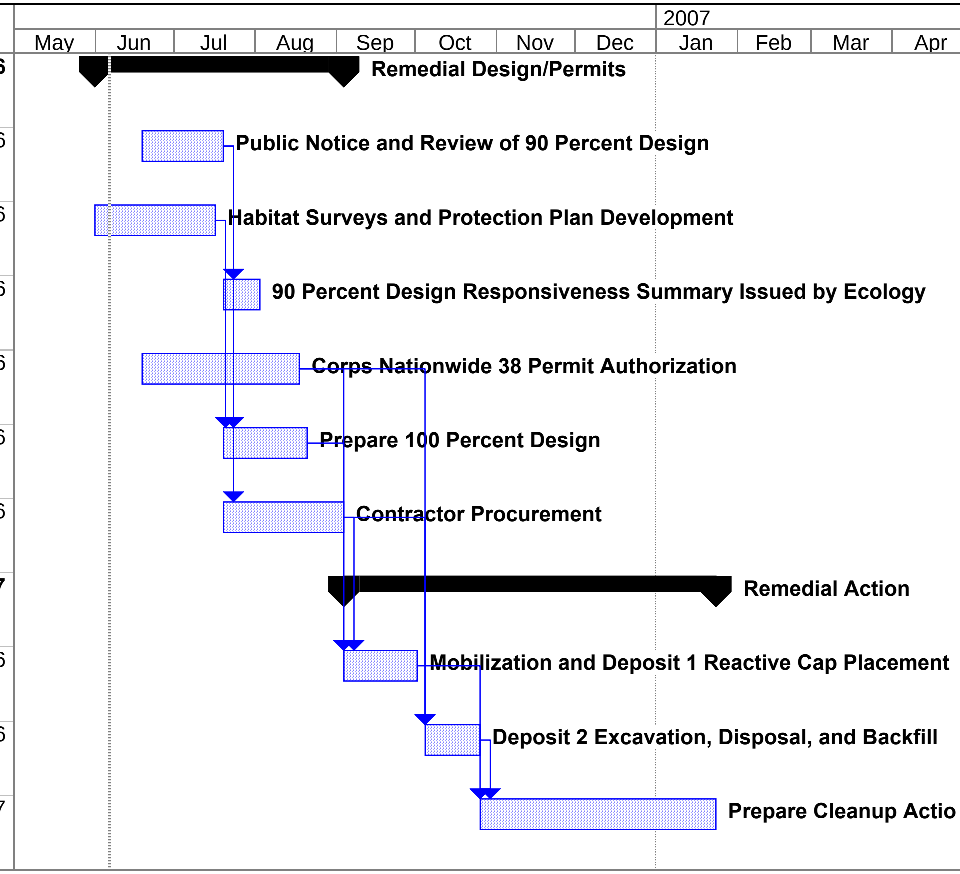
Jun 07, 2006 9:57am cdavidson K:\Jobs\050306-Upriver\05030601\100% Final Draft\05030601-002.dwg FIG 6

ANCHOR ENVIRONMENTAL, L.L.C.

Figure 6
Deposit 2 Access Routes and Staging/Stockpiling Areas
Upriver Dam PCB Sediments Site

Figure 7
Timeline for Upriver Dam PCB Sediment Site RD/RA
June 6, 2006 Update

ID	Task Name	Finish
1	**Remedial Design/Permits**	**Mon 9/4/06**
2	Public Notice and Review of 90 Percent Design	Thu 7/20/06
3	Habitat Surveys and Protection Plan Development	Mon 7/17/06
4	90 Percent Design Responsiveness Summary Issued by Ecology	Thu 8/3/06
5	Corps Nationwide 38 Permit Authorization	Fri 8/18/06
6	Prepare 100 Percent Design	Mon 8/21/06
7	Contractor Procurement	Mon 9/4/06
8	**Remedial Action**	**Wed 1/24/07**
9	Mobilization and Deposit 1 Reactive Cap Placement	Mon 10/2/06
10	Deposit 2 Excavation, Disposal, and Backfill	Thu 10/26/06
11	Prepare Cleanup Action Report	Wed 1/24/07



Project: Upriver Dam Schedule - 6-6-0
Date: Tue 6/6/06

Task	Milestone	External Tasks
Split	Summary	External Milestone
Progress	Project Summary	Deadline

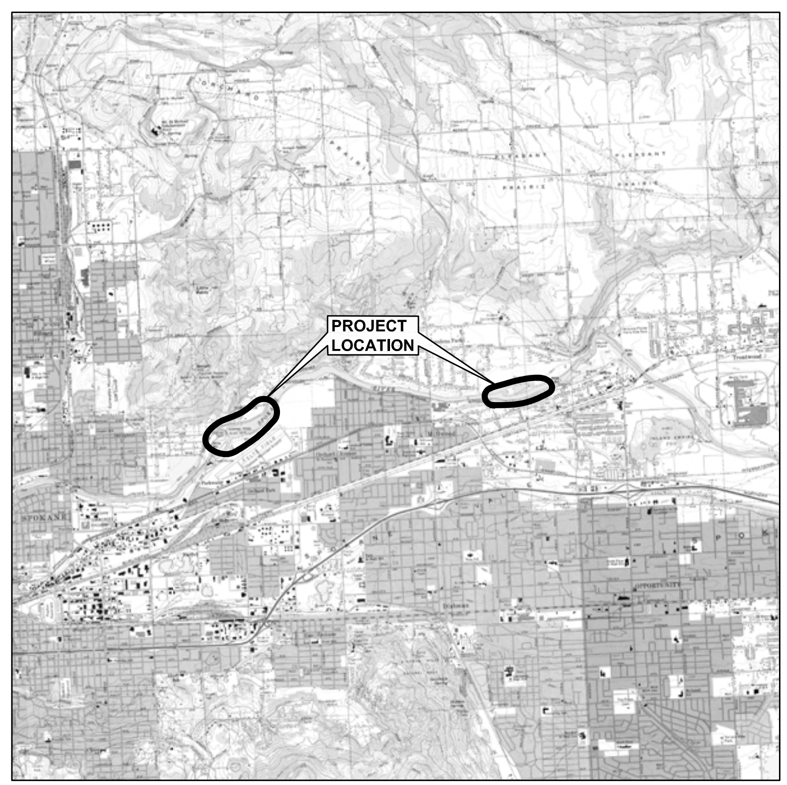
APPENDIX A
DRAFT FINAL DESIGN DRAWINGS

DRAFT FINAL DESIGN
UPRIVER DAM PCB SITE PROJECT
SPOKANE RIVER
SPOKANE, WASHINGTON

PROJECT VICINITY

NOT TO SCALE

PROJECT AREA



NOTE: BASE MAP PREPARED FROM TERRAIN NAVIGATOR PRO USGS 7.5 MINUTE QUADRANGLE MAPS OF GREEN ACRES AND SPOKANE NE, WASHINGTON.

0 2
SCALE IN MILES

DRAWING INDEX

SHEET	SHEET DESIGNATION	SHEET TITLE
1	A1	COVER SHEET
2	A2	DEPOSIT 1 SITE OVERVIEW
3	A3	DEPOSIT 1 SITE ACCESS PLAN
4	B1	DEPOSIT 1 CAPPING PLAN
5	B2	DEPOSIT 1 CAPPING PLAN CROSS SECTIONS
6	B3	DEPOSIT 1 CAPPING PLAN CROSS SECTIONS AND CAPPING DETAIL
7	C1	DEPOSIT 2 ACCESS & TURBIDITY CONTROL PLAN
8	C2	DEPOSIT 2 EXCAVATION PLAN
9	C3	DEPOSIT 2 CROSS SECTIONS
10	C4	DEPOSIT 2 CROSS SECTIONS
11	C5	DEPOSIT 2 DETAILS
12	C6	DEPOSIT 2 SAMPLING STATION DETAILS

ANCHOR ENVIRONMENTAL, L.L.C.
1423 3rd Avenue, Suite 300
Seattle, WA 98101 (206) 287-9130

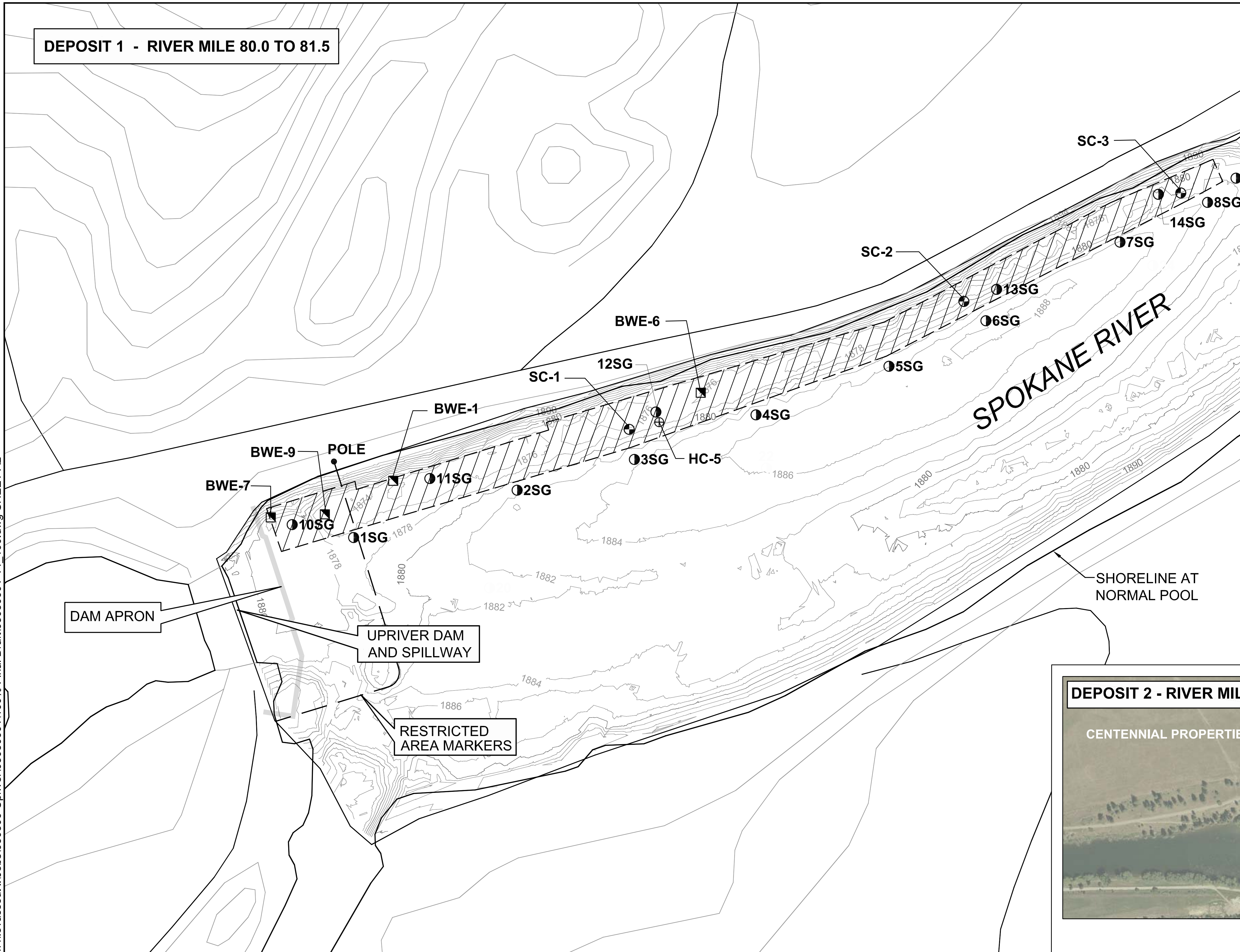
AVISTA Utilities

DESIGNED BY: B. PATTERSON
DRAWN BY: C. DAVIDSON
CHECKED BY:
APPROVED BY: J. VERDUIN
SCALE: AS SHOWN
DATE: MAY 2006

SHEET NO. 1 OF 12

A1

NOT FOR CONSTRUCTION



PCB SEDIMENT DEPOSIT AREA 1

PREVIOUS SAMPLE LOCATIONS

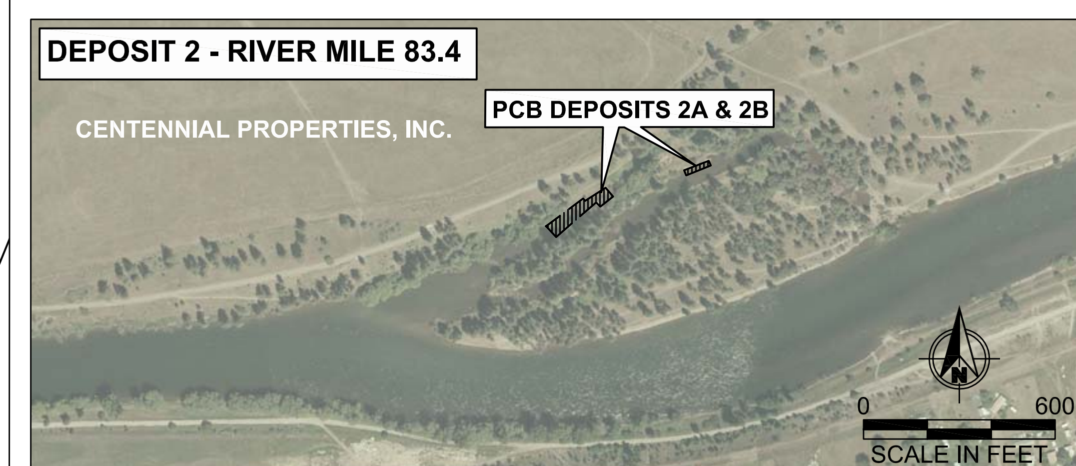
SC-1 CORE STATION LOCATION

4SG SURFACE SEDIMENT STATION LOCATION

BWE-1 VISUAL SURFACE GRAB LOCATION AND IDENTIFICATION

0 200
SCALE IN FEET

NOTES:
1. AERIAL PHOTO PROVIDED BY AVISTA DATED JUNE 2002.
2. BATHYMETRY BASED ON SURVEY DATA PROVIDED BY BLUE WATER ENGINEERING DATED MAY 20-22, 2003.
3. HORIZONTAL DATUM: STATE PLANE NAD83 WASHINGTON, NORTH
4. VERTICAL DATUM: NAVD88



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JOHN R. VERDUIN — STATE OF WASHINGTON — 27870 — REGISTERED PROFESSIONAL ENGINEER — EXPIRES 02/16/07

REVISIONS				
REV	DATE	BY	APP'D	DESCRIPTION

DESIGNED BY: B. PATTERSON
DRAWN BY: C. DAVIDSON
CHECKED BY:
APPROVED BY: J. VERDUIN
SCALE: AS SHOWN
DATE: JUNE 2006

FINAL DRAFT DESIGN
UPRIVER DAM PCB SITE PROJECT

DEPOSIT 1
SITE OVERVIEW

A2

SHEET NO. 2 OF 12

Jun 01, 2006 10:33am hlevasseuK:\Jobs\050306-Upriver\05030601\100% Final Draft\05030601-14 100.dwg SHEET A2

•O CONTROL POINT LOCATION AND DESIGNATION

CONTROL PT.	NORTHING	EASTING
O	269240	2504211
P	269511	2504049
Q	269136	2504096
R	269200	2504152
S	269466	2504014
T	269381	2503961
U	267705	2502512
V	269307	2503956

NOTES:

1. MINOR ROAD IMPROVEMENTS CAN BE MADE TO EXISTING ACCESS ROUTES. (I.E. GRADING GRAVEL)
2. STAGING/STOCKPILING AREA AND ACCESS ROUTE SHALL BE RETURNED TO PRE-CONSTRUCTION CONDITION UPON COMPLETION OF WORK.
3. CONTRACTOR SHALL CONFINE STAGING/STOCKPILING OPERATIONS TO DESIGNATED AREA.
4. CONTRACTOR SHALL MINIMIZE NOISE AND DUST POLLUTION DURING OPERATIONS.
5. EQUIPMENT HEIGHT RESTRICTED TO 56' ON ACCESS ROAD.
6. AERIAL PHOTO PROVIDED BY AVISTA DATED JUNE 2002.
7. BATHYMETRY BASED ON SURVEY DATA PROVIDED BY BLUE WATER ENGINEERING DATED MAY 20-22, 2003.
8. HORIZONTAL DATUM: STATE PLANE NAD83 WASHINGTON, NORTH
9. VERTICAL DATUM: NAVD88

N

0 300
SCALE IN FEET

DRAFT FINAL DESIGN SUBMITTAL
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Jun 01, 2006 10:42am hlevasseuK:\Jobs\050306-Upriver\05030601\100% Final Draft\05030601-19_100.dwg SHEET A3

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JOHN R. VERDUIN, STATE OF WASHINGTON, 27870, REGISTERED PROFESSIONAL ENGINEER, EXPIRES 02/16/07

REVISIONS				
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CHECKED BY:
APPROVED BY: J. VERDUIN
SCALE: AS SHOWN
DATE: JUNE 2006

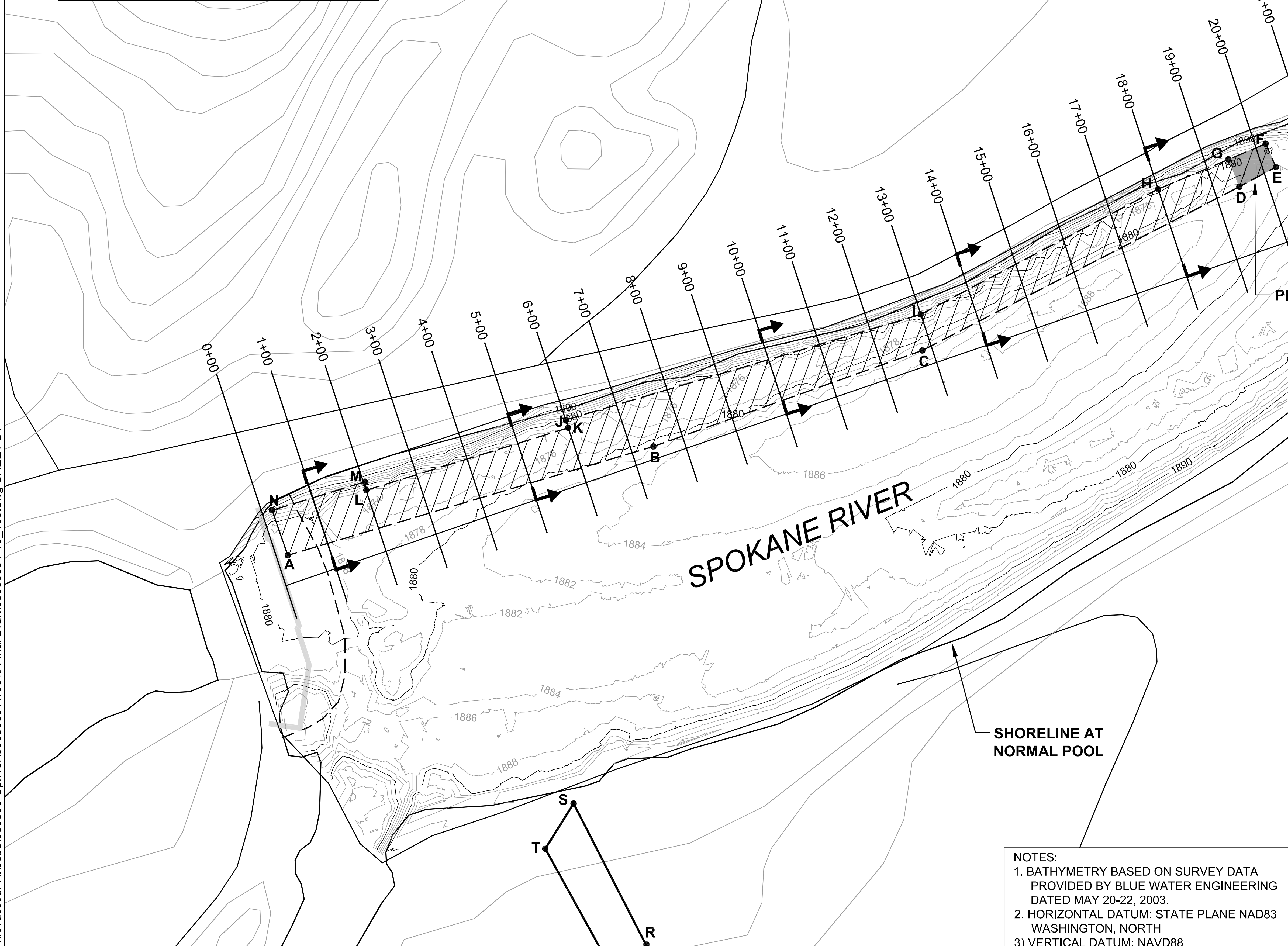
FINAL DRAFT DESIGN
UPRIVER DAM PCB SITE PROJECT

DEPOSIT 1
SITE ACCESS PLAN

A3

SHEET NO. 3 OF 12

DEPOSIT 1 - RIVER MILE 80.0 TO 81.5



DEPOSIT 1 CAP BOUNDARY (SEE DETAIL)

•A CONTROL POINT LOCATION AND DESIGNATION

CROSS SECTION LOCATION AND DESIGNATION

CONTROL PT.	NORTHING	EASTING
A	269936	2503475
B	270142	2504166
C	270323	2504674
D	270632	2505273
E	270670	2505342
F	270714	2505323
G	270684	2505252
H	270628	2505120
I	270391	2504671
J	270192	2504000
K	270177	2504005
L	270059	2503623
M	270075	2503621
N	270021	2503445
Q	269136	2504096
R	269200	2504152
S	269467	2504015
T	269381	2503961

0 200
SCALE IN FEET

NOTES:
1. BATHYMETRY BASED ON SURVEY DATA PROVIDED BY BLUE WATER ENGINEERING DATED MAY 20-22, 2003.
2. HORIZONTAL DATUM: STATE PLANE NAD83 WASHINGTON, NORTH
3) VERTICAL DATUM: NAVD88

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ANCHOR ENVIRONMENTAL, L.L.C.

AVISTA Utilities

JOHN R. VERDUIN, STATE OF WASHINGTON, 27870, REGISTERED PROFESSIONAL ENGINEER, EXPIRES 02/16/07

REVISIONS				
REV	DATE	BY	APP'D	DESCRIPTION

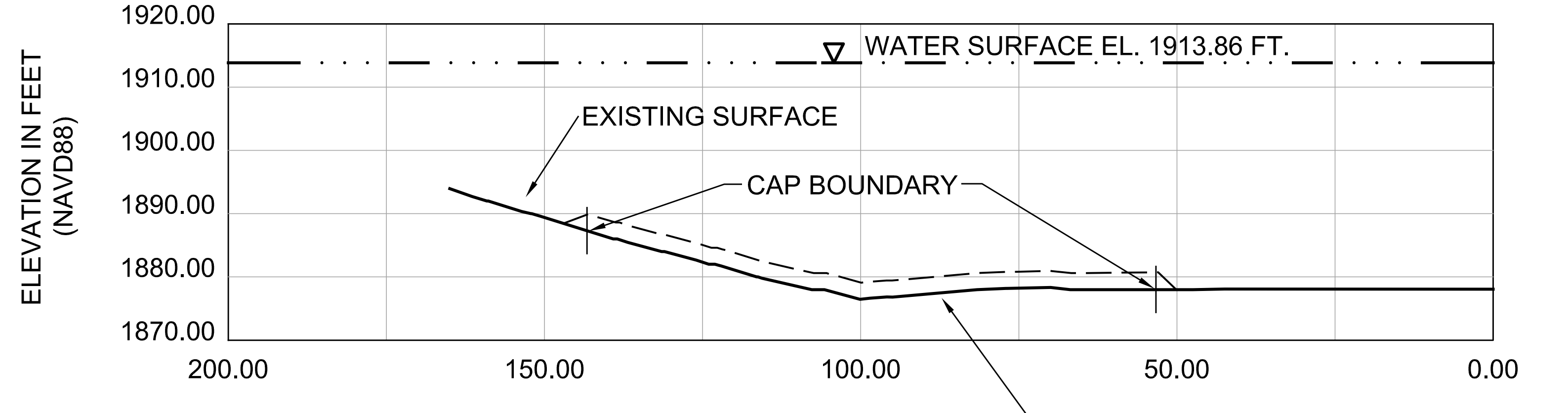
DESIGNED BY: B. PATTERSON
DRAWN BY: C. DAVIDSON
CHECKED BY:
APPROVED BY: J. VERDUIN
SCALE: AS SHOWN
DATE: JUNE 2006

FINAL DRAFT DESIGN
UPRIVER DAM PCB SITE PROJECT

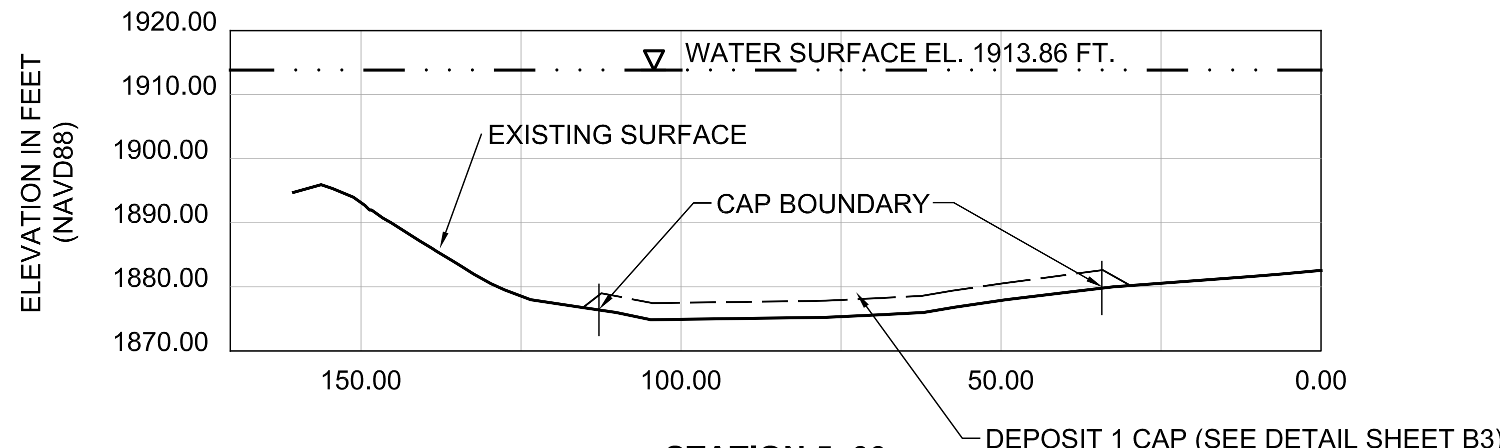
DEPOSIT 1
CAPPING PLAN

B1

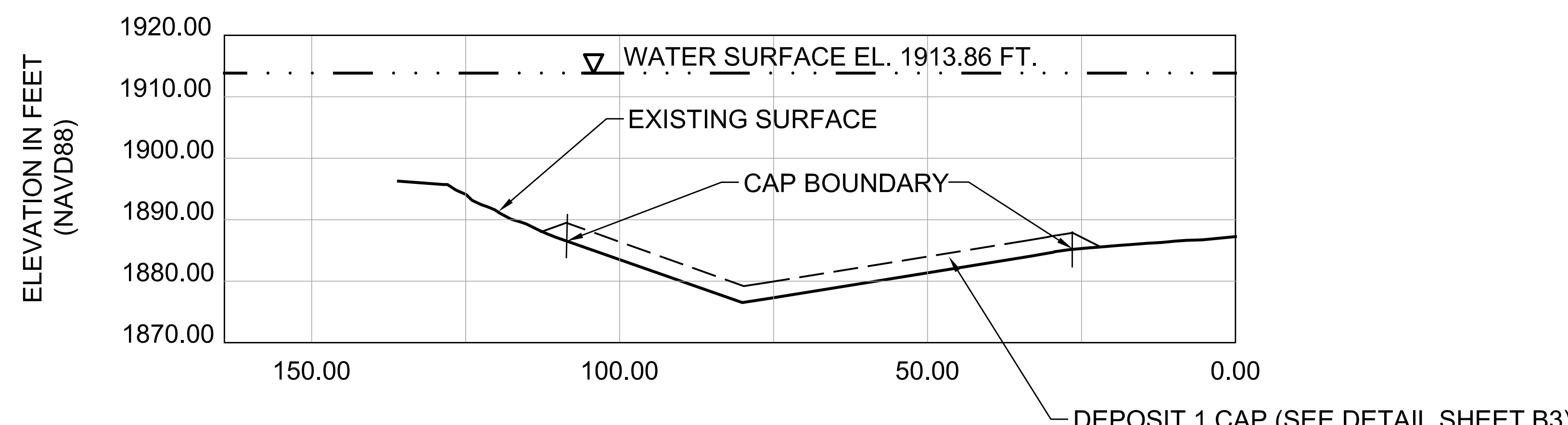
SHEET NO. 4 OF 12



STATION 1+00



STATION 5+00



STATION 10+00

0 30
SCALE IN FEET

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ANCHOR ENVIRONMENTAL, L.L.C.

AVISTA Utilities

JOHN R. VERDUIN
STATE OF WASHINGTON
27870
REGISTERED PROFESSIONAL ENGINEER
EXPIRES 02/16/07

REVISIONS

REV	DATE	BY	APP'D	DESCRIPTION

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DRAWN BY: C. DAVIDSON
CHECKED BY:
APPROVED BY: J. VERDUIN
SCALE: AS SHOWN
DATE: JUNE 2006

FINAL DRAFT DESIGN
UPRIVER DAM PCB SITE PROJECT

DEPOSIT 1
CAPPING PLAN CROSS SECTIONS

B2

SHEET NO. 5 OF 12

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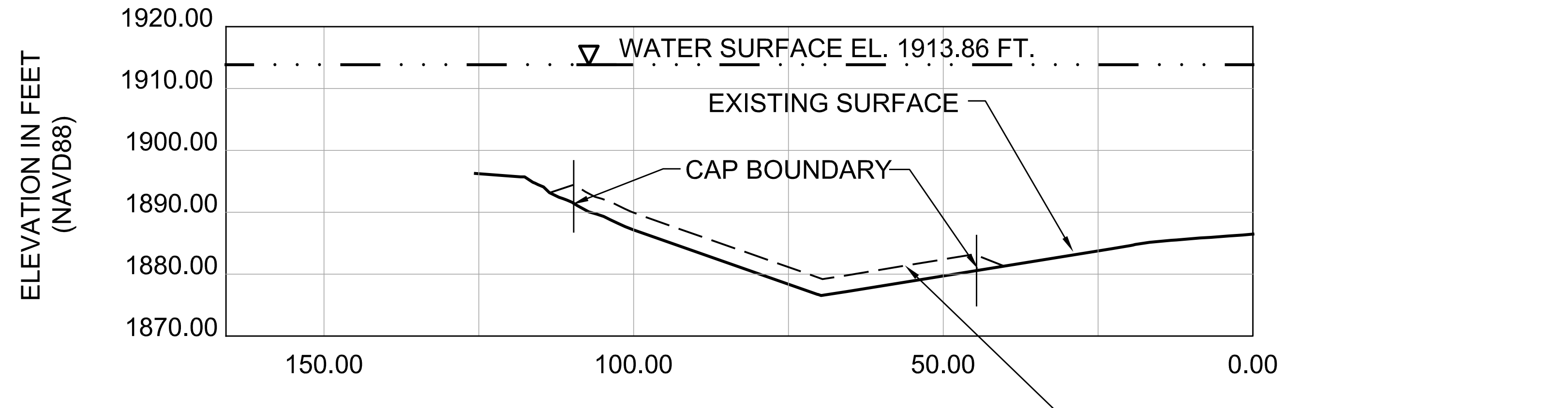
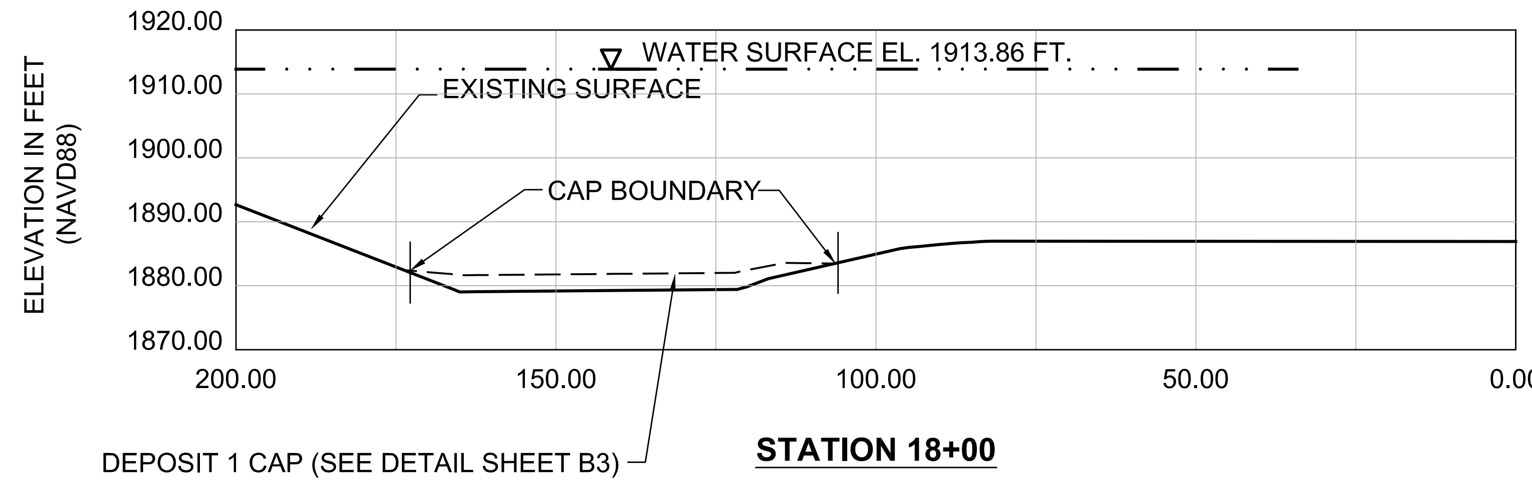
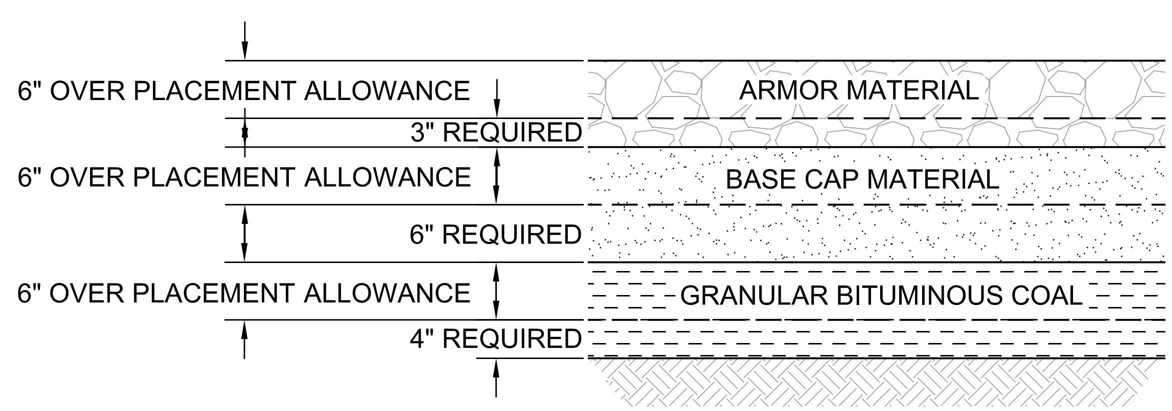


STATION 14+00



STATION 18+00

0 30
SCALE IN FEET



DEPOSIT 1 CAP DETAIL (TYPICAL)

NOT TO SCALE

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ANCHOR ENVIRONMENTAL, L.L.C.

AVISTA Utilities

JOHN R. VERDUIN, STATE OF WASHINGTON, 27870, REGISTERED PROFESSIONAL ENGINEER, EXPIRES 02/16/07

REVISIONS

REV	DATE	BY	APP'D	DESCRIPTION

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DRAWN BY: C. DAVIDSON
CHECKED BY:
APPROVED BY: J. VERDUIN
SCALE: AS SHOWN
DATE: JUNE 2006

FINAL DRAFT DESIGN
UPRIVER DAM PCB SITE PROJECT

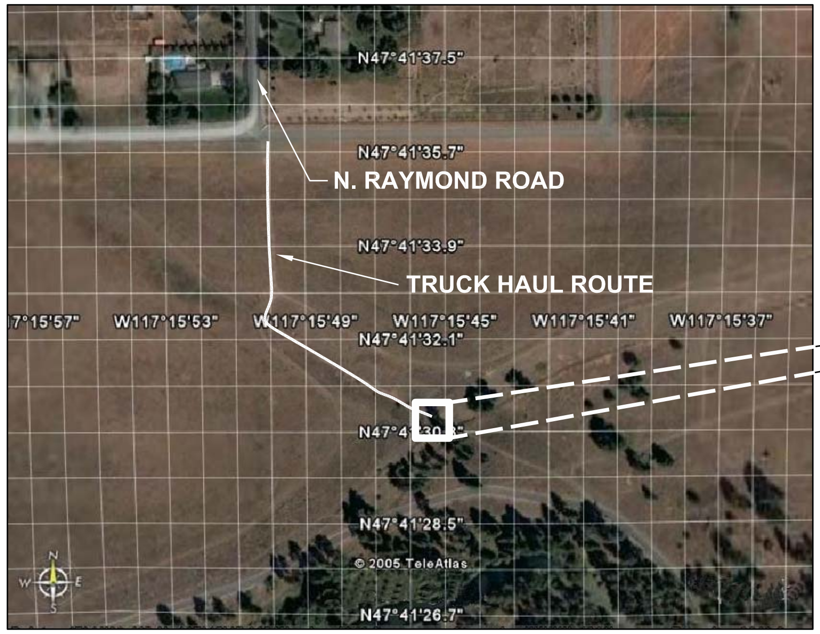
DEPOSIT 1
CAPPING PLAN CROSS SECTIONS

B3

SHEET NO. 6 OF 12

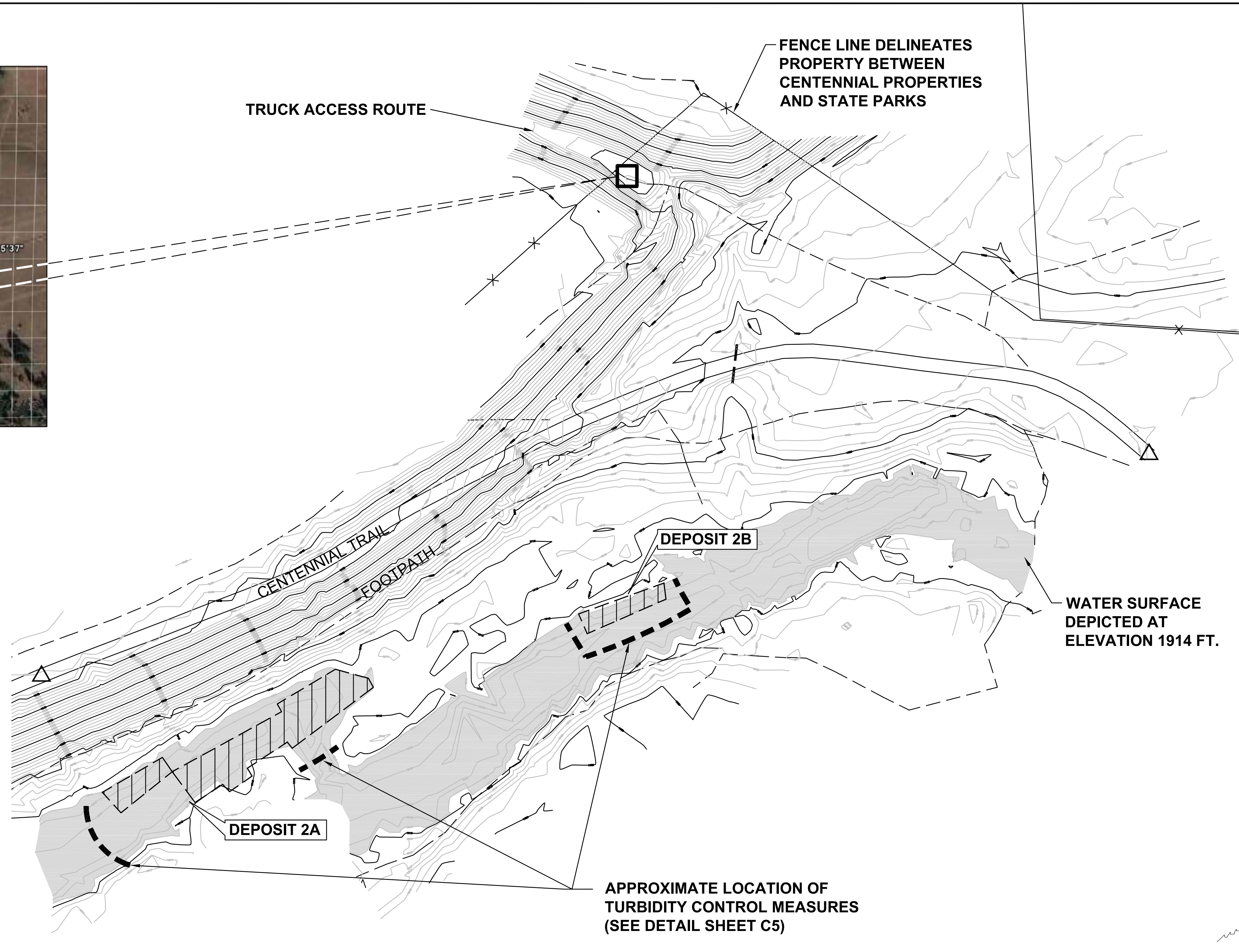
Jun 01, 2006 10:48am hlevasseur K:\Jobs\050306-Upriver\05030601\100% Final Draft\05030601-15_100.dwg SHEET B3

DEPOSIT 2 - RIVER MILE 83.4



NOT TO SCALE

HAUL ROUTE



△ PROPOSED SIGNAGE LOCATION

0 100
SCALE IN FEET

NOTES:
1. UPLAND CONTOURS BASED ON 2002 AERIAL PHOTO USING LIDAR METHOD PROVIDED BY SPOKANE COUNTY.
2. IN-WATER SURVEY CONDUCTED BY SCOTT VALENTINE SURVEYING IN APRIL 2006.
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DRAFT FINAL DESIGN SUBMITTAL
NOT FOR CONSTRUCTION

Jun 01, 2006 11:20am hlevasseurK:\Jobs\050306-Upriver\05030601\100% Final Draft\05030601-29_100.dwg SHEET C1

ANCHOR ENVIRONMENTAL, L.L.C.

AVISTA Utilities

JOHN R. VERDUIN · STATE OF WASHINGTON · 27870 · REGISTERED PROFESSIONAL ENGINEER · EXPIRES 02/16/07

REVISIONS

REV	DATE	BY	APP'D	DESCRIPTION

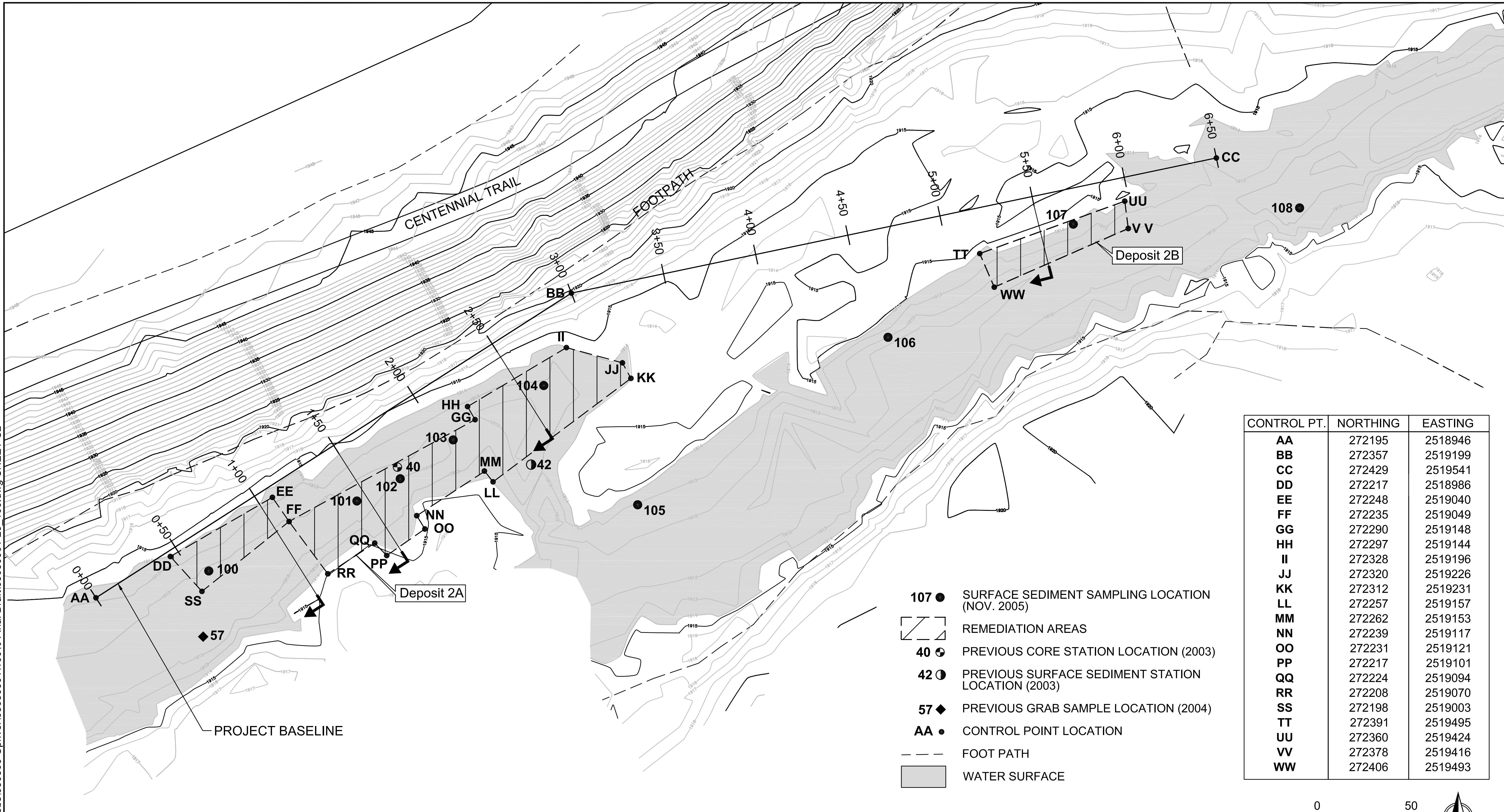
DESIGNED BY: B. PATTERSON
DRAWN BY: C. DAVIDSON
CHECKED BY:
APPROVED BY: J. VERDUIN
SCALE: AS SHOWN
DATE: JUNE 2006

FINAL DRAFT DESIGN
UPRIVER DAM PCB SITE PROJECT

DEPOSIT 2
HAUL & TURBIDITY CONTROL PLAN

C1

SHEET NO. 7 OF 12



CONTROL PT.	NORTHING	EASTING
AA	272195	2518946
BB	272357	2519199
CC	272429	2519541
DD	272217	2518986
EE	272248	2519040
FF	272235	2519049
GG	272290	2519148
HH	272297	2519144
II	272328	2519196
JJ	272320	2519226
KK	272312	2519231
LL	272257	2519157
MM	272262	2519153
NN	272239	2519117
OO	272231	2519121
PP	272217	2519101
QQ	272224	2519094
RR	272208	2519070
SS	272198	2519003
TT	272391	2519495
UU	272360	2519424
VV	272378	2519416
WW	272406	2519493

107 ● SURFACE SEDIMENT SAMPLING LOCATION (NOV. 2005)

REMEDIATION AREAS

40 PREVIOUS CORE STATION LOCATION (2003)

42 ◑ PREVIOUS SURFACE SEDIMENT STATION LOCATION (2003)

57 ◆ PREVIOUS GRAB SAMPLE LOCATION (2004)

AA • CONTROL POINT LOCATION

FOOT PATH

WATER SURFACE

0 50
SCALE IN FEET

NOTES:
1. UPLAND CONTOURS BASED ON 2002 AERIAL PHOTO USING LIDAR METHOD PROVIDED BY SPOKANE COUNTY.
2. IN-WATER SURVEY CONDUCTED BY SCOTT VALENTINE IN APRIL 2006.
3. HORIZONTAL DATUM: STATE PLANE NAD83 WASHINGTON, NORTH.
4. VERTICAL DATUM: NAVD88

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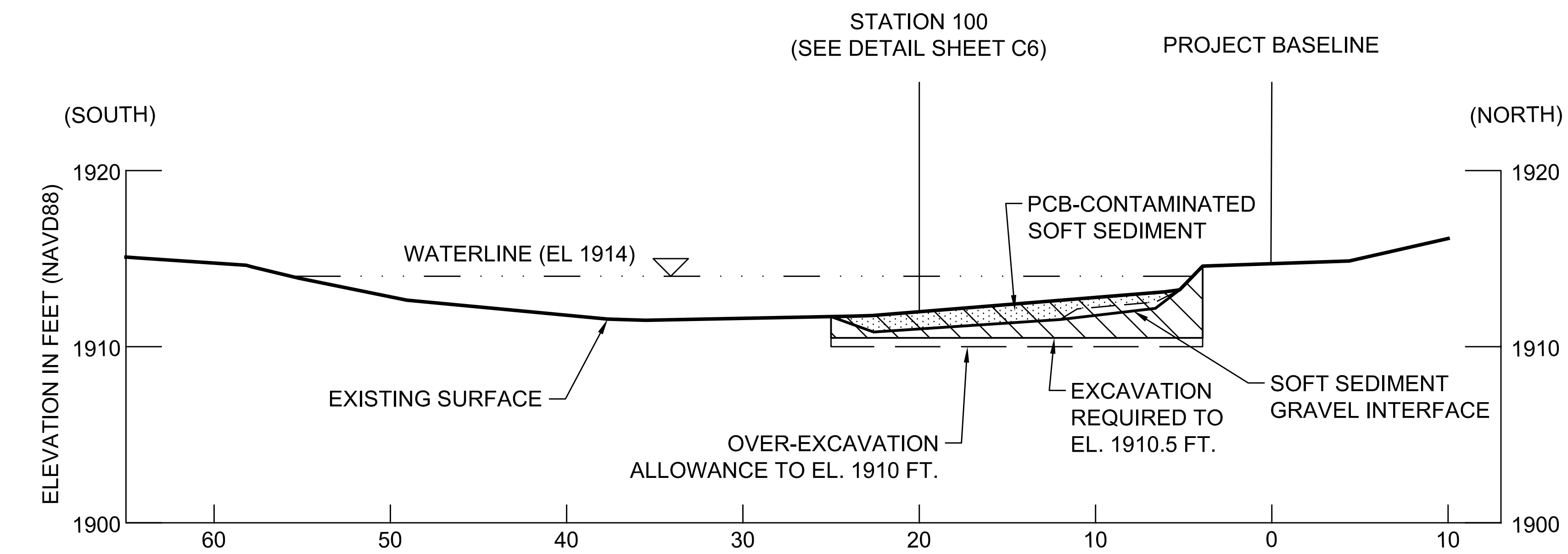
APPROVED BY: J. VERDUIN
SCALE: AS SHOWN
DATE: JUNE 2006

FINAL DRAFT DESIGN
UPRIVER DAM PCB SITE PROJECT

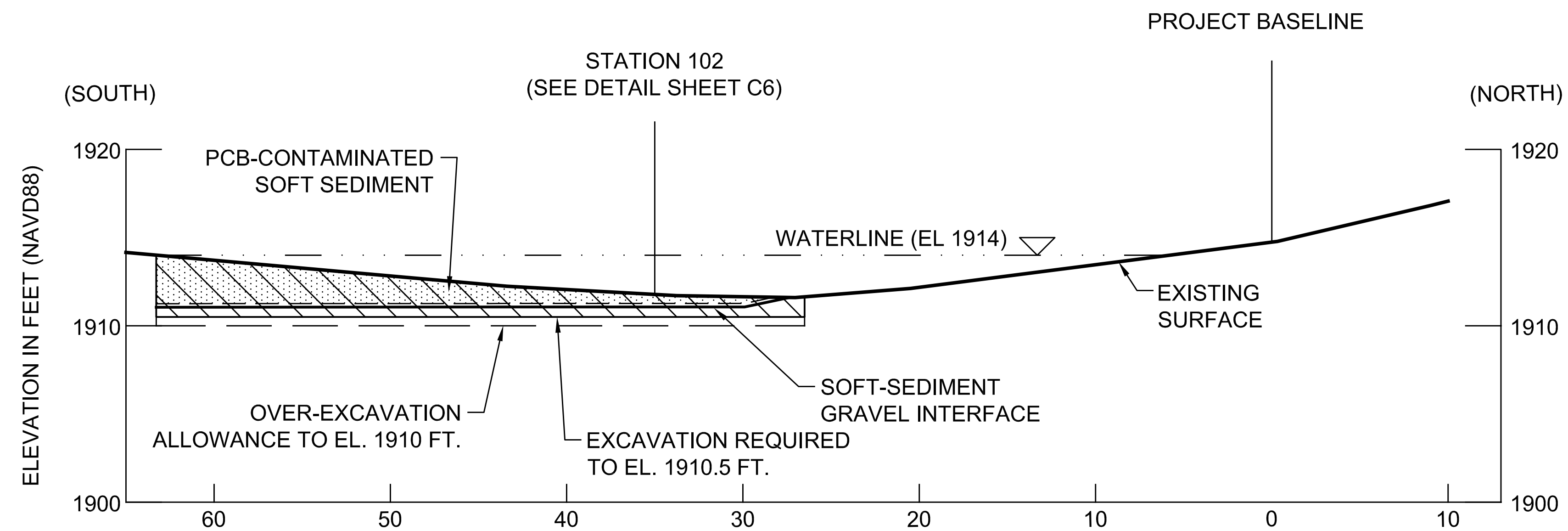
DEPOSIT 2
EXCAVATION PLAN

C2

SHEET NO. 8 OF 12



STATION 1+00
DEPOSIT 2A



STATION 1+50
DEPOSIT 2A

MATERIAL TO BE EXCAVATED
REQUIRED EXCAVATION LINE
ALLOWABLE OVER-EXCAVATION LINE
PCB-CONTAMINATED SOFT SEDIMENT
SOFT SEDIMENT GRAVEL INTERFACE

0 10
SCALE IN FEET

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ANCHOR ENVIRONMENTAL, L.L.C.

AVISTA Utilities

JOHN R. VERDUIN, STATE OF WASHINGTON, 27870, REGISTERED PROFESSIONAL ENGINEER
EXPIRES 02/16/07

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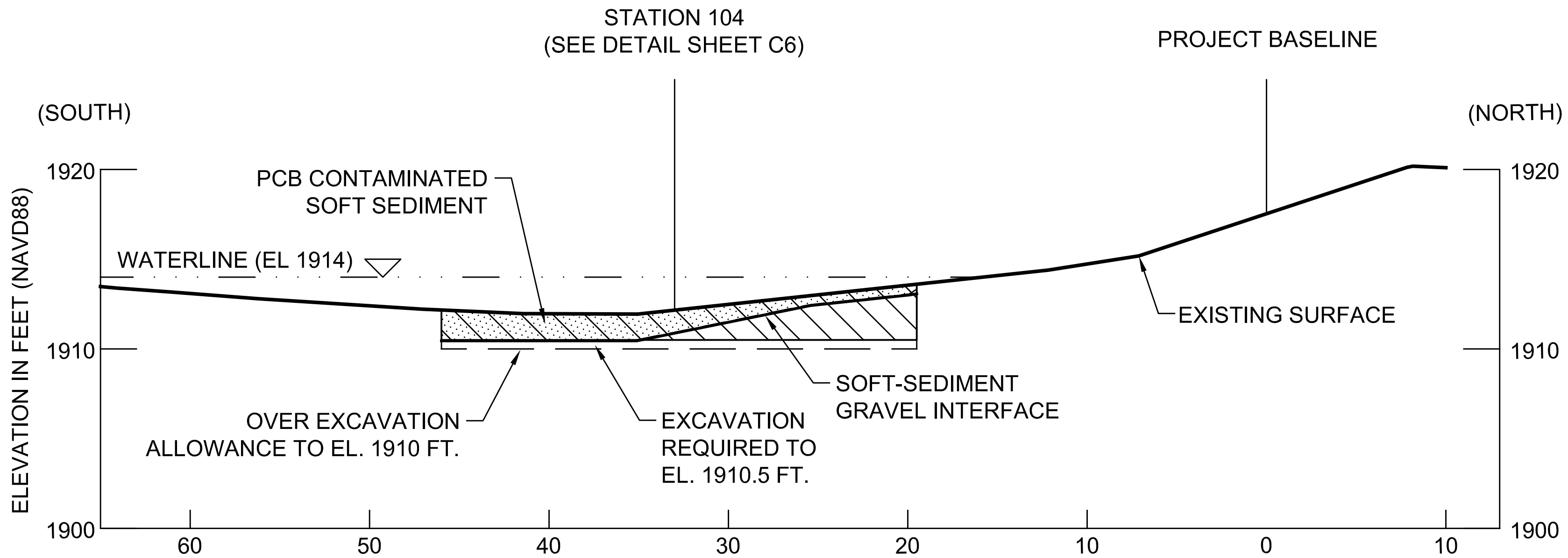
DATE: JUNE 2006

FINAL DRAFT DESIGN
UPRIVER DAM PCB SITE PROJECT

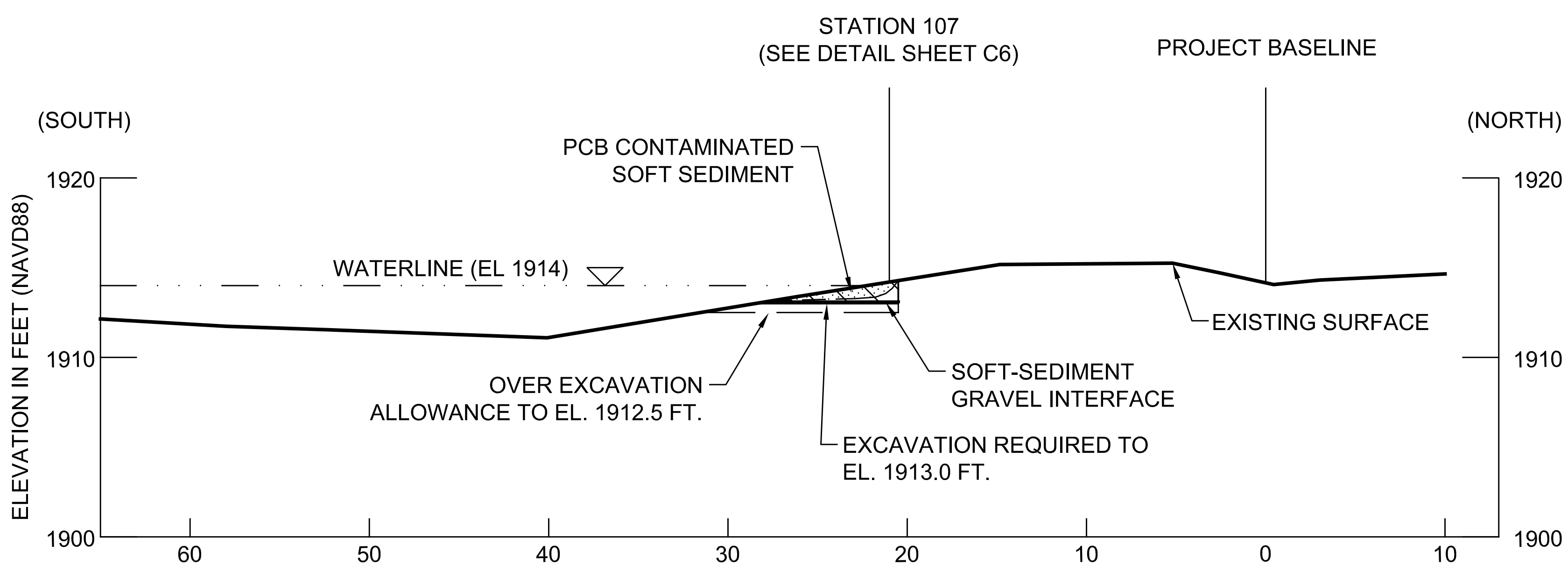
DEPOSIT 2
CROSS SECTIONS

C3

SHEET NO. 9 OF 12



STATION 2+50
DEPOSIT 2A



STATION 5+50
DEPOSIT 2B

MATERIAL TO BE EXCAVATED
REQUIRED EXCAVATION LINE
ALLOWABLE OVER EXCAVATION LINE
PCB CONTAMINATED SOFT SEDIMENT
SOFT-SEDIMENT GRAVEL INTERFACE

0 10
SCALE IN FEET

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APPROVED BY: J. VERDUIN
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DATE: JUNE 2006

FINAL DRAFT DESIGN
UPRIVER DAM PCB SITE PROJECT

DEPOSIT 2
CROSS SECTIONS

C4

SHEET NO. 10 OF 12

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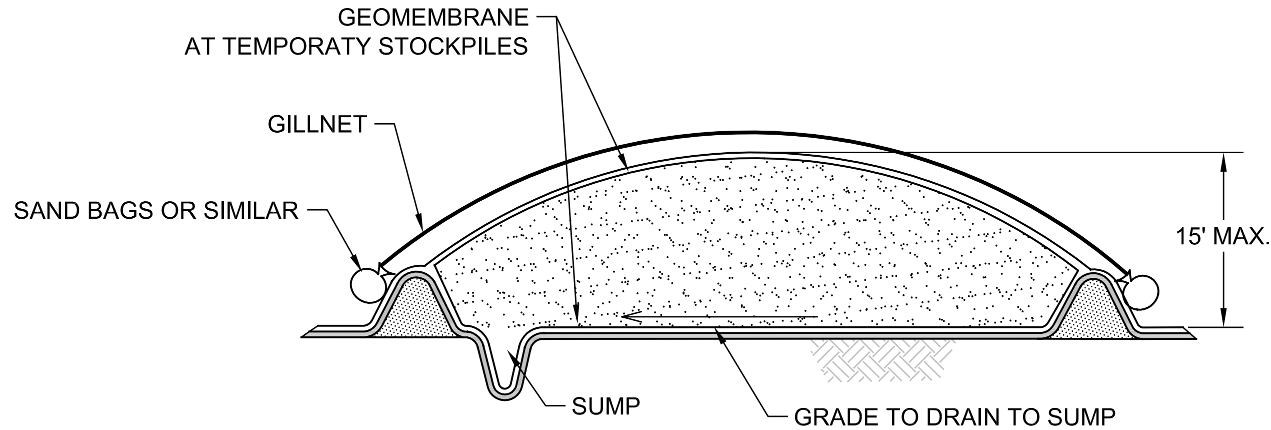
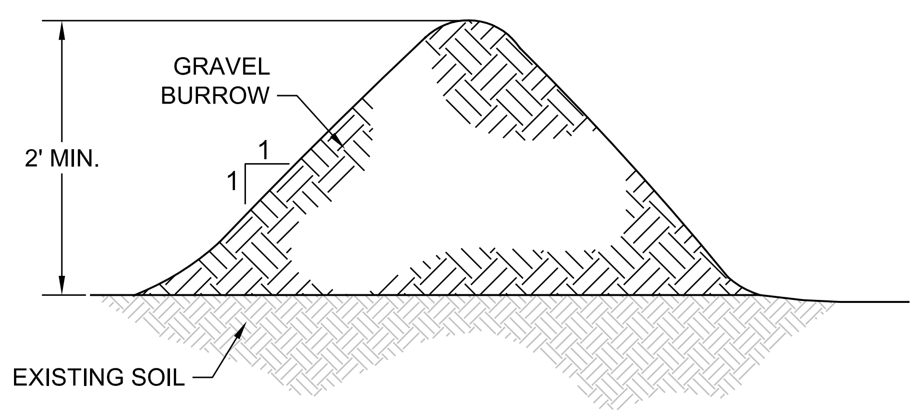


NOTES:
1. STOCKPILE SOIL TO A MAXIMUM HEIGHT OF 15 FEET; SIDEWALLS NOT TO EXCEED A 1:1 SLOPE.
2. INSTALL SUMP AT LOW POINT OF DRAINAGE AND REMOVAL OF ACCUMULATED WATER AND PROPERLY DISPOSE.
3. THE SUMP SHALL BE FILLED WITH GRAVEL BACKFILL FOR DRAINS MATERIAL.

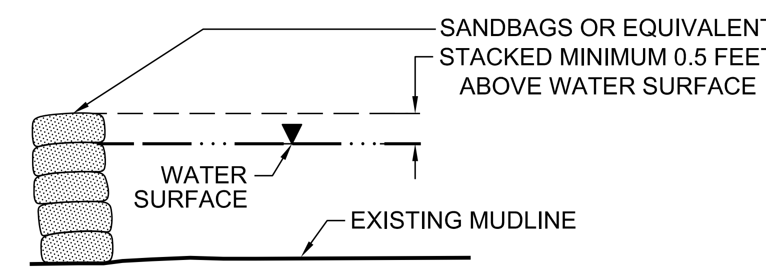
DEPOSIT 2: CROSS SECTION TEMPORARY CONTAMINATED SEDIMENT STOCKPILE (TYPICAL)

NOT TO SCALE



DEPOSIT 2: SOIL/CONTAMINATED SEDIMENT STOCKPILE BERM DETAIL CROSS SECTION (TYPICAL)

NOT TO SCALE



DEPOSIT 2: TURBIDITY CONTROL DETAIL (TYPICAL)

NOT TO SCALE

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ANCHOR ENVIRONMENTAL, L.L.C.

AVISTA Utilities

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REVISIONS

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DESIGNED BY:	B. PATTERSON
DRAWN BY:	C. DAVIDSON
CHECKED BY:	
APPROVED BY:	J. VERDUIN
SCALE:	AS SHOWN
DATE:	JUNE 2006

FINAL DRAFT DESIGN UPRIVER DAM PCB SITE PROJECT

DEPOSIT 2 DETAILS

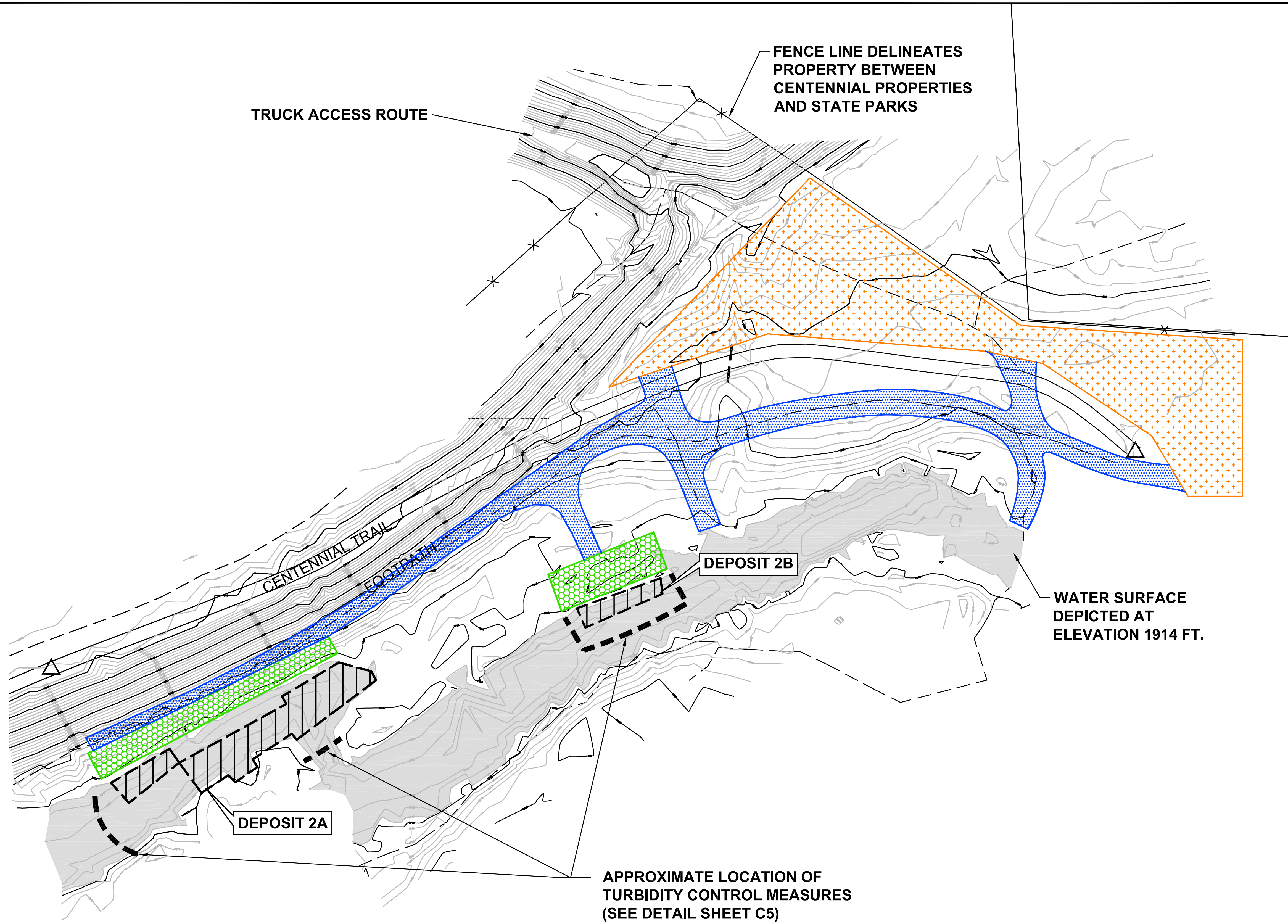
C5

SHEET NO. 11 OF 12

DEPOSIT 2 - RIVER MILE 83.4

- REMEDIATION AREA
- STAGING/STOCKPILE AREA BOUNDARY
- UPLAND ACCESS ROUTE BOUNDARY
- UPLAND EXCAVATION EQUIPMENT CONFINEMENT BOUNDARY

0 100
SCALE IN FEET



NOTES:

1. UPLAND CONTOURS BASED ON 2002 AERIAL PHOTO USING LIDAR METHOD PROVIDED BY SPOKANE COUNTY.
2. IN-WATER SURVEY CONDUCTED BY SCOTT VALENTINE SURVEYING IN APRIL 2006.
3. HORIZONTAL DATUM: STATE PLANE NAD83 WASHINGTON, NORTH.
4. VERTICAL DATUM: NAVD88
5. ALL STAGING/STOCKPILING OPERATIONS SHALL BE CONFINED TO STATE PARK PROPERTY.
6. CONSTRUCTION SIGNAGE WARNING THE PUBLIC SHALL BE PLACED NEAR THE DESIGNATED LOCATIONS AND REMAIN IN PLACE UNTIL PROJECT COMPLETION.
7. THE CONTRACTOR SHALL ECERCISE GREAT CARE IN PROTECTING THE ECOLOGICAL HABITAT IN THE VICINITY OF DEPOSIT 2.
8. THE CONTRACTOR SHALL STAY WITHIN DESIGNATED UPLAND ACCESS ROUTE BOUNDARIES WHEN TRAVELING BETWEEN THE EXCAVATION AREAS AND THE STAGING AND STOCKPILING AREAS. CONCTRACTOR MAY CHOOSE ANY WATERBORNE ROUTE TO ACCESS DEPOSIT 2A AND 2B.
9. THE CONTRACTOR SHALL LIMIT EXCAVATION AND BACKFILL ACTIVITIES TO THE WATER OR THE DESIGNATED EXCAVATION AREAS.
10. THE CONTRACTOR SHALL LIMIT TRAVEL ON THE PAVED CENTENNIAL TRAIL TO THE EXTENT POSSIBLE.
11. A VEGETATIVE ASSESSMENT SURVEY OF THE DEPOSIT 2 AREA IS ONGOING. THE RESULTS OF THE SURVEY WILL COMPLETE THIS PLAN AND INCLUDE DETAILS ON TREE PROTECTION, LWD REMOVAL AND REPLACEMENT, AND ACCESS RESTRICTIONS IN SENSITIVE AREAS IMPACTED BY CONSTRUCTION ACTIVITIES IN ACCORDANCE WITH THIS PLAN.
12. THE CONTRACTOR SHALL BE RESPONSIBLE FOR RESTORATION OF AREAS IMPACTED BY CONSTRUCTION ACTIVITIES IN ACCORDANCE WITH THIS PLAN.
13. COMPLIANCE WITH THIS PLAN WILLL BE VERIFIED BY THE ENGINEER BOTH DURING AND UPON COMPLETION OF CONSTRUCTION.

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ANCHOR ENVIRONMENTAL, L.L.C.

AVISTA Utilities

JOHN R. VERDUIN, STATE OF WASHINGTON, 27870, REGISTERED PROFESSIONAL ENGINEER, EXPIRES 02/16/07

REVISIONS

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DESIGNED BY: B. PATTERSON
DRAWN BY: C. DAVIDSON
CHECKED BY:
APPROVED BY: J. VERDUIN
SCALE: AS SHOWN
DATE: JUNE 2006

FINAL DRAFT DESIGN
UPRIVER DAM PCB SITE PROJECT

DEPOSIT 2
CONTRACTOR LIMITS & HABITAT PROTECTION PLAN

C6

SHEET NO. 12 OF 12

APPENDIX B
CONSTRUCTION QUALITY ASSURANCE PLAN (CQAP)

APPENDIX B
CONSTRUCTION QUALITY ASSURANCE PLAN (CQAP)

SPOKANE RIVER UPRIVER DAM PCB SEDIMENTS SITE

Prepared for

Avista Development, Inc.

Prepared by

Anchor Environmental, L.L.C.
1423 Third Avenue, Suite 300
Seattle, Washington 98101

June 2006

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1 INTRODUCTION

This Construction Quality Assurance Plan (CQAP) for the cleanup of two polychlorinated biphenyl (PCB) sediment deposits (denoted the Upriver Dam Cleanup Project) located in Spokane County, Washington is one of the elements of the Draft Final Design Submittal for Deposit 1 near Upriver Dam (Deposit 1) and Deposit 2 near Donkey Island (Deposit 2) (depicted on Figure 1). This CQAP was prepared to comply with the requirements described in the Consent Decree (CD) executed in August 2005 between Washington State Department of Ecology (Ecology) and Avista Development, Inc. (Avista), which is included as an exhibit to the Cleanup Action Plan (CAP) prepared by Ecology for the site (Ecology 2005). Remedial design/remedial action (RD/RA) activities will be performed in compliance with the Washington Administrative Code (WAC), Washington's Sediment Management Standards (SMS) (Ecology 1995; WAC 173-204), and the Model Toxics Control Act (MTCA) (Ecology 2001; WAC 173-340), as set forth in the CD. This CQAP has been prepared on behalf of Avista and specifically addresses Deposit 1 and Deposit 2.

The purpose of this CQAP is to describe how construction will ensure implementation of the Upriver Dam Cleanup Project requirements. This document identifies the quality assurance/quality control (QA/QC) steps to be used in construction management, including monitoring actions, reporting mechanisms, and documentation formats. It also presents how environmental monitoring will be performed and how modifications to the construction procedures will be directed, as necessary, in response to results of monitoring actions. Further, it delineates the quality assurance methods and protocols for project personnel to ensure they have a complete understanding of monitoring, feedback, and adjustment mechanisms.

The Remedial Action Contractor (Contractor) will use this CQAP, together with the contract plans and specifications, to develop a Remedial Action Construction Schedule, Construction Quality Control (CQC) Plan, Contractor Health and Safety Plan (CHASP), Environmental Protection Plan (EPP), and Results of Testing of Imported Materials. Table 1 lists Contractor submittals relevant to the CQAP.

The remaining sections of this CQAP specify the following project elements:

- **Section 2**. The responsibilities and authorities of key project personnel, contractors, and all organizations involved in the construction or oversight of the remedial action.

- **Section 3**. The qualifications of necessary personnel, the Contractor, and subcontractors, including qualifications of the CQC Supervisor.
- **Section 4**. Remedial action construction elements, including potential issues, concerns and solutions, equipment, monitoring and maintenance, and corrective actions.
- **Section 5**. Documentation requirements for construction quality assurance activities, including daily summary reports, as well as procedures, documentation, and reporting for project modifications and change orders.

2 PROJECT ORGANIZATION AND RESPONSIBILITIES

The roles and responsibilities of the parties involved in the remedial action are delineated in the CD, as executed by Avista and Ecology. An organization chart representing specific project responsibilities, including project administration, management, and oversight, is shown on Figure 2.

2.1 Washington State Department of Ecology

Ecology is the regulatory authority and responsible agency for overseeing and authorizing the remedial action. In this capacity, Ecology reviews monitoring plans during the remedial design phase and will review information described in this CQAP to ensure that the project is constructed in a manner consistent with the remedial design. Ecology's site manager is Zach Hedgpeth, who will be designated to exercise project oversight for the agency and to coordinate with Avista. Ecology will make final decisions to resolve unforeseen problems, which may change the project components, or the manner in which the construction is undertaken.

2.2 Avista Development, Inc.

The construction project will be managed by Avista and executed by contractors specializing in sediment capping, excavation, and backfilling. All remedial action activities pursuant to Sections VI of the CD shall be performed under the direction and supervision of the Supervising Contractor, who will be assigned by Avista and approved by Ecology. Avista's Project Coordinator, Doug Pottratz, who is designated pursuant to Section VII of the CD, may also be designated as Avista's Supervising Coordinator. Avista will be responsible for ensuring implementation of this CQAP, including required monitoring, sampling, testing, and reporting. Included within this responsibility will be monitoring of the Contractor's quality control activities to ensure that project construction is conducted in accordance with the contract plans and specifications. These activities may be assigned to subordinate inspectors or conducted by consultants with the requisite expertise and experience under direction from Avista.

2.3 Construction Contractor

Direction of the work for the Contractor will be through an on-site Project Manager or General Superintendent who will be held responsible for prosecuting the work in full compliance with the contract plans. The superintendent will work with the Engineer (designated in section 2.5) to resolve all job-related problems and day-to-day project management. The superintendent may utilize one or more foremen to directly supervise the major construction activities. The superintendent will exercise supervision over all subcontractors, if subcontractors are utilized.

The Contractor will implement a CQC system through which the Contractor assures that all the requirements of the contract are being complied with. The CQC system will identify personnel, procedures, methods, instructions, inspections, records, and forms to be used in the CQC system. The CQC Manager will have written CQC duties and responsibilities delegated by an officer of the firm. The Contractor will also employ a Health and Safety Manager to implement its CHASP as required. The CHASP specifies the minimum health and safety requirements for job site activities and the measures and procedures to be employed for protection of on-site personnel and tenants, as well as visitors.

The Contractor will be selected through a competitive process. Firms seeking to bid on the project will be pre-qualified by Avista and will be selected based on expertise, experience, and capability to satisfactorily perform the work.

The contract specifications require the Contractor to develop and implement the Remedial Action Submittals identified in Table 1. The purpose of these submittals is to ensure that quality and performance goals for the remedial action are achieved.

2.4 Subcontractors

The Contractor may employ subcontractors to perform selected phases of the work for which the subcontractors have special expertise. The subcontractors will be responsible to the Contractor for the quality of their work and for the health and safety of their project personnel in accordance with the Contractor's CQC Plan and CHASP. The subcontractors' principals will designate job site superintendents or foremen with responsibility for seeing that the work is conducted in accordance with the plans, specifications, and contract requirements.

2.5 Consultants

During the course of construction, consultants may be utilized to ensure that the design objectives are realized and that the project is constructed in accordance with the remedial design documents and the plans and specifications. Avista has selected Anchor Environmental, L.L.C. (Anchor) as the supervising consultant for the Remedial action. John Verduin, PE, will serve as the Project Engineer (Engineer). The Engineer is responsible for preparing the design of the remediation such that successful implementation of the design will result in achieving the remediation objectives and that the project is constructed in accordance with the specifications.

3 CONSTRUCTION CONTRACTOR/SUBCONTRACTOR QUALIFICATIONS

Prior to bidding of the project, a prospective contractor must demonstrate, through pre-qualifications conducted by Avista, the expertise, experience, and capability to satisfactorily execute the work. The Contractor will maintain, as part of its permanent organization, high-caliber, knowledgeable, and experienced key personnel. These individuals must have experience in the type of work being contracted. The journeyman operators, surveyors, and other Contractor personnel performing key jobs must have demonstrated the ability and skills to satisfactorily perform those assignments. The Contractor's Superintendent(s) will be expected to have at least 10 years of experience in the type of work being contracted. In addition, the Contractor must have documented qualifications and experience for performing the independent checks on the Contractor's operations that are necessary to determine compliance with the contract provisions.

The Contractor will designate a CQC Supervisor from within its organization who is responsible for the overall management of quality control to ensure compliance with the contract plans and technical specifications.

Any subcontractors utilized in the work must have demonstrated to the satisfaction of Avista that they are qualified and have satisfactorily performed the type of work for which they will be engaged. The Contractor is responsible for the performance of its subcontractors. All contractors and subcontractors will be required to have all health and safety training required by the Washington State Department of Labor and Industries (Chapter 296-62 WAC, Subpart P, Hazardous Waste Operations and Emergency Response), including on-site training.

4 REMEDIAL ACTION CONSTRUCTION ELEMENTS

All work will be conducted in strict accordance with the project plans and specifications, as approved by Ecology, which contain specific, detailed requirements to achieve the overall quality of the construction product.

The Contractor will be required to perform the following activities necessary to implement the Remedial action:

- Site preparation work at Deposit 1 and Deposit 2
- Cap placement at Deposit 1
- Excavation of Deposit 2
- Backfilling at Deposit 2
- Site closure at Deposit 1 and Deposit 2

In the following sections, the construction elements identified above are discussed in terms of:

- **Description.** Tasks related to the construction activities are described.
- **Potential Issues, Concerns, and Solutions.** Potential construction concerns, sources of information regarding potential problems, and common or anticipated remedies are described and evaluated.
- **Contaminant Monitoring, Contingency Plans, and Corrective Actions.** A plan for monitoring to be performed during remediation, required laboratory tests and their interpretation, a Quality Assurance Project Plan (QAPP), a schedule of construction monitoring tasks, a description of threshold or triggering criteria, a contingency plan that describes construction alternatives in the event of a failure (to prevent undue hazard), and an evaluation of design vulnerability and environmental risks in the event of failure.
- **Equipment, Monitoring, and Maintenance.** The equipment that will be used, as well as the monitoring and maintenance necessary to maintain equipment performance, is described.

4.1 Site Preparation Work

4.1.1 Description

The Deposit 1 staging/stockpiling area is a vacant property owned by the City of Spokane located along the south shore of the river immediately upstream of Upriver

Dam between the Spokane Police Academy and the Gonzaga Rowing Team Boathouse (Figure 3). The Contractor will clear the vacant lot of any vegetation and debris that may interfere with staging and stockpiling operations. Once cleared, the specified capping material will be delivered to the Deposit 1 staging/stockpiling area. The Contractor will provide sufficient measures within the staging/stockpiling area to prevent mixing of the capping materials while also providing adequate space for the loading of the material onto barges. The staging/stockpiling area will be sufficiently protected to resist erosion caused by wind and rain. Silt fences, ecology blocks, jersey barriers, and other items are examples of measures that may be used for environmental protection of the site and adjacent properties.

The Deposit 2 staging/stockpiling area is located on Washington State Department of Parks and Recreation property (Figure 4). This staging/stockpiling area will be made suitable for use by the Contractor by clearing any vegetation and debris less than 10 feet tall. The Contractor will take precautions to protect native vegetation, ecological habitat, and potential cultural resources in the area. The staging/stockpiling area will be sectioned to accommodate two functions. One section will be used as a staging area for delivery of the clean backfill material. The Contractor will sufficiently protect this area from environmental conditions such as wind and rain. Ecology bocks, jersey barriers, and/or rain tarps are examples of measures that could be taken for environmental protection of the site. The second section of the Deposit 2 staging/stockpiling area will be designated for the stockpiling of the contaminated sediments. This area will be enclosed by a suitable barrier (jersey barrier, ecology blocks, or a similar method) and lined along the inside of the enclosure with an impermeable liner of polypropylene or similar material to prevent water or sediment from leaving the stockpile. The excavated material from Deposits 2A and 2B will be placed within this enclosure and allowed to passively dewater prior to shipment to the disposal facility. Because of the considerable sand content of the target sediments, passive dewatering is likely to proceed relatively quickly (within 2 days), and gravity should be sufficient to dewater the sediments.

Prior to the start of construction, the staging/stockpiling areas, excavation boundaries, and access routes will be staked by the Engineer as shown on Figure 4. Erosion control devices will be placed to prevent runoff of sediment into wetlands and streams as specified. The Contractor will confine construction activities to the minimum area necessary to complete the project within the designated boundaries. The boundaries were chosen to provide the Contractor with ample flexibility to conduct the work either from an upland route or within the water while limiting the disturbance to sensitive habitat areas, shorelines, and native vegetative communities. Temporary silt fences and/or sand dams will be placed such that the excavation areas are isolated from the larger side channel areas and from the Spokane River.

4.1.2 Potential Issues, Concerns, and Solutions

Discussions with the property tenants adjacent to the staging and stockpiling area of Deposit 1 are ongoing and have generated a few items of concern. The list below discusses these concerns and addresses the potential solutions:

- **Noise:** The Deposit 1 staging and stockpiling area is directly east of the Spokane Police Academy and the Contractor access route runs adjacent to the Academy grounds. Noise along the access route has the potential to disturb the Academy's training program. Construction is scheduled during the fall and winter, which corresponds with the Academy's least active period where the class size is the smallest.
- **Height of Equipment**: The Contractor access route also runs adjacent to the Felt's Field runway. Due to possible interference with air traffic, all construction equipment traveling on the access route must be lower than a 7:1 slope from the centerline of the runway. Figure 3 depicts the height restrictions at various locations around the site. The most restrictive height is 56 feet on the access route, which should not present difficulties for the Contractor.
- **Traffic:** In order to minimize traffic congestion and interference with Police Academy operations, the access route will divert from Waterworks Street and proceed off-road to the staging and stockpiling area at Deposit 1 (Figure 3). Some improvements will be required by the Contractor to ensure adequate road quality for transportation. All improvements will be reverted back to their approximate pre-construction condition upon completion of the work. A temporary gate will also be installed by the Contractor (Figure 3) that will circumvent the Police Academy and allow access to the site.

- **Security:** Because the construction sites at Deposit 1 and 2 are easily accessed by the public, the Contractor will construct a temporary fence around the construction site. The fence will serve both as a safety precaution for the public and security for the Contractor's equipment. Upon completion of the work, the fence will be removed and properly disposed.
- **Centennial trail:** Centennial Trail is open to the public and receives use year-round. The Contractor will utilize safety precautions such as placing flaggers on the trail during construction activities near Deposit 2 to control pedestrian traffic while allowing the trail to remain open and safe.
- **Neighborhood Traffic:** The truck and access route for Deposit 1 was intentionally chosen to remain on major streets and highways and to avoid densely populated neighborhoods. Because of its remote location, Deposit 2 work will require some construction traffic on N. Raymond road, which passes through a residential area (Figure 4). The Contractor will be required to observe all speed limits and take extra precaution in this area. N. Raymond road is approximately .25 miles long and is the most direct route to the Deposit 2 site.

4.1.3 Equipment, Monitoring, and Maintenance

The Contractor will utilize delivery trucks to bring the three layers of cap material to the Deposit 1 staging and stockpiling area. The cap, including overplacement volumes, will consist of approximately 4,700 cy of coal, 5,600 cy of base cap and 4,200 cy of gravel armor, totaling approximately 14,500 cy of material. Each truckload will carry approximately 10 cy with a 10-cy trailer attached for a maximum capacity of 20 cy; therefore, approximately 725 truck loads are anticipated for the delivery of the Deposit 1 capping material. The Contractor will also mobilize and demobilize the construction equipment along the access route. This will include the delivery of approximately 20 10-foot by 40-foot flatbed scows, a derrick, some land-based earth moving equipment, a conveyor system, and a tug boat and skiff. These items will be brought to the site by truck and loaded into the water on the bank at the staging and stockpiling area. The Deposit 1 capping is expected to take approximately 7 weeks.

At Deposit 2, approximately 600 cy of backfill material will be delivered to the staging and stockpiling area via delivery truck. Additionally, an equal volume of excavated material will be hauled away to a disposal facility. Therefore, approximately 1,200 cy of material will be moved to or from the site, totaling approximately 60 truck trips. A front end loader will likely be used by the Contractor to excavate Deposits 2A and 2B. The material will then be moved to the staging and stockpiling area by a low ground pressure vehicle or similar vehicle and sorted by a front end loader. The Deposit 2 excavation and backfilling is expected to take 2 weeks.

4.2 Capping of Deposit 1

4.2.1 Description

The remedial project design for Deposit 1 includes placement of a clean cap system over a 3.6-acre deposit of fine-grained surface sediments contaminated with PCBs. The cap has been designed to provide an absorptive layer of coal (6 inches), overlain by a sand base cap (6 inches) and armoring gravel (3 inches) with an over-placement allowance of 6 inches for each layer, and will be constructed in a manner that minimizes turbidity and ensures accurate placement. The cap, including over-placement volumes, will consist of approximately 4,700 cy of coal, 5,600 cy of base cap and 4,200 cy of gravel armor.

Cap material will be moved from the stockpiling/staging area to a haul barge via a front end loader and a conveyor system. The haul barge will then be positioned adjacent to a derrick for material placement. The coal will be kept wetted on the barge. The material will be lowered below the water surface during placement. Placement of the coal material will be performed by a derrick from a barge using a clamshell bucket lowered through the water column to a depth of no more than 5 feet above the sediment surface prior to slowly releasing the material. The sand and gravel layer will be placed using a clamshell bucket opened at the water surface. The bucket will be opened slowly and concurrently swung from side to side. The slow release of the sand and gravel will allow the material to gently flow through the water column.

4.2.2 Potential Issues, Concerns, and Solutions

A potential construction concern associated with the Deposit 1 capping activity is the accurate placement of cap material. The approach designed to mitigate this problem is based on successful cap placement methods used at other similar sites. The Contractor will subdivide the 3.6-acre Deposit 1 cap area into approximately 60 grid areas, each measuring approximately 50-feet by 50-feet. The Contractor will then calculate the volume or tonnage of coal and sand base cap material required to be placed in each capping grid and will monitor the delivered quantity of material. Once the target quantity of material has been placed within the grid, a piston core will be collected at a random position within the grid to verify the cap thickness. The piston core tubing will be made of a clear polycarbonate material that allows for efficient visual identification of the layers of the cap. If the minimum thickness of the cap has been achieved in that grid, then the Contractor will proceed to the next grid. If the minimum thickness of the cap layer is not obtained, then additional material will be placed throughout the grid and the sector re-verified through additional random piston coring. The volume or tonnage of cap material placed during subsequent cap placements will be adjusted based on the preceding core observations.

This general method will be used for the first two layers of the cap (coal and base cap) to ensure that the specific thicknesses are placed. Since the armor layer will prevent adequate penetration by a piston corer, a hydrographic survey will be used to verify the thickness of the final armor layer. The Contractor will conduct a survey after the base cap layer has been placed and another survey after the armor layer has been placed. The difference between the surfaces of these two contours will be used to verify the armor layer thickness.

The Contractor will also be required to complete a post-cap placement survey to verify that the minimum thickness was placed. The difference between the final grade and existing mudline (and accounting for any settlements) will be the cap thickness. In addition, the Contractor will monitor the amount of capping material placed in each area to control cap thickness. The Contractor will use an electronic positioning system to monitor and document their position.

Prior to production cap construction, the Contractor will be required to construct a Pilot Cap section. The Pilot Cap section will allow the Engineer to observe the Contractor's proposed methods of placing the cap layers as well as monitor the Contractor's methods to ensure placement quality. The Engineer will review cap placement documentation, piston core results, and post-cap bathymetry data to verify placement. If the Engineer determines that the Contractor is not placing cap material in the correct location, the Contractor will be contacted immediately to correct the situation. Any such direction and corrective action will be documented on the next Quality Assurance Report.

4.2.3 Monitoring, Contingency Plans, and Corrective Actions

Cap thickness monitoring is described above in Section 4.2.2.

During capping activities, the Engineer will also monitor water quality. Monitoring will be performed to evaluate and document turbidity and dissolved oxygen levels during capping and to determine the need for corrective actions or procedure modifications to bring construction activities into compliance with water quality performance criteria.

Purpose and Objectives of Water Quality Monitoring. Section 401of the Clean Water Act (CWA) and State Surface Water Quality Standards (Chapter 173-201A WAC) require that construction operations shall not violate applicable effluent or water quality standards. Ecology is responsible for certifying during remedial design that such operations will comply with this requirement. This determination allows for the designation of mixing zones within which standards may be exceeded, but beyond which applicable standards must be met. While capping operations conducted as part of a MTCA remedial action do not require following the procedures for a formal Section 401 water quality certification, these operations must comply with the substantive requirements of such certification.

The Engineer will monitor water quality to verify that turbidity measurements and dissolved oxygen concentrations are maintained within water quality criteria in the vicinity of the construction activities for the following:

- Dissolved Oxygen – Concentration decreases relative to upstream conditions of less than 0.2 mg/L.
- Turbidity – Less than a 5 nephelometric turbidity unit (NTU) or 10 percent increase above upstream conditions.

Monitoring Parameters and Performance Criteria. The Spokane River is classified as class A water under WAC 173-201A, which includes a project-related dissolved oxygen decrease of less than 0.2 mg/L, and a turbidity limit of less than a 5 NTU increase over background if upstream turbidity is less than 50 NTU. If upstream background turbidity is greater than 50 NTU then a 10 percent increase in turbidity over the background reading is allowed.

As described in Section 2.2.8 of the accompanying Engineering Design Report, peak turbidity increases predicted at Deposit 1 during project capping operations are anticipated to be less than 5 NTU, and within the state surface water quality turbidity standard. These calculations reveal that if coal obtained from the Spring Creek & Decker Mines or Palmer Coking Coal is used for the Deposit 1 cap, expected construction-related turbidity increases will be below the 5 NTU increase allowed under the state water quality standards. If Elk Valley coal is used for the lower section of the Deposit 1 cap, construction-related turbidity increases could potentially and periodically exceed the 5 NTU. However, because of the conservative assumptions used, these calculations provide only an initial screening-level estimate of reasonable worst-case turbidity that may occur during construction. Turbidity monitoring will be performed during cap placement to verify water quality compliance and to determine the need for any further operational controls.

Monitoring Locations. During construction, and consistent with the requirements of WAC 173-201A, turbidity standards must normally be met at a point 150 feet downstream of the Deposit 1 remedial action area, or approximately at the Upriver Dam spillway. The background turbidity measurement will be made 300 feet upstream of the Deposit 1 remedial action area. Water quality monitoring at each location will target three depths: 1 foot below water surface, at mid-depth and 1 foot above mudline. Routine ambient monitoring activities will be performed at these locations on two occasions immediately prior to the beginning of construction (to establish baseline water quality conditions), and while construction is in progress.

Monitoring Schedule. Water quality monitoring will be performed according to three schedules:

- **Intensive Monitoring** – twice per construction shift. Intensive monitoring will be initiated at the start of the construction phase and upon exceedance of water quality performance criteria at the compliance boundary. Intensive monitoring will continue for a period of 2 days following startup. If performance criteria have not been exceeded at the water quality compliance boundary within the 2-day startup period, then monitoring will continue at the routine frequency.
- **Routine Monitoring** – once daily. Routine monitoring will continue for an additional 5 days. If performance criteria have not been exceeded at the water quality compliance boundary during the 5-day period, then monitoring will continue at the limited frequency at the direction of the Engineer and approval of Ecology.
- **Limited Monitoring** – once weekly.

Operational Modifications if Out of Compliance. If exceedance of water quality criteria occurs at the compliance boundary, as defined above, the Contractor will be required to modify operations. Construction activities will also cease at the first indication of significant oil sheen and/or distressed or dying fish in the vicinity. In this event, Ecology will be notified immediately. Modifications may include slowing of construction activities, modifying placement techniques, deploying silt curtains or booms, or other operational modifications.

4.2.4 Description of Equipment, Monitoring, and Maintenance

Capping equipment will consist of a conveyor and front end loader on shore near the staging and stockpiling area that will load the capping material onto a haul scow barge. A tug or contractor's skiff will then maneuver the scow from the docking position at the staging/stockpiling area into position at Deposit 1. A derrick will also be maneuvered into place by the tug and anchored into position then unload the capping material from the scow. Bathymetric surveys and piston coring will be conducted to verify cap placement using a skiff or survey boat.

In accordance with the contract terms, the equipment will be maintained by the Contractor in good working order and in safe working condition at all times. Survey equipment will be maintained and calibrated for the life of the contract. Calibration techniques are prescribed to ensure that the equipment performs to the accuracy required by the specified Survey Order as defined in Standard Hydrographic Survey Manuals. Barge conditions will be monitored and maintained throughout capping activities. The Contractor will be instructed to correct any deficiencies.

4.3 Excavation and Backfill of Deposit 2

4.3.1 Description

Deposits 2A and 2B in the Donkey Island area will be excavated to remove the approximate extents of the PCB contamination. This will result in a total removal of approximately 600 cy of sediment. Conventional upland excavation equipment such as track hoes or excavators will be used for the removal action. The excavation will likely be conducted in the water and from the northern bank of Deposit 2A. At Deposit 2B, excavation will be conducted solely from the northern bank near the deposit or from the water. The excavated material will be placed in an earthmover (such as a low ground pressure front end loader) and moved to the Deposit 2 staging/stockpiling area for passive dewatering and then transportation to an approved disposal facility.

Clean sand material meeting specifications will be purchased from a regional supplier and delivered to the Deposit 2 staging/stockpiling area for use as backfill. Once the excavation of the contaminated material is complete, an earthmover will transport the clean sand to the Deposit 2 site where it will be placed by the excavator. Upon completion of the backfill, the deposit and excavation area will be restored by the Contractor to its approximate pre-excavation condition in order to preserve the shoreline and river riparian/backwater habitat surrounding Deposit 2.

4.3.2 Potential Issues, Concerns, and Solutions

The main concerns associated with Deposit 2 work are excavating to the required extents, containing turbidity, and avoiding damage to the surrounding environment and cultural resources. Each of these items is discussed below:

Excavating to the required extents and depths. Suitable pre-excavation surveys were completed by the Engineer in April 2006 to determine the starting elevation of Deposits 2A and 2B prior to construction activities. Thus, there is no need for the Contractor to perform an additional baseline survey. Once excavation has been completed to the specified elevations, a post-excavation survey will be conducted by the Engineer to demonstrate that the specified elevation has been reached. Should the excavated surface not reach the designed elevation, additional excavation will be required.

Surface (0 to 10 cm below mudline) sediment samples will be collected at four stations within the Deposit 2 boundaries: Station 100, 102, 104, and 107. After collection of the samples and verification by the Engineer that the final elevation has been attained, backfill material will be placed. The collected surface sediment samples will be analyzed for total solids and Total PCBs. Unavoidable sediment residuals exceeding the cleanup level may possibly remain within the excavation areas, which may be documented by the post-excavation sampling data. The post-excavation sampling results will be used to determine the need for post-backfill/cap monitoring. That is, if all four post-excavation surface sediment samples contain Total PCB concentrations at or below 62 μg/Kg dw, no post-excavation monitoring will be required in Deposit 2. However, if any of the four post-excavation surface sediment samples contain Total PCB concentrations above 62 μg/Kg dw, long-term monitoring of the backfill/cap surface will be performed to assess the performance of the cap. In this situation, monitoring will be performed during Years 2 and 4 following completion of the remedial action, as generally described in the accompanying Operations, Maintenance, and Monitoring Plan (OMMP), to be described in more detail in an OMMP Addendum submitted to Ecology for review.

A measurement will be made between the two surfaces (pre- and post-excavation elevation) to calculate total volume of material excavated to be used for pay purposes, as well as the required volume of backfill material needed to return the site to the pre-excavation elevation. Once the required backfill material has been placed, a final survey will be conducted to verify the extent of the backfill material. If the final surface is below the specified elevation, additional backfill material will be placed.

Containing turbidity. Water quality monitoring will not be required during construction at Deposit 2. However, due to the ecological diversity and sensitive nature of the area surrounding Deposit 2, turbidity control measures will be required when conducting construction activities at either Deposit 2A or 2B. The Contractor will place silt curtains, sandbags, or a similar turbidity control measure approved by Ecology in the channel within 50 feet of the extents of the deposits. The turbidity control measures will minimize the water quality impact during construction. Once the turbidity control measures are in place, the Engineer will seine the contained area for fish and other aquatic species.

Avoiding damage to surrounding environment. The Contractor will submit a plan for approval by Ecology that details the most efficient routes and means of excavation to complete the work at Deposit 2 in accordance with the specifications and taking into consideration the sensitive nature of the habitat, cultural resources, and the surrounding topography. Restrictive areas and clearing limits will be delineated on the final construction drawings to indicate areas that the Contractor must avoid, as well as areas where only limited activities may take place. Upon completion of the work, all areas in the vicinity of Deposit 2 used by the Contractor will be restored to their approximate pre-excavation condition in order to preserve the shoreline and river riparian/backwater habitat.

4.3.3 Monitoring, Contingency Plans, and Corrective Actions

During excavation and backfill of Deposit 2, the Engineer will perform visual examination of sediment conditions (i.e., T probe polling) during two conditions: post-excavation and post-backfill placement. The purpose of the post-excavation sediment polling and visual/photographic documentation is to confirm that fine-grained sediments in Deposits 2A and 2B have been removed to the extent practicable, allowing for unavoidable excavation residuals. Limited polling will also take place upon completion of backfilling to verify that backfill material is placed in a manner that minimizes mixing with underlying sediments. Depending on the field observations and polling results, corrective actions could include additional removal of sediment material or placement of additional backfill material.

Two topographic surveys will also be performed by the Engineer: one after excavation and another after backfilling. Traditional upland techniques will be used for the surveys as the water in the channel near Deposit 2 is relatively shallow. These surveys will be used to measurement and payment at Deposit 2.

4.3.4 Description of Equipment, Monitoring, and Maintenance

Equipment used for the excavation of Deposits 2A and 2B will include hydraulic excavation equipment such as track hoes, back hoes, loaders, and a low ground pressure haul vehicle. Surveys will also be conducted by the Engineer after excavation and after backfilling of Deposit 2 utilizing traditional upland survey techniques.

A staging and stockpiling area will be constructed by the Contractor within the designated area and in accordance with the specifications. Environmental controls will be required to prevent erosion of the material from natural forces such as rain and wind. The area designated for staging operations will be surrounded by an earthen berm or retaining wall made of cement ecology blocks and will only be used for staging of delivered clean backfill material. The stockpiling area will be constructed separate from the staging area and will be lined to minimize draining of water (or sediment) out of the stockpiling area. All contaminated material will be transported to an approved disposal facility. Any drainage water at the stockpiling area will be collected in a sump and discharged back to the Deposit 2 area. Before the water enters the sump, the water will be filtered of fines using hay bales, filter fabric, rock, or an equivalent filter.

The Contractor will conduct regular inspections and maintenance of the staging and stockpiling area to ensure compliance with its intended purpose. Any leaks, spills, or release of contaminated material outside of the stockpiling area will be immediately contained, cleaned up, and reported to the Engineer and Ecology.

5 DOCUMENTATION AND REPORTING

The Contractor will be responsible for quality control during construction and Avista's Project Coordinator will be responsible for quality assurance (i.e., verifying that the required quality control measures have been implemented). The Contractor will be required to submit various work plans for approval by the Project Coordinator prior to construction. Ecology will also review many of these documents pursuant to their approval authority defined in the CD. The following sections detail submittals required of the Contractor prior to, during, and at completion of various tasks. These submittals are also summarized in Table 1.

5.1 Pre-Construction Submittals

5.1.1 Construction Work Plan(s) and Schedule

The Contractor will submit Construction Work Plan(s) and Schedule identifying activities of the Contractor and subcontractors for the various elements of work. The Contractor will maintain the schedule throughout the construction period, record changes in responsibilities, and distribute the revised schedule promptly after each change. The Work Plans will detail the Contractor's proposed methods for implementing the work.

5.1.2 Construction Quality Control Plan (CQC Plan)

A CQC Plan will be submitted no later than 14 days prior to the start of any remedial activities. The CQC Plan will present the system through which the Contractor will ensure compliance with the requirements of the contract. The CQC Plan will identify personnel, procedures, methods, instructions, inspections, potential remedies, records, and forms to be used in the CQC system.

The CQC Plan will address the following items at a minimum:

- General requirements
- Quality control organization
- Inspection and testing requirements
- Inspection and test plan
- Documentation of quality control activities
- Requirements for corrective action when quality control and/or acceptance criteria are not met

5.1.3 Contractor Health and Safety Plan (CHASP)

The Contractor will submit a CHASP that presents the minimum health and safety requirements for job site activities and the measures and procedures to be employed for protection of on-site personnel. The plan will cover the controls, work practices, personal protective equipment, and other health and safety requirements that will be implemented by the Contractor in connection with the remedial action activities. The specifications (Section 01063—Safety and Health) provide additional detail.

5.1.4 Environmental Protection Plan (EPP)

For construction activities, the Contractor will be required to submit an EPP to Avista and Ecology for approval. The EPP will present the procedures by which the Contractor will establish and maintain quality control for environmental protection of all items of the remedial action and is to address all construction elements. The specifications (Section 01560—Environmental Protection) provide additional detail about the requirements for the EPP.

5.1.5 Results of Testing on Imported Materials

Prior to any on-site placement of imported materials, the Contractor will submit a Borrow Site Characterization Report to the Engineer. The report will identify the source of materials (including a map documenting the origin of the material) and provide documentation of a site inspection and of material sampling and characterization (including physical and chemical testing) to ensure that the imported material will uniformly meet the physical specifications of its intended use. Additional information about the imported material characterization is provided in the specifications (Section 02300—Earthwork).

5.1.6 Spill Prevention, Control, and Countermeasures Plan (SPCC Plan)

The Contractor will be responsible for the preparation of a Spill Prevention, Control, and Countermeasure (SPCC) Plan to be used for the duration of the project. The SPCC Plan will be submitted to the Engineer prior to the commencement of any construction activities. A copy of the SPCC Plan with any updates will be maintained at the work site by the Contractor. The SPCC Plan will identify construction planning elements and recognize potential spill sources at the site. The SPPC Plan will outline responsive actions in the event of a spill or release, and will identify notification and reporting procedures. The SPPC Plan will also outline contractor management elements such as personnel responsibilities, project site security, site inspections, and training. The SPPC Plan will outline what measures the Contractor will take to prevent the release or spread of hazardous materials, either found on site and encountered during construction but not identified in contract documents, or any hazardous materials that the Contractor stores, uses, or generates on the construction site during construction activities. These items include, but are not limited to, gasoline, oils, and chemicals. Hazardous materials are defined in Revised Code of Washington (RCW) 70.105.010 under "hazardous substance."

5.2 Construction Documentation and Reporting

During construction activities, the Contractor will be required to submit daily and monthly reports to Avista and Ecology. These submittals are for information only and are intended to summarize daily and monthly work conditions, deviations, and corrective measures, as described below. A brief description of the contents of the general documentation that will be submitted by the Contractor during construction is also provided below.

5.2.1 Daily Quality Control Report

During construction activities, the Contractor will prepare a Daily Quality Control Report and submit it to the Engineer. These reports will summarize the work performed by the Contractor, the equipment used, and the results of any quality control inspections, tests, or other monitoring activities. The reports will also document any noncompliant conditions, the communication of such conditions to the Project Coordinator, and the corrective actions taken to bring the construction activity into compliance.

A copy of the Daily Quality Control Report will be sent to Ecology on a daily basis as part of the Quality Assurance Report (discussed in Section 5.2.2).

5.2.2 Weekly Quality Assurance Report

The Engineer will document the results of his/her quality assurance inspections and testing and monitoring activities on a weekly basis on the Quality Assurance Report form. These reports will be transmitted weekly from the Project Engineer to Ecology. In the event that quality assurance inspections utilize the results of the Contractor's surveys and tests, those results will be summarized and included in the Quality Assurance Report.

If tests performed for the quality assurance inspection reveal out-of-specification conditions, the Engineer will immediately contact the Contractor's Superintendent to determine what action will be taken to modify the construction operation and correct the condition. If warranted, the Engineer will follow up this personal contact with a written memo to the Contractor's Superintendent confirming any oral instructions given. Instructions to the Contractor regarding any work that does not comply with the specifications will be confirmed with the Contractor in writing. The results of these discussions and follow-up corrective actions will be included in the weekly Quality Assurance Report.

As Ecology will likely be on-site during construction to monitor clean-up activities, the Engineer will notify Ecology in a timely manner of all construction management activities and any significant events. Corrective actions will be taken if any work is found not to be in accordance with the Ecology-approved remedial design plans, contract plans and specifications, work plan, and/or other Ecology-approved documents.

5.2.3 Water Quality Monitoring Reports

Daily Water Quality Monitoring Reports will be prepared by the Engineer during all in-water capping, excavation, and backfilling activities for which monitoring is required. In addition, the Engineer will submit weekly Water Quality Monitoring Summary Reports to Ecology. These reports will summarize the week's in-water construction activities, the Contractor's performance relative to water quality, any exceedances of water quality criteria over the measured background conditions, and the corrective actions taken.

5.3 Post-Construction Documentation and Reporting

A Final Cleanup Action Report will be prepared by the Engineer for submittal to Ecology after the completion of the construction activities at Deposit 1 and Deposit 2. The report will include as-built survey and other appropriate completion information.

6 REFERENCES

Ecology. 1995. Chapter 173-204 WAC. Sediment Management Standards. December 1995. Washington State Department of Ecology. Olympia, WA

Ecology. 2001. Chapter 173-340 WAC. Model Toxics Control Act. February 2001. Washington State Department of Ecology. Olympia, WA

Ecology. 2005. Final Cleanup Action Plan Spokane River Upriver Dam PCB Site Spokane, WA. Washington State Department of Ecology. Eastern Regional Office Spokane, WA

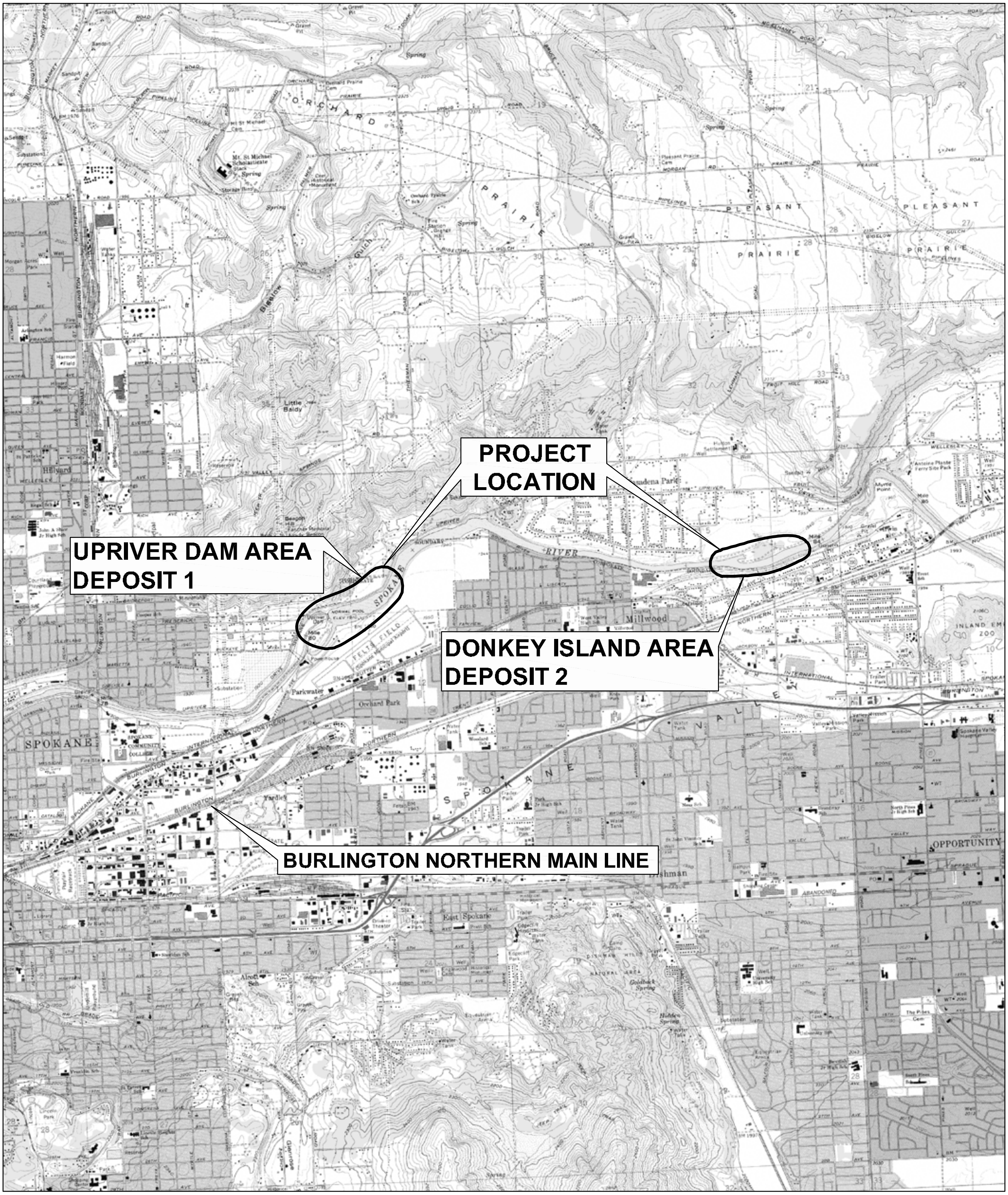
TABLES

Table 1
Construction Submittals

Document	Schedule	Author	Recipient	Copy
Construction Work Plans and Schedule	pre-construction	Contractor	Avista	Ecology
Construction Quality Control Plan	pre-construction	Contractor	Avista	Ecology
Contractor Health and Safety Plan	pre-construction	Contractor	Avista	Ecology
Environmental Protection Plan	pre-construction	Contractor	Avista, Ecology	
Cap and Backfill Material Characterization Report	pre-construction	Contractor	Avista	Ecology
Spill Prevention, Control, and Countermeasures Plan	pre-construction	Contractor	Avista	Ecology
Quality Control Reports	daily	Contractor	Avista	Ecology
Quality Assurance Reports	weekly	Engineer	Ecology	
Water Quality Monitoring Reports*	daily	Engineer		Ecology
Water Quality Monitoring Summary Reports	weekly	Engineer	Ecology	
Final Cleanup Action Report	post-construction	Engineer	Ecology	

* Water Quality Montoring Reports will be completed daily by the Engineer, and submitted weekly to Ecology as the Water Quality Monitoring Summay Report.

FIGURES

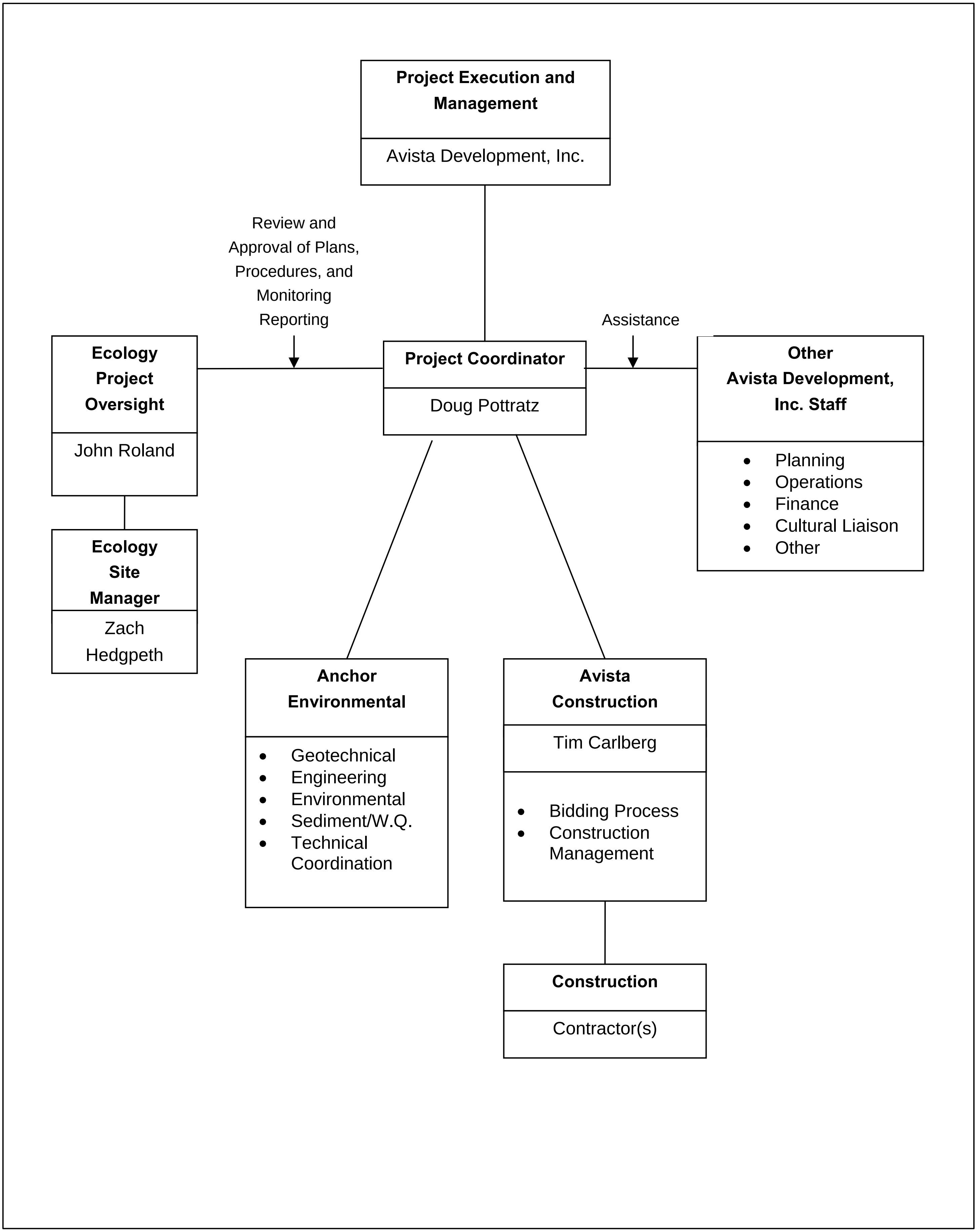


Note: Base map prepared from Terrain Navigator Pro USGS 7.5 minute quadrangle maps of Green Acres and Spokane NE, Washington.

Jun 05, 2006 11:41am cdavidson K:\Jobs\050306-Upriver\05030601\05030601-18.dwg FIG 1

ANCHOR ENVIRONMENTAL, L.L.C.

Figure 1
Site Location
Upriver Dam PCB Sediment Site



ANCHOR ENVIRONMENTAL, L.L.C.

Figure 2
Organizational Chart
Upriver Dam PCB Sediments Site

CONTROL PT.	NORTHING	EASTING
O	269240	2504211
P	269511	2504049
Q	269136	2504096
R	269200	2504152
S	269466	2504014
T	269381	2503961
U	267705	2502512
V	269307	2503956

NOTES:

1. MINOR ROAD IMPROVEMENTS CAN BE MADE TO EXISTING ACCESS ROUTES. (I.E. GRADING GRAVEL)

2. STAGING/STOCKPILING AREA AND ACCESS ROUTE SHALL BE RETURNED TO PRE-CONSTRUCTION CONDITION UPON COMPLETION OF WORK.

3. CONTRACTOR SHALL CONFINE STAGING/STOCKPILING OPERATIONS TO DESIGNATED AREA.

4. CONTRACTOR SHALL MINIMIZE NOISE AND DUST POLLUTION DURING OPERATIONS.

5. EQUIPMENT HEIGHT RESTRICTED TO 56' ON ACCESS ROAD.

6. AERIAL PHOTO PROVIDED BY AVISTA DATED JUNE 2002.

7. BATHYMETRY BASED ON SURVEY DATA PROVIDED BY BLUE WATER ENGINEERING DATED MAY 20-22, 2003.

8. HORIZONTAL DATUM: STATE PLANE NAD83 WASHINGTON, NORTH

9. VERTICAL DATUM: NAVD88

Jun 05, 2006 11:45am cdavidson K:\Jobs\050306-Upriver\05030601\90 Percent\05030601-19_90.dwg FIG 3 EDR

ANCHOR ENVIRONMENTAL, L.L.C.

Figure 3
Deposit 1 Site Access Plan
Upriver Dam PCB Site Project

APPENDIX C
OPERATIONS, MAINTENANCE, AND MONITORING PLAN (OMMP)

APPENDIX C
OPERATIONS, MONITORING, AND MAINTENANCE PLAN (OMMP)

UPRIVER DAM PCB SEDIMENTS SITE

Prepared for

Avista Development, Inc.

Prepared by

Anchor Environmental, L.L.C.
1423 Third Avenue, Suite 300
Seattle, Washington 98101

June 2006

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1 INTRODUCTION

This Operations, Monitoring, and Maintenance Plan (OMMP) for the cleanup of a polychlorinated biphenyl (PCB) sediment deposit (denoted the Upriver Dam Cleanup Project) located in Spokane County, Washington is one of the elements of the Draft Final Design Submittal. This OMMP was prepared to comply with the requirements described in the Consent Decree (CD) executed in August 2005 between Washington State Department of Ecology (Ecology) and Avista Development, Inc. (Avista), which is included as an exhibit to the Cleanup Action Plan (CAP) prepared by Ecology for the site (Ecology 2005). Remedial design/remedial action (RD/RA) activities will be performed in compliance with the Washington Administrative Code (WAC), Washington's Sediment Management Standards (SMS) (Ecology 1995a; WAC 173-204), and the Model Toxics Control Act (MTCA) (Ecology 2001; WAC 173-340), as set forth in the CD.

This OMMP describes how the Upriver Dam Cleanup Project will be implemented to comply with requirements described in the CD and CAP. This OMMP has been prepared on behalf of the project sponsor (Avista) who will oversee operations, maintenance, and monitoring at the site. Anchor Environmental, L.L.C. (Anchor), and/or other consultants will assist Avista in these activities as necessary.

The purpose of this document is to describe the post-remedial action environmental monitoring activities for the construction completed at Deposit 1 of the Upriver Dam Cleanup Area and the steps necessary to assess successful completion of the work. Remedial action will also be conducted at Deposit 2, near Donkey Island; however, long-term sampling, monitoring, and institutional controls are not required in that part of the site. This document identifies for Ecology the quality assurance/quality control (QA/QC) steps to be used to perform initial baseline sampling and long-term operation, maintenance, and monitoring of the Upriver Dam Cleanup Project, including monitoring actions and reporting mechanisms. The OMMP in conjunction with the Sampling and Analysis Plan (SAP; Appendix D of the Engineering Design Report) identifies specific objectives, rationale, and methods to assess the long-term performance of the cleanup remedy. The document describes how environmental monitoring will be performed and how response actions will be directed, as necessary, based on the monitoring results. Further, it delineates the quality assurance methods and protocols for project personnel to ensure that all have a complete understanding of monitoring, feedback, and adjustment mechanisms.

Long-term performance and confirmation monitoring activities are scheduled to be the basis of Ecology's 5-year review of the effectiveness of the remedial action. Sampling events will occur in Years 2 and 4 following cap construction.

The Construction Quality Assurance Plan (CQAP; Appendix B of the Engineering Design Report) is an accompanying document that describes the steps to be undertaken during construction to obtain regulatory approval of the remedial action's completion.

The SAP (Appendix D of the Engineering Design Report) is another accompanying document that specifies procedures that ensure sample collection, handling, and analysis will result in data of sufficient quality to evaluate the effectiveness of remedial actions at Deposit 1.

The sections below describe the monitoring data quality objectives including the type, number, and location of samples to be collected; the frequency of sample collection; the sampling methods to be used; the analyses to be performed; and the procedures and schedule for reporting. The OMMP also includes a description of threshold or triggering criteria, and a description and schedule of corrective actions to be implemented in the event that these criteria are exceeded.

The monitoring activities discussed in subsequent sections of this OMMP are described below:

- **Section 2**. The responsibilities and authorities of key project personnel, contractors, and all organizations involved in the remedial action.
- **Section 3**. Routine Monitoring Events
- **Section 4.** Unscheduled Monitoring Events
- **Section 5.** Schedule
- **Section 6**. Corrective Actions
- **Section 7**. Reporting

2 PROJECT ROLES AND RESPONSIBILITIES

2.1 Washington Department of Ecology

Ecology is the regulatory authority and responsible agency for overseeing and authorizing the remedial action. In this capacity, Ecology reviews monitoring plans during the remedial design phase and will review information described in this OMMP to ensure that the project is constructed in a manner consistent with the remedial design. Zach Hedgpeth has been designated the Ecology's site manager to exercise project oversight for Ecology and to coordinate with Avista. Ecology will make final decisions to resolve unforeseen problems, which may change the project components, or the manner in which the OMMP is undertaken.

2.2 Avista Development, Inc.

The operation, maintenance, and monitoring work on this project will be managed by Avista and executed by Avista or by one or more consultants specializing in this work. The Project Coordinator for Avista is Doug Pottratz. Avista has responsibility for management and contract administration, and may also perform the maintenance and monitoring as appropriate. Avista will also be responsible for implementation of the OMMP, including required monitoring, sampling, testing, and reporting. Included within this responsibility will be the monitoring or quality control activities to ensure that activities described in this OMMP are conducted in accordance with the requirements described herein. These activities may also be assigned to consultants with the requisite expertise and experience.

2.3 Consultants

During the course of construction, consultants may be utilized to ensure that the design objectives are realized and that the OMMP is implemented in accordance with the remedial design documents. All personnel utilized in this work will have the expertise, experience, and capability to satisfactorily execute the work. All personnel will be required to have applicable training.

3 ROUTINE MONITORING EVENTS (SEDIMENT QUALITY)

Monitoring will be performed at Deposit 1 to confirm that the remedial action achieves the performance standards specified in the CD and CAP. The objectives of long-term monitoring at the Deposit 1 are as follows:

- To verify that the cap is sound and not substantially eroded over time by natural and anthropogenic forces.
- To verify that the sediment surface (nominally 0 to 10 cm) is not recontaminated above the cleanup standard of 62 micrograms/kilogram dry weight basis (62 μg/Kg dw).
- To verify that PCBs capped at Deposit 1 are not migrating upward through the cap.
- To generally document the performance of the cap for inclusion in the 5-year review conducted by Ecology.

3.1 Sediment Monitoring Rationale

As described in the Final CAP (Ecology 2005), multiple physical and chemical analysis surveys have been performed on the sediments in the vicinity of Deposit 1. These investigations include:

- Ecology's 1993-94 Investigations (Ecology 1995b)
- Kaiser's 1994 Investigations (Hart Crowser 1995)
- Ecology's 1999 Survey (Johnson 2000)
- Ecology's 2000 Sediment Toxicity Tests (Johnson and Norton 2001)
- EPA's 2001 Coeur d'Alene Basin Remedial investigation/Feasibility Study (EPA 2001)
- Avista's and Kaiser's 2001 Investigation (Exponent and Anchor 2001)
- Avista and Kaiser's 2005 Focused Remedial Investigation Report (Anchor 2005a)
- Avista and Kaiser's 2005 Focused Feasibility Study (Anchor 2005b)

These events were analyzed to complete a characterization of the nature and extent of the PCB sediment contamination at Deposit 1. Ecology selected 62 μg/Kg total PCBs in the sediment as the cleanup level that will be protective of human health and the river ecological community. The selected cleanup remedy addressed the PCB-contaminated sediments and is detailed in the Engineering Design Report. The remedy requires placement of a minimum 13-inch cap over the identified PCB contaminated sediments at Deposit 1. The cap will consist of a minimum of 4 inches on bituminous coal acting as an absorptive layer overlain by a minimum of 6 inches of sand. The final layer will consist of 3 inches of protective armor. The cap is designed to physically isolate the PCB-contaminated sediments below the biologically active zone (0-10 cm), stabilize the subsurface PCB-contaminated sediments from potential worst-case hydrodynamic forces, and reduce the transport of dissolved PCBs into the overlying water column.

This long-term monitoring plan was developed to ensure that the above stated design objectives are met and that cap performance data could be evaluated after 5 years. This long-term monitoring plan will consist of evaluations at Years 2 and 4 and following major flood events. Cap performance evaluations will include hydrographic surveys to assess the cap thickness and its resistance to erosive forces over time. Surface and subsurface sediment sampling will also be conducted to verify that the 62 μg/Kg dw sediment cleanup level is maintained and that dissolved PCBs have not migrated up through the cap. As part of each 5-year review, Ecology will make a determination regarding necessary long-term monitoring.

3.2 Sediment Monitoring Strategy

Each long-term monitoring event at Deposit 1 will encompass two broad categories:

- Physical Integrity Performance Monitoring
- Sediment Quality Confirmation Monitoring

The physical integrity monitoring will be conducted by a hydrographic survey conducted at the start of each sampling event. The survey will be used to evaluate the cap thickness by comparing the surface of the cap from the post-construction survey that serves as the as-built condition. Based on the results of the survey, cap areas of relatively greater erosion or settlement will be targeted (in part) as locations to conduct sediment quality monitoring. Visual inspections by divers to evaluate cap erosion may also be required to further detail the physical integrity of the cap and located potential surface sediment sampling locations, as necessary.

Sediment quality monitoring will be conducted at five locations on the Deposit 1 cap. Two surface sediment grab locations will be chosen following the hydrographic survey and will be biased towards relatively low spots on the cap. Three subsurface sediment cores will be collected at locations corresponding to pre-design sampling stations. Sediment sampling locations will be proposed to Ecology for approval prior to initiation of field efforts. The following section describes the methods to be used to perform the sediment sampling.

3.3 Sediment Sampling Locations and Methods

Methods and procedures for the bathymetric survey and sediment sampling are provided below. Detailed procedures, QA/QC guidelines, and other organizational details are found in the SAP (Appendix D of the Engineering Design Report). The SAP specifies procedures that ensure sample collection, handling, and analysis will result in data of sufficient quality to evaluate the effectiveness of remedial actions at Deposit 1.

3.3.1 Bathymetric Surveys

Bathymetric surveys will be performed over the full extent of the capping area as depicted in the construction drawings (Appendix A, Sheet B1). The surveys will be completed in general conformance with a Corps of Engineers Class I survey (EM 110-2-1003) with the following modifications:

- Tracklines will be placed on 25-foot centers (versus 100-foot centers as specified in EM 110-2-1003)
- Surveys will tie into a local elevation datum

Survey methods and transect locations will be similar between each long-term monitoring survey to allow detailed comparisons. Changes in bathymetry will be evaluated to identify areas of net erosion or deposition relative to post-construction conditions. A moderate concern area of potential erosion will be assigned when the total cap thickness is within 6 inches of the minimum 13-inch specification (i.e., total cap thickness of between 13 and 19 inches). A high concern area of potential erosion will be assigned when the total cap thickness is less than the minimum 13-inch specification. A moderate concern exceedance may trigger sediment sampling in that area to verify that surface sediments at that location are maintained below 62 μg/Kg dw total PCBs, whereas a high concern exceedance may trigger additional contingency evaluations.

3.3.2 Surface Sediment Sampling

Surface sediment samples from the 0 to 10 cm biologically mixed surface layer will be collected for chemical and physical testing using a van Veen grab sampler or equivalent in accordance with Puget Sound Estuary Program (PSEP) protocols (PSEP 1997). Upon contact with sediments, the jaws will be drawn shut to collect the sample. As described in the SAP, samples will be collected in the following manner in accordance with the PSEP protocols:

- The sampling vessel will be positioned within 3 meters of the desired location. At the time of sampling, the geodetic horizontal position (i.e., latitude and longitude) of each sample location will be documented to the nearest 0.01 seconds.
- Water depth will be recorded at each sample location. Depth will be determined by leadline measurements or a depth finder.
- The van Veen will be decontaminated and deployed.
- The sediment sample will be retrieved aboard the vessel and evaluated against the following PSEP acceptability criteria:
    - van Veen sampler is not overfilled (i.e., there is no sediment surface against top of sampler)
    - Sediment surface is relatively flat, indicating minimal disturbance or winnowing
    - Overlying water is present, indicating minimal leakage
    - Overlying water has low turbidity, indicating minimal sample disturbance
    - Desired penetration depth is achieved
- Overlying water will be siphoned off and a stainless steel trowel or similar device will be used to collect only the desired sediment fraction from inside the van Veen sampler, taking care not to collect sediment in contact with the sides of the sampler.
- The desired sediment fraction from the inside of the van Veen sampler will be placed in a high-density polyethylene (HDPE) bucket or stainless steel bowl. Sediment from multiple grabs may be necessary to collect sufficient sample volumes for analysis. When sufficient sample volume has been collected, the sediment will be homogenized using a stainless steel spoon or variable speed drill fitted with a stainless steel paddle.

- Homogenized sediment will be placed immediately into appropriate pre-labeled sample containers and placed immediately on ice for transport to the appropriate laboratory.

3.3.3 Subsurface Sediment Sampling

During the Years 2 and 4 monitoring events, sediment cores will be collected at three predetermined locations within Deposit 1 (SC-1, SC-2, SC-3; Figure 1) to verify the predicted lack of upward migration of PCBs through the cap. If chemical sampling results from the cores warrant alternative methods for evaluation, bioassay testing can be added as a possible contingency method.

The primary means to collect subsurface sediments will be piston coring. The piston corer will be lowered to the appropriate depth. When that depth is reached, the piston will be tied off and the core tube pushed to the required depth.

The minimum acceptable penetration depth for a successful core will be 1 or more feet below the bottom of the Deposit 1 cap. If these acceptance criteria are met, the core will then be capped and delivered onshore for processing.

The procedure for piston coring is described in the SAP and summarized below:

- Clean and rinse the tubes in a solution of laboratory grade non-phosphate based soap and potable water.
- 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:
  - Water depth at each boring location
  - Location of each boring station as determined by differential global positioning system (DGPS)
  - Date and time of collection of each sediment core sample
  - Names of field supervisor and person(s) collecting and logging in the sample
  - Observations made during sample collection including: weather conditions, complications, and other details associated with the sampling effort
  - The sample station number

  - Length and depth intervals of each core section and recovery for each sediment sample
  - Qualitative notation of apparent resistance of sediment column to coring
  - Any deviation from the SAP.
- When retrieved, each core will be inspected and a physical description of the material at the mouth of the core will be entered into the core log.
- Core tubes longer than 4 feet will be cut in half to facilitate upright storage. The core sections will be stored upright in iced containers for transport to the core processing facility.
- At the core processing facility, the cores will be cut open and a sediment description of each core sample will be recorded on the core log 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, color)
  - Odor (e.g., hydrogen sulfide)
  - Wood material and other debris
  - Biological activity (e.g., detritus, shells, tubes, bioturbation, live or dead organisms)
  - Presence and depth of the redox potential discontinuity layer
  - Any other distinguishing characteristics or features
- Sample intervals will target three layers: the sand material, the coal material, and the 1-foot layer below the cap

Should piston coring through the armor layer of the cap not prove successful, alternative methods such as diver-assisted sampling may need to be employed.

Table 1 lists the coordinates for the three pre-determined sediment core locations.

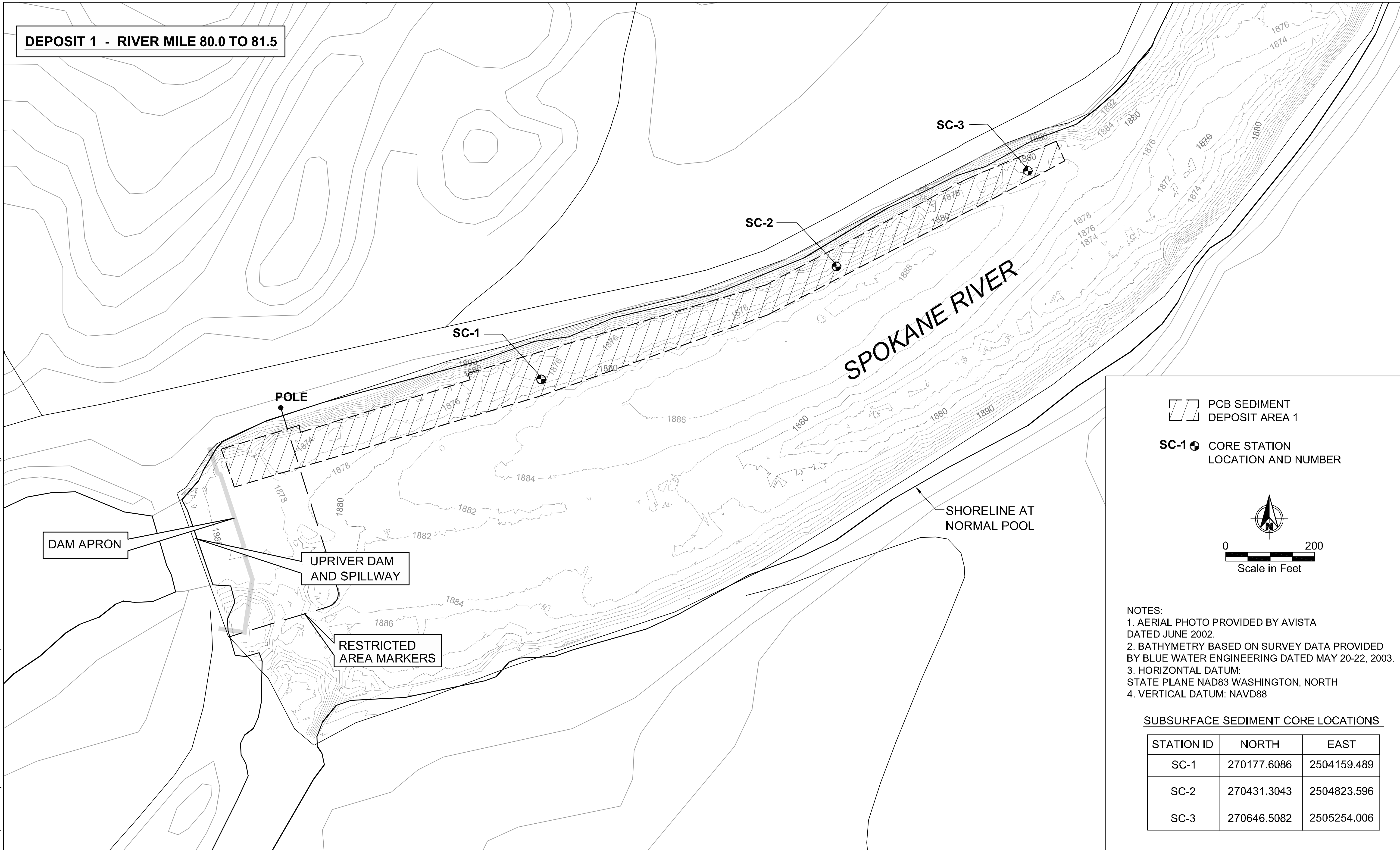
Table 1
Subsurface Sediment Core Locations for OMMP

Station ID	North	East
SC-1	270177.6086	2504159.489
SC-2	270431.3043	2504823.596
SC-3	270646.5082	2505254.006

State Plane NAD83
Washington North - 4601
U.S. Survey Feet

3.4 Sample Analyses

All surface and subsurface sediment samples collected will be analyzed for PCB Aroclors using EPA Method 8082, total organic carbon (TOC), total solids, and grain size. At least one sample from each location will be frozen at -20°C and archived for potential future analyses.



NOTES:
1. AERIAL PHOTO PROVIDED BY AVISTA DATED JUNE 2002.
2. BATHYMETRY BASED ON SURVEY DATA PROVIDED BY BLUE WATER ENGINEERING DATED MAY 20-22, 2003.
3. HORIZONTAL DATUM: STATE PLANE NAD83 WASHINGTON, NORTH
4. VERTICAL DATUM: NAVD88

SUBSURFACE SEDIMENT CORE LOCATIONS

STATION ID	NORTH	EAST
SC-1	270177.6086	2504159.489
SC-2	270431.3043	2504823.596
SC-3	270646.5082	2505254.006

Apr 14, 2006 2:07pm cdavidson K:\Jobs\050306-Upriver\05030601190 Percent\05030601-14_90.dwg FIG 1 OMMP

ANCHOR ENVIRONMENTAL, L.L.C.

Figure 1
Sampling Station Locations
OMMP
Upriver Dam PCB Site Project

4 UNSCHEDULED MONITORING EVENTS (MAJOR FLOOD EVENTS)

Unscheduled monitoring will be conducted following a significant flood event in order to confirm that the armor layer specified in the design documents protects the underlying layers of the cap from erosional forces. As described in section 2.2.7 of the Engineering Design Report, the cap armor layer was designed to maintain its integrity under reasonable worst-case environmental and human use conditions (e.g., to resist shear stresses under a 100-year flood condition). Therefore, the flood event that will trigger unscheduled monitoring will be defined as a 50-year or higher flood. The strategy, location, and methods for an unscheduled sampling monitoring event remain as described in Section 3 of this report.

5 SCHEDULE

An initial post-construction bathymetric survey of the Deposit 1 cap will occur immediately following completion of the remedial action. The initial post-construction survey will verify the baseline (Year 0) extent of the cap, and along with the post-cap piston core verification data, will serve as the basis to assess long-term stability. Bathymetric surveys and sediment quality monitoring will also be completed during Years 2 and 4 following completion of the remedial action.

Sediment quality monitoring during Years 2 and 4 following completion of the remedial action should be sufficient to document effectiveness of the action over a 5-year period. After the 5-year monitoring period, the data will be summarized and reviewed by Ecology as part of the 5-year MTCA remedial action review. This review will determine the need for and/or scope of future monitoring that may be implemented as part of the long-term monitoring assessment of the Upriver Dam Project.

Table 2 summarizes the year in which each monitoring events will occur. Refer to Section 3 of this report and the SAP (Appendix D of the Engineering Design Report) for the following amplifying information:

- Data objectives, including the rationale for the type, number, location, and frequency of samples to be collected
- Monitoring elements and analyses to be performed
- Sampling equipment and methods to be used

Table 2
Summary of the OMMP Schedule for Deposit 1

Description of Monitoring Event	Year		
	0	2	4
Construction Phase Monitoring[1] Hydrographic surveys Cap thickness verification	X		
Physical Integrity Performance Monitoring Hydrographic surveys		X	X
Sediment Quality Confirmation Monitoring Surface sediment sampling Subsurface sediment sampling		X	X
Unscheduled Monitoring Hydrographic surveys Surface sediment sampling Subsurface sediment sampling	After a 50-year flood event or larger.		

Notes:
[1] Year 0 events described in the CQAP.

6 CORRECTIVE ACTIONS

In the event that monitoring indicates that remedial action performance standards are not being achieved, Avista will submit recommendations for further monitoring or corrective actions to Ecology for review. A response plan will describe additional response actions to be taken to ensure the successful performance of the work. In conjunction with Ecology, Avista will evaluate the extent and significance of the exceedance or trigger. The need for additional response actions will take into consideration all monitoring results relative to an overall assessment of the successful performance of the remedial action. Through these discussions, an appropriate course of action will be developed and implemented, as necessary.

Possible additional response actions may include, but are not limited to, the scenarios detailed below. The specific problem causing the need for a contingency will dictate which additional response actions may be most appropriate.

- **Erosion of Cap Material**
  - Perform additional monitoring to further assess erosion and to determine the extent, cause, and potential solution to the verified erosion
  - Perform additional sediment quality sampling within those erosion areas where there may be a potential for underlying material to be exposed
  - Discuss operations that might contribute to erosion and modifications to these operations that may be required to maintain remedy effectiveness
  - Place additional material with less erosion potential to supplement caps
- **Sediment Cleanup Standard Chemical Exceedance**
  - Place additional capping material
  - Conduct a source control evaluation
  - Conduct confirmation biological sediment toxicity testing to confirm or refute the occurrence of adverse ecological impacts

7 REPORTING

Subsequent to each monitoring event described in Section 5, the Engineer will submit a detailed report to Ecology outlining the actions taken and the results, which will include survey maps and chemical analysis data. A recommendation for further action will be described in detail if warranted.

A Final Cleanup Action Report will be prepared by the Engineer for submittal to Ecology after the completion of the construction activities at Deposit 1. The report will include as-built survey and other appropriate completion information that will serve as the as-built conditions for the cap. The OMMP will be finalized after construction is complete and will be submitted as part of the Final Cleanup Action Report.

8 REFERENCES

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Anchor. 2005b. Draft Final Focused Feasibility Study Upriver Dam PCB Sediment Site. February 2005. Prepared by Anchor Environmental, L.L.C. Seattle, WA

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APPENDIX D
SAMPLING AND ANALYSIS PLAN FOR DEPOSIT 1 ROUTINE MAINTENANCE (SAP)

APPENDIX D

SAMPLING AND ANALYSIS PLAN FOR DEPOSIT 1 ROUTINE MONITORING

UPRIVER DAM PCB SEDIMENTS SITE

Prepared for

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June 2006

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1 INTRODUCTION

This Sampling and Analysis Plan (SAP) describes the sampling activities required in the Operations Maintenance and Monitoring Plan (OMMP; Appendix C) and is directed by the Washington State Department of Ecology (Ecology) in the Final Cleanup Action Plan (CAP, Ecology 2005) for Deposit 1 of the Upriver Dam polychlorinated biphenyl (PCB) Sediments Site.

The OMMP for the cleanup of a PCB sediment deposit (denoted the Upriver Dam Cleanup Project) located in Spokane County, Washington is one of the elements of the Draft Final Design Submittal. The OMMP was prepared to comply with the requirements described in the Consent Decree (CD) executed in August 2005 between Ecology and Avista Development, Inc. (Avista), which is included as an exhibit to the CAP prepared by Ecology for the Site (Ecology 2005). Remedial design/remedial action (RD/RA) activities will be performed in compliance with the Washington Administrative Code (WAC), Washington's Sediment Management Standards (SMS) (Ecology 1995; WAC 173-204), and the Model Toxics Control Act (MTCA) (Ecology 2001; WAC 173-340), as set forth in the CD.

The selected remedy for Deposit 1 was an in situ sediment cap placed above the PCB-contaminated sediment. The achievement of remedial design objectives will be evaluated by long-term monitoring of the cap, and this SAP describes the sampling activities necessary to achieve this goal.

2 BATHYMETRIC SURVEY

A bathymetric survey will be performed over the full extent of the capping area as depicted in the construction drawings at the commencement of each long-term monitoring event. The survey will be completed in general conformance with a U.S. Army Corps of Engineers (Corps) Class I survey (EM 110-2-1003) with the following modifications:

- Tracklines will be placed on 25-foot centers (versus 100-foot centers as specified in EM 110-2-1003)
- The reported elevation datum will be mean lower low water (MLLW)

Survey methods and transect locations will be similar between each long-term monitoring event to allow detailed comparisons. Changes in bathymetry will be evaluated to identify areas of net erosion or deposition relative to post-construction conditions. These "low spots" will then be targeted as sampling locations for further analysis described in subsequent sections.

3 SEDIMENT SAMPLING AND ANALYSIS

This section addresses procedures for the collection of surface and subsurface sediments at the site.

3.1 Sediment Sampling Locations

As discussed in the OMMP, the objective of the sediment sampling activities described in this SAP is to investigate the long-term effectiveness of the sediment cap at Deposit 1 and to ensure that the cap material will be maintained as designed.

A total of two surface grab samples will be taken from two "low spot" areas identified from the bathymetric survey. In addition to the two surface (0 to 10 cm) sediment samples, three subsurface sediment samples will be collected from Stations SC-1, SC-2, and SC-3 (Figure 1) to delineate the vertical extent of PCB concentrations within the sediment cap. Subsurface core location coordinates are provided in Table 1.

3.2 Sampling Schedule

Sediments will be collected during one sampling event in Year 2 and in Year 4 following the completion of the remedial action as outlined in the CAP (Ecology 2005). Unscheduled sediment monitoring will be conducted following a 50-year or higher flood event and will be performed using the same procedures described in this SAP for a scheduled routine monitoring event. Should more than two 50-year flood events occur during the first five years of the cap life, Ecology will determine if additional long-term monitoring is required.

3.3 Site Access

Site access will be obtained by launching the sampling vessel at the boat launch adjacent to Upriver Dam. Permission for access to the boat launch will be coordinated with the dam operators.

3.4 Station Positioning and Location Control

Whenever possible, station positioning will be determined by differential global positioning system (DGPS). 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 1 meter. However, it is possible that electrical interference near the Upriver Dam may prevent use of DGPS. If this is the case, station positioning will be determined using a hand-held GPS unit and the data will be treated as described above. The DGPS instrumentation is normally accurate to 1 to 3 meters, while GPS instrumentation is normally accurate to 3 to 10 meters; however, for readings taken near large electrical equipment (such as Upriver Dam), accuracy may be somewhat degraded. Vertical elevation of each sediment sampling station will be measured using a fathometer or lead line and converted to North American Vertical Datum 88 (NAVD88) vertical datum using water level records maintained at Upriver Dam.

3.5 Field Documentation Procedures

Field procedures, sample information, and custody records will be maintained in a variety of log sheets and forms. Procedures used to document station locations, sample collection, and sample custody are described in this section.

3.5.1 Field Logs and Sample Labels

A field logbook and station and sample log forms will be used to document sample collection activities. A bound, waterproof notebook with consecutively numbered pages will be used for the field logbook. All daily field activities will be documented in indelible ink in this logbook; all entries will be signed and dated and no erasures will be made. If an incorrect entry is made, the information will be crossed out with a single strike mark that is signed and dated by the sampler. Field logbooks will be stored in a secure manner when not in use. The following information will be recorded in the field logbook each day of sample collection:

- Project name and location
- Project number
- Date and time of entry (24-hour clock)
- Time and duration of daily sampling activities
- Weather conditions
- Variations, if any, from specified sampling protocols and reasons for deviations
- Name of person making entries and other field personnel
- Onsite visitors, if any

- Specific information on each type of sampling activity (i.e., surface sediment or sediment core)
- Station name, date, gear, water depth, and location coordinates
- Sample identifiers and sample numbers for all samples collected each day

Each gear deployment event will be recorded on a station or sample log sheet. One or more station or sample log sheets will be completed for each station sampled. The station name, date, gear, cast number, depth, and location coordinates will be recorded on each log sheet.

A sample label will be completed for each sample and attached to the outside of each sample container. All sample label entries will be made with indelible ink. The sample labels will include the following information: sample number, site name, sampling date and time, sampling personnel, and preservative (if appropriate).

3.5.2 Sample Identifiers

A set of sample identifiers will be established before field sampling begins. Sample numbers will be assigned in the field as samples are being collected. The suite of sample identification codes is designed to fulfill three purposes: 1) to identify related samples (i.e., replicates), 2) to ensure proper data analysis and interpretation, and 3) to obscure the relationships between samples so that laboratory analysis will be unbiased by presumptive similarities between samples. The sample identifier codes and their uses are described below:

- Location Identifier – This will consist of the initials UPR followed by a location number (station number). The sample location number will be as identified in Table 1. For example, subsurface sediment sample collected at Station SC-1 will have a location identifier of UPR-SC-1XX, where XX is the matrix identifier as described below.
- Matrix Identifier – The matrix identifier will follow the location identifier. Matrix identifiers for this project are SD for sediment. For example, a sediment sample retrieved from Station UPR-SC-1 would have a sample identifier code of UPR-SC-1SD.

- Depth Identifier – The depth identifier for core samples is a dash followed by a consecutive letter that follows the SD identification (-A for the first interval, -B for the second, etc.). The first depth interval for a sediment core sample collected from UPR-SC-1SD would be identified as UPR-SC-1SD-A.
- Date Identifier – The date identifier is a dash followed by a date code (YYMMDD), where YY = year, MM = month, and DD = day of month.

3.6 Equipment Decontamination Procedures

Decontamination procedures to be used during sample collection are specified in this section. The objective for decontamination is to reduce the chance of cross-contaminating samples collected from one location to the next.

The van Veen grab sampler, piston head of the piston corer, and polycarbonate core tubes will be decontaminated prior to sampling at each location. Decontamination of this equipment will consist of scrubbing and rinsing the equipment down with site water, followed by a non-phosphatic detergent wash (consisting of a dilute mixture of Liquinox and tap water), and site water rinse. Care will be taken during sampling to avoid contact of the clean sampling equipment with potentially contaminated surfaces.

All sample processing equipment and reusable materials that contact the sediment will be decontaminated on site and between sampling locations. Decontamination will follow this sequence:

1. Tap water or site water (for sampling equipment) rinse
2. Nonphosphatic detergent wash (visible sediment to be removed by scrubbing in previous step)
3. Tap water rinse
4. Distilled-water rinse three consecutive times
5. Cover clean equipment with aluminum foil

3.7 Surface Sediment Sampling

Surface sediment sampling procedures and chemical analyses are described in the following section. The Quality Assurance Project Plan (QAPP; see Section 4) provides additional details regarding quality assurance/quality control (QA/QC) procedures.

3.7.1 Surface Sediment Sampling Procedures

Surface sediment samples (0 to 10 cm below mudline) will be collected using a stainless steel van Veen or similar grab sampler in accordance with standard methods described in EPA 1986 as updated in 1989, 1991, 1995, and 1997. Sample collection will be documented on the attached surface sediment collection record (Figure 2).

Upon retrieval, material collected in the grab sampler will be evaluated for acceptability according to the following criteria:

- The sampler is not overfilled.
- Overlying water is present.
- The overlying water is not excessively turbid.
- The sediment surface is relatively undisturbed (no winnowing).
- A sediment penetration depth of at least 12 cm is attained.

After a sediment grab is accepted, the overlying water will be siphoned off and the upper 10 cm of sediment will be collected in accordance with EPA (1986 as updated in 1989, 1991, 1995, and 1997) guidelines. Stainless steel spatulas and spoons will be used to transfer the sediment to a stainless steel bowl. A stainless steel ruler will be used to ensure that the sediment penetration depth of the sampler is adequate and that the correct sediment depth interval is removed. Sediment touching the sides of the grab sampler will not be collected.

Sediment in the bowl will then be mixed with a large stainless steel spoon until uniform texture and color are achieved. Subsamples of the homogenized sediment will be transferred to pre-cleaned glass containers with Teflon-lined lids and immediately placed on ice in a cooler.

3.7.2 Surface Sediment Sample Analysis

All surface sediment samples collected from the two stations to be determined from the forthcoming bathymetric survey will be analyzed for PCB Aroclors using EPA Method 8082, total organic carbon (TOC), total solids, and grain size. At least one sample from each location will be frozen at -20°C and archived for potential future analyses.

Method reporting limits are summarized in Table 2. Sample jars and preservation and holding time requirements are summarized in Table 3.

3.8 Subsurface Sediment Sampling

Subsurface sediment sampling procedures and chemical analyses are described in the following section. The accompanying QAPP (Section 4) provides additional details regarding QA/QC procedures.

3.8.1 Subsurface Sediment Sampling Procedures

Subsurface sediment samples will be collected using a piston coring device fitted with 2.87-inch inner diameter polycarbonate tubing. Should this method not prove successful, alternative methods such as diver assisted sampling may need to be employed.

Core collection will be documented on the attached Sediment Core Collection Form (Figure 3). Extra polycarbonate tubes will be available during sample operations for uninterrupted sampling in the event of a potential core tube breakage or contamination. Samples will be collected in the following manner:

- The core tube will be decontaminated.
- Water depth will be sounded with the piston cable.
- The core tube will be attached to the piston head.
- The coring device will be gradually lowered into the water.
- The piston cable will be tied off to the deck in order to secure the piston in the core tube at approximately 20 cm above the sediment-water interface.
- The core will be driven into the sediment, using drive rods, until refusal.
- The filled core tube will be retrieved slowly and steadily to avoid agitating the sample.
- As the corer is lifted out of the water, a plug will be immediately inserted into the bottom of the core tube to prevent sediment from slipping out.
- The core will be evaluated against the following acceptability criteria:
  - At least 5 cm of overlying water is present
  - The overlying water is not excessively turbid
  - The sediment surface is relatively undisturbed

  - At least 80 percent core recovery versus penetration is observed
- If the core meets the above acceptability criteria, the core will be processed immediately by cutting the core lengthwise into two equal halves or by extruding the sediment from the base of the core tube.
- The characteristics of the core will be documented (as described below) as the sediment is being extruded.
- Each core will be sectioned at three intervals to visually correspond to the base cap layer, coal layer, and sub cap layer.
- Sediment from the middle of each core interval will be thoroughly homogenized and transferred into an appropriate pre-labeled sample container (certified, pre-cleaned) and placed immediately on ice for transport to the appropriate laboratory. Care will be taken to not mix sediment intervals (i.e., coal layer with the base cap layer).

As samples are taken, logs and field notes of all core samples will be maintained and correlated to the sampling location map. The following information will be included in this log:

- Elevation of each boring station sampled; this will be accomplished using a fathometer or lead line
- Location of each boring station as determined by the on-board DGPS or GPS
- Date and time of collection of each sediment core sample
- Names of field supervisor and person(s) collecting and logging the sample
- Observations made during sample collection, including weather conditions, complications, boat traffic, and other details associated with the sampling effort
- The sample station number
- Length and depth intervals of each core section and recovery for each sediment sample
- Qualitative notation of apparent resistance of sediment column to coring
- Any deviation from the approved sampling plan

In addition, a sediment description of each core sample will be recorded on the core log 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 and consistency of soil, color)
- Odor (e.g., hydrogen sulfide, petroleum)
- Vegetation
- Debris
- Biological activity (e.g., detritus, shells, tubes, bioturbation, live or dead organisms)
- Presence and depth (feet) of the redox potential discontinuity layer
- Presence of oil sheen
- Any other distinguishing characteristics or features

3.8.2 Subsurface Sediment Sample Analysis

A maximum of three subsurface sediment sample intervals will be collected at Stations SC-1, SC-2, and SC-3 (Table 1) and analyzed for PCB Aroclors using EPA Method 8082, TOC, total solids, and grain size (for a total of a maximum of nine samples, excluding QA/QC). After analysis, all sediment core intervals from each location will be frozen at -20°C and archived.

Method reporting limits are summarized in Table 2. Sample jars and preservation/ holding time requirements are summarized in Table 3.

3.9 Sample Custody and Transport Procedures

All containerized sediment samples 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 for analysis will be shipped to the laboratory within 24 hours of being sealed.
- Individual sample containers will be placed in a sealable plastic bag, packed to prevent breakage, and transported in a sealed ice chest or other suitable container.
- 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.

- Ice will be placed in separate plastic bags and 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
- The cooler lids will be secured by wrapping the coolers in strapping tape
- Signed and dated chain-of-custody seals will be placed on all coolers prior to shipping

Upon transfer of sample possession to the analytical laboratory, the persons transferring custody of the sample container will sign the chain-of-custody form. Upon receipt of samples at the laboratory, the shipping container seal will be broken and the condition of the samples recorded by the recipient. Chain-of-custody forms will be used internally in the lab to track sample handling and final disposition.

3.10 Investigation-Derived Waste Handling Procedures

It is not anticipated that any investigation-derived waste will be generated during this sampling effort. No organic solvents will be used for decontamination during this investigation. All detergents used will be phosphate free and site water used for decontamination of sampling equipment will be returned directly to the site. Excess sediment collected during coring will be properly disposed of and not returned directly to the site. All other disposable materials (e.g., gloves) will be bagged and discarded in a municipal waste container.

4 QUALITY ASSURANCE PROJECT PLAN

Comprehensive and well defined procedures for project management, QA/QC, and documentation are instrumental in the execution of a successful field effort and the generation of high-quality data. The procedures that will be used for this investigation are described below.

4.1 Project Management

This section of the QAPP includes descriptions of the project management structure and procedures that relate to project quality assurance.

4.1.1 Project Organization

Avista will be responsible for planning and managing the tasks associated with this investigation. The work described in this SAP will be completed by Anchor Environmental, L.L.C. (Anchor). Project personnel and responsibilities are summarized in Table 4.

The chemical testing laboratory for total solids, grain size, TOC, and total PCB Aroclors analyses will likely be Columbia Analytical Services (CAS) located in Kelso, Washington. The chemical testing laboratory will conduct analyses in accordance with their quality assurance manuals. The manuals include descriptions of laboratory organization, personnel, and responsibilities; facilities and equipment; analytical methods and QA/QC protocols; and routine procedures for sample custody and data handling.

No changes in procedures specified in this QAPP, standard operating procedures (SOPs) for field and laboratory procedures, and in the laboratory quality assurance manuals will be permitted without written justification and a detailed explanation of the intended change. All changes are subject to approval by the project QA/QC coordinator and the Avista and consultant project managers. A description of any changes, with rationale, will be included in applicable quality assurance or data reports generated for this project.

4.1.2 Quality Objectives and Criteria for Measurement Data

The primary quality objective for measurement data is to obtain results that are of known and acceptable quality and are representative of the conditions present at the site. Measurement quality objectives (MQOs) have been established for this project to support this objective. Quantitative MQOs for laboratory analyses are provided in Table 5. Quantitative MQOs include precision, accuracy, and completeness. The qualitative goals of representativeness and comparability of the data are ensured by the careful collection of samples according to protocols established in the SAP (Section 3) and the use of standard methodology for testing and analyses.

To confirm that project MQOs for precision and accuracy are achieved, analytical results for field and laboratory quality control samples will be evaluated, as discussed in Section 4.3. Quality control results that do not meet target values will be qualified during data validation, and their limitations will be noted in the data quality and usability report for the project, as discussed in Section 4.3.2 of this QAPP. To ensure comparability and representativeness of the laboratory data, standard instrumentation will be used for the analyses and the instruments will be properly calibrated and maintained.

4.1.3 Special Training and Certification

Procedures to be completed for this study are, for the most part, routine. Standard procedures will be used to collect the sediment samples and to complete laboratory analyses. All field personnel will have completed the 40-hour Hazardous Waste Operations and Emergency Response training with annual refresher courses as required by the Occupational Safety and Health Administration.

4.1.4 Preventive Maintenance

Preventive maintenance procedures for this project will include routine maintenance for field equipment, scheduled equipment calibration, and having duplicate equipment available (e.g., additional batteries for field equipment) should equipment failures occur during field collection efforts.

4.1.5 Documents and Records

Procedures, observations, and test results will be documented for all sample collection, laboratory analysis and reporting, and data validation activities. Internal and external reporting procedures for this study are described in this section.

4.1.5.1 Field Records

Field records will be maintained during all stages of sample collection and preparation for shipment to the laboratory. Field records are described in Section 3.5.

In addition to the standard field records, the following reports may be completed if a deviation from the SAP or QAPP is encountered or to document an audit:

- Corrective action reports documenting any problems encountered during field activities and corrective actions taken
- System and performance audit reports completed during the investigation
- A summary of any changes made to documented procedures and the rationale for the changes

4.1.5.2 Laboratory Data Reports

The laboratory will perform data reduction as described in each test method for this project (Table 5) and submit a complete data package with full documentation for all analyses or other determinations. The laboratory's quality assurance officer is responsible for reviewing the laboratory data packages and checking data reduction prior to submittal to Anchor. The laboratory will correct any transcription or computation errors identified during their review.

The analytical laboratory will provide all information required for a complete quality assurance review, including the following:

- A cover letter discussing analytical procedures and any difficulties that were encountered
- A summary of analyte concentrations and method reporting limits with laboratory data qualifier codes appended, as appropriate

- Initial and continuing calibration data, including instrument printouts and quantification summaries for all analytes
- Results for method and calibration blanks
- Results for all QA/QC checks, including laboratory control samples (LCSs), matrix spike samples, surrogate spikes, duplicate matrix spike samples, and laboratory duplicate or triplicate samples
- Original data quantification reports for all analyses and samples
- All laboratory worksheets and standards preparation logs (data include final dilution volumes, sample sizes, wet-to-dry ratios, and spiking and standards preparation procedures for all analyses)

4.2 Data Acquisition

All field and laboratory procedures related to sample collection and analysis will be completed as described in written SOPs that are routinely used by Anchor and CAS. These SOPs will be selected and approved by the field team leader, project QA/QC coordinator, and laboratory quality assurance officer, as applicable, prior to commencement of field and laboratory activities. A general description of these procedures is provided below.

4.2.1 Field Procedures for Sample Collection

Sample collection procedures are provided in Section 3, including the following:

- Station positioning and location control
- Collection of surface sediment samples
- Collection of subsurface sediment samples
- Field documentation procedures
- Sample custody and transport procedures

4.2.2 Laboratory Procedures

Laboratory custody, sample storage, and sample analysis procedures are discussed in this section.

4.2.2.1 Laboratory Custody and Sample Storage

The laboratory project manager will verify receipt of each sample shipment and will contact the field sample manager to provide notification that all samples were received and to relay any concerns or observations regarding sample integrity or documentation. The laboratory project manager will also be responsible for ensuring that chain-of-custody forms and internal tracking records are completed upon receipt of the samples and maintained through all stages of laboratory analysis. Storage information will be maintained until disposal of the samples.

4.2.2.2 Chemical Analyses

Sediment samples will be analyzed for total solids, grain size, TOC, total PCB Aroclors as indicated. The methods of analysis are indicated in Table 5. All QA/QC procedures specified in each method will be followed and control limits will be met or corrective action will be taken as described in the methods.

Target method reporting limits for chemical analyses are provided in Table 2. The actual reporting limits attained during this site investigation may be elevated with respect to target reporting limits if interferences are encountered from the sample matrices. Sample cleanup procedures will be used as necessary to minimize interferences and optimize detection limits.

4.2.3 Quality Control

Quality control samples and procedures are used to obtain quantitative information regarding the execution of laboratory testing activities. Field quality control samples are not planned for this sampling effort.

4.2.3.1 Laboratory Quality Control Samples and Procedures

Each analytical protocol used in this site investigation (Table 5) includes specific instructions for analysis of quality control samples and completion of quality control procedures during sample analysis. These quality control samples and procedures verify that the instrument is calibrated properly and remains in calibration throughout the analytical sequence and that the sample preparation procedures have been effective and have not introduced contaminants into the samples. Additional quality control samples are used to identify and quantify positive or negative interference caused by the sample matrix. Each method protocol provides control limits that indicate acceptable conditions for analysis of samples as well as unacceptable conditions that would necessitate reanalysis of samples.

The following laboratory quality control procedures are required for most of the protocols for chemical analyses:

- Calibration and calibration verification
- Method blanks
- Laboratory control samples
- Matrix spike samples and matrix spike duplicates
- Laboratory duplicates
- Surrogate spike compounds

4.2.4 Data Management

Computerized systems will be used to record, store, and sort the technical data that will be generated to support the sediment study. Automated procedures will be used by the laboratory to capture and summarize analytical results. Electronic data files will be imported directly from the laboratory to the project database, minimizing both data entry effort and opportunities for error. Sampling location coordinates will be entered into the database to enable computer generation of maps and figures.

Field logbooks, station/sample forms, and chain-of-custody forms will be prepared by the field team while sample collection activities are in progress. Sample information from the field will be entered manually into the database. Each data record will include a unique sample code, station ID, sample type (matrix), analyte, analyte concentration, and concentration units. Electronic data summaries will be produced to support data validation procedures. Data qualifiers will be entered into the database when validation is completed and verified, and the dataset is approved as final. All manual and electronic entries will be verified by the data manager or validation personnel.

Project data tables and reports will be prepared using customized retrievals that filter and sort the data according to criteria specified by the user. The data are automatically formatted for direct use with statistics software packages and various types of geographic information system software. The maintenance of a single, authoritative database prevents the proliferation of multiple versions of data and the introduction and propagation of errors. Data will be provided to Ecology in a format compatible with its Environmental Information Management System, consistent with data templates received by Ecology at the outset of this project.

4.3 Data Verification, Validation, and Usability

Data verification and validation are conducted to establish the quality and usability of the project data. Data verification is the process of determining whether samples have been collected and analyzed according to procedures prescribed in this study plan, pertinent field and laboratory SOPs, and laboratory method descriptions. Data validation is the process of evaluating the technical quality of the verified data with respect to the project quality objectives. Data validation and verification criteria and procedures are described below.

4.3.1 Verification and Validation of Field Information

All protocols related to sample collection, storage, shipping, and handling include requirements for quality assurance procedures and documentation of activities. Any deviations from specified procedures will be documented in detail in the field logbook. The field logs will be reviewed as they are completed and again after the sampling effort is complete. Any field conditions or activities that may have affected the quality of the data will be evaluated by the Project QA/QC Coordinator and the field team leaders.

4.3.2 Verification and Validation of Laboratory Data

Chemical data will be evaluated according to criteria specified in the functional guidelines for data validation (EPA 1999 and 2001). Data may be qualified as estimated or rejected if quality control samples and procedures do not meet control limits, as described in the functional guidelines.

Verification and validation of chemical data will be completed at the laboratory and by the data validator. The laboratory will be responsible for the review and verification of all bench sheets, manual entry and transcriptions of data, and any professional judgments made by a chemist (e.g., identification of an Aroclor) during sample preparation, analysis, and calculation and reporting of the final concentrations. The laboratory will also be responsible for the review of quality control results to determine whether data are of usable quality or if reanalysis is required. Any nonconformance issues identified during the laboratory's quality assurance checks will be corrected and noted by the laboratory. Close contact will be maintained between the Project QA/QC Coordinator and the laboratory project manager so that any quality issues can be resolved in a timely manner. Any data quality deviations will be discussed in the laboratory case narrative, including the direction or magnitude of any bias to the data, if possible.

Data validation and verification will be completed by a data validator prior to finalization of the data and release of the data set for interpretation. Chemical data will be validated according to EPA Level 3 criteria (PSEP 1991). Level 3 validation includes evaluation of the results for quality control samples (i.e., surrogate recoveries, calibration and method blanks, matrix spikes and matrix spike duplicates, and LCSs) with respect to control limits. Initial and continuing calibration results, calculations, and transcriptions will not be checked on a routine basis. The laboratory is responsible for 100 percent verification of these results and procedures.

Data qualifiers will be applied to the results according to procedures described in the EPA Contract Laboratory Program national functional guidelines for data review (EPA 1999 and 2001), as applicable, with modifications made as appropriate to accommodate method-specific quality control requirements. For conventional analyses and for field quality control results, data qualifiers will be applied when the quality control results do not meet MQOs (Table 5). The project data will be released for interpretation only after validation has been completed and all qualifiers have been correctly entered into the database.

4.3.3 Reconciliation with User Requirements

The goal of data validation is to determine the quality of each data point and to identify data that do not meet the project MQOs and project quality objectives. Nonconforming data may be qualified as estimated or rejected as unusable during data validation if criteria for data quality are not met. Rejected data will not be used for any purpose. An explanation of the rejected data will be included in the data validation report.

Data qualified as estimated (J) will be used for evaluating water quality and will be appropriately qualified in the final project database. These data are less precise or less accurate than unqualified data. The data users, data validator, and Anchor project managers are responsible for assessing the effect of the inaccuracy or imprecision of the qualified data on statistical procedures and other data uses for the sediment study. The data quality report will include all available information regarding the direction or magnitude of bias or the degree of imprecision for qualified data to facilitate the assessment of data usability.

5 REFERENCES

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EPA. 1999. Laboratory Data Validation: Functional Guidelines for Evaluating Organics Analysis. Prepared by U.S. Environmental Protection Agency Work Group. U.S. Environmental Protection Agency, Hazardous Site Evaluation Division, Washington, DC.

EPA. 2001. Laboratory Data Validation: Functional Guidelines for Evaluating Inorganics Analysis. Prepared by U.S. Environmental Protection Agency Work Group. U.S. Environmental Protection Agency, Hazardous Site Evaluation Division, Washington, D.C.

PSEP. 1991. A project manager's guide to requesting and evaluating chemical analyses. Prepared for U.S. Environmental Protection Agency Region 10, Office of Puget Sound, Seattle, WA. Puget Sound Estuary Program.

TABLES

Table 1
Proposed Sediment Locations and Planned Analyses

Station ID	Location *		Sample ID	Interval	Total Solids and Grain Size 16 oz jar	Total PCBs and TOC ** 8 oz jar	Archive 8 oz jar
	Northing	Easting					
SC-1	270177.6086	2504159.4890	UPR-SC-1SD-A	Base Cap Layer	1	1	1
			UPR-SC-1SD-B	Coal Layer	1	1	1
			UPR-SC-1SD-C	0-1 foot below cap	1	1	1
SC-2	270431.3043	2504823.5960	UPR-SC-2SD-A	Base Cap Layer	1	1	1
			UPR-SC-2SD-B	Coal Layer	1	1	1
			UPR-SC-2SD-C	0-1 foot below cap	1	1	1
SC-3	270646.5082	2505254.0060	UPR-SC-3SD-A	Base Cap Layer	1	1	1
			UPR-SC-3SD-B	Coal Layer	1	1	1
			UPR-SC-3SD-C	0-1 foot below cap	1	1	1
SS-1	TBD***		UPR-SS-1SD	0-10 cm	1	1	1
SS-2	TBD		UPR-SS-2SD	0-10 cm	1	1	1
Total Analyses					11	11	11

Notes

* Coordinate Datum in State Plane NAD 83 WA North

**Total Organic Carbon

***To be determined post bathymetric survey

Table 2
Analyte List and Method Reporting Limits

Analyte	Method Reporting Limit
Conventionals	
Total Solids	0.1 %
Grain size	0.1 %
Total organic carbon	0.05 %
Polychlorinated Biphenyls as Aroclors	
Aroclor 1016	10 µg/kg
Aroclor 1221	20 µg/kg
Aroclor 1232	10 µg/kg
Aroclor 1242	10 µg/kg
Aroclor 1248	10 µg/kg
Aroclor 1254	10 µg/kg
Aroclor 1260	10 µg/kg
Total PCBs	10 µg/kg

Note

*Concentrations are provided on a dry-weight basis unless noted otherwise.

Table 3
Sample Jars and Preservation and Holding Time Requirements

<table>
<tr><th>Jar Number</th><th>Analyte</th><th>Container</th><th>Preservation and Handling</th><th>Maximum Holding Time (from date of collection)</th><th>Minimum Volume</th></tr>
<tr><td>1</td><td>Total Solids and Grain Size</td><td>500-mL wide-mouth glass jar; Teflon-lined lid</td><td>Cool (4°C)</td><td>180 days</td><td>200-mL</td></tr>
<tr><td rowspan="2">2</td><td rowspan="2">Total PCB and Total Organic Carbon</td><td rowspan="2">250-mL wide-mouth glass jar; Teflon-lined lid</td><td rowspan="2">Cool (4°C)/Dark Frozen (-20°C)/Dark</td><td>14 days cool / 1 year frozen</td><td rowspan="2">100-mL</td></tr>
<tr><td>28 days</td></tr>
<tr><td>3</td><td>Archive</td><td>250-mL wide-mouth glass jar; Teflon-lined lid</td><td>Frozen (-20°C)/Dark</td><td>1 year</td><td>100-mL</td></tr>
</table>

Notes
PCB - polychlorinated biphenyl

Table 4
Project Personnel and Responsibilities

Personnel	Responsibilities
Industry Project Manager	• Provide final approval of the sediment investigation study plan • Overall responsibility for Avista activities • Oversee all program activities to ensure compliance • Provide technical oversight and consultation on major quality assurance problems • Provide final approval of all necessary actions and adjustments for activities to accomplish project objectives
Environmental Consultant Project Manager	• Oversee all sediment investigation activities under Avista's direction • Provide technical oversight • Implement necessary actions and adjustments for activities to accomplish overall study objectives and quality objectives for this investigation
Project QA/QC Coordinator	• Provide technical quality assurance assistance • Oversee quality assurance activities to ensure compliance with the QAPP • Coordinate and supervise data validation and data quality report preparation • Review and submit quality assurance report
Field Team Leader	• Coordinate and supervise field activities • Ensure field procedures are completed in accordance with the SAP and QAPP • Authorize and document minor adjustments to the SAP in response to field conditions, as necessary • Track submittal and receipt of samples at the laboratory • Initiate chain-of-custody and sample acknowledgement receipt forms
Database Administrator	• Organize and maintain project database • Ensure that data are stored in accordance with the QAPP • Supervise data management personnel
Laboratory Quality Assurance Officer	• Ensure that sample receipt and custody records are properly handled and data are reported within specified turnaround times • Calibrate and maintain instruments as specified • Perform internal quality control measures and analytical methods as required; take appropriate corrective action as necessary • Notify the QA/QC coordinator when problems occur • Report data and supporting quality assurance information as specified in this QAPP

Table 5
Summary of Measurement Quality Objectives

Analysis	Method Reference	Units	Accuracy (percent)	Precision (RPD)	Completeness (percent)
Conventional Analytes					
Total Solids	EPA Method 160.3 (U.S. EPA 1983)	%	NA	±35	100
Grain size	PSEP 1986	%	NA	±35	100
Total organic carbon	PSEP 1986	%	80-120	±20	100
Organic Compounds					
PCB Aroclors	EPA Method 8082 (U.S. EPA 1983)	µg/kg	50-150	±50	95

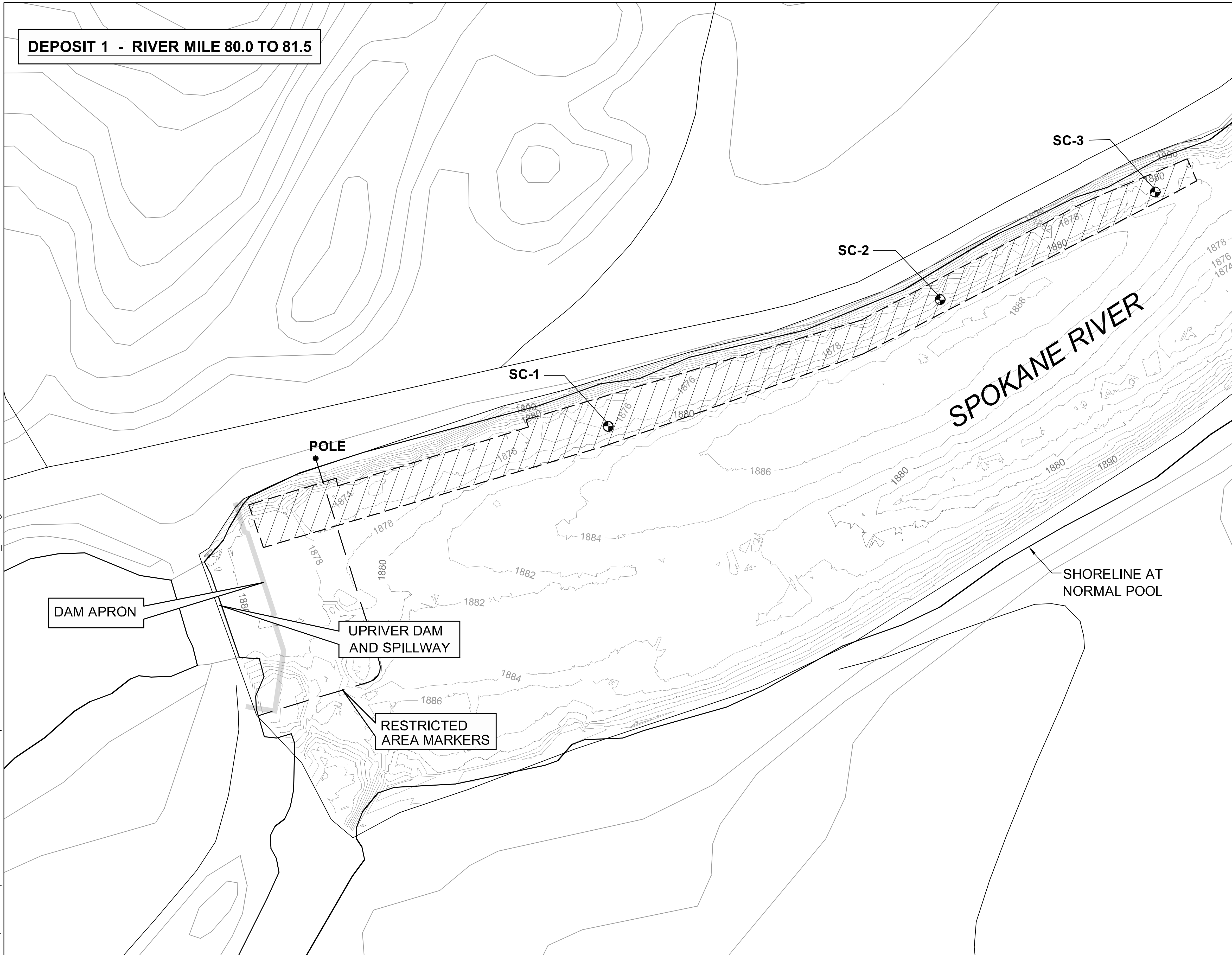
Notes

EPA U.S. Environmental Protection Agency

PCB polychlorinated biphenyl

RPD relative percent difference

FIGURES



PCB SEDIMENT DEPOSIT AREA 1

SC-1 CORE STATION LOCATION AND NUMBER

N

0 200
Scale in Feet

NOTES:
1. AERIAL PHOTO PROVIDED BY AVISTA DATED JUNE 2002.
2. BATHYMETRY BASED ON SURVEY DATA PROVIDED BY BLUE WATER ENGINEERING DATED MAY 20-22, 2003.
3. HORIZONTAL DATUM: STATE PLANE NAD83 WASHINGTON, NORTH
4. VERTICAL DATUM: NAVD88

SUBSURFACE SEDIMENT CORE LOCATIONS

STATION ID	NORTH	EAST
SC-1	270177.6086	2504159.489
SC-2	270431.3043	2504823.596
SC-3	270646.5082	2505254.006

Apr 14, 2006 2:07pm cdavidson K:\Jobs\050306-Upriver\05030601190 Percent\05030601-14_90.dwg FIG 1 OMMP

ANCHOR ENVIRONMENTAL, L.L.C.

Figure 1
Sampling Station Locations
OMMP
Upriver Dam PCB Site Project

ANCHOR ENVIRONMENTAL, L.L.C.

Surface Sediment Field Sample Record

Collection Date:
Shipping Date:

Project Name: **Project No:** **Station ID:**

Sampling Crew: ____________________
Sampling Vessel: ____________________ Sampling Method: ____________________
Subcontractor(s): ____________________
Station Coordinates: N / Lat. ____________________ Weather: ____________________
E / W / Long. ____________________ ____________________
Datum: NAD 83 / WGS 84 Zone:

Sample Number: ____________________
Analysis: Metals / BNAs / VOCs / PCBs / Pest / Herb / TBTs / Diox-Furans
TS / Grain Size / TOC / TVS / Ammonia / Sulfides
(Circle Appropriate Analyses)

Field Test Results
Salinity: ____________________ ppt
Ammonia: ____________________ mg/L
Grain Size: ml Coarse: ______ ml Fines: ______
Comments: ____________________

Grab Number: _______________ Water Depth:_________ Penetration/Sampled Depth: __________ Time: __________
Bioassay / Chemistry (circle) AVS/SEM; Total Sulfides; VOC Sample (circle)

Sediment Type:	Sediment Color:	Sediment Odor:		Comments:
cobble	D.O.	none	H2S	
gravel	gray	slight	Petroleum	
sand C M F	black	moderate	other:	
silt clay	brown	strong		
organic matter	brown surface	overwhelming		

Grab Number: _______________ Water Depth:_________ Penetration/Sampled Depth: __________ Time: __________
Bioassay / Chemistry (circle) AVS/SEM; Total Sulfides; VOC Sample (circle)

Sediment Type:	Sediment Color:	Sediment Odor:		Comments:
cobble	D.O.	none	H2S	
gravel	gray	slight	Petroleum	
sand C M F	black	moderate	other:	
silt clay	brown	strong		
organic matter	brown surface	overwhelming		

Grab Number: _______________ Water Depth:_________ Penetration/Sampled Depth: __________ Time: __________
Bioassay / Chemistry (circle) AVS/SEM; Total Sulfides; VOC Sample (circle)

Sediment Type:	Sediment Color:	Sediment Odor:		Comments:
cobble	D.O.	none	H2S	
gravel	gray	slight	Petroleum	
sand C M F	black	moderate	other:	
silt clay	brown	strong		
organic matter	brown surface	overwhelming		

Grab Number: _______________ Water Depth:_________ Penetration/Sampled Depth: __________ Time: __________
Bioassay / Chemistry (circle) AVS/SEM; Total Sulfides; VOC Sample (circle)

Sediment Type:	Sediment Color:	Sediment Odor:		Comments:
cobble	D.O.	none	H2S	
gravel	gray	slight	Petroleum	
sand C M F	black	moderate	other:	
silt clay	brown	strong		
organic matter	brown surface	overwhelming		

Recorded by:____

Figure 2
Surface Sediment Field Sample Record

Figure 3

Sediment Core Collection Form

ANCHOR ENVIRONMENTAL, L.L.C.

Station ID: ______________________ **Date:** ______________________

Project Name: ______________________ **Project Number:** ______________________

Coordinates:
Lat/Northing ______________________ Long/Easting: ______________________

Vertical Datum MLLW MLW Other:

Depth Measurement Sounder Leadline

Project Depth ______________________ **Overdredge** ______________________

	Attempt 1	**Attempt 2**	**Attempt 3**
Time:			
(A) Measured Water Depth			
(B) Tide Height			
(C) Mudline Elevation			
(-A+B = C include sign of tide height as reported)			
Estimated Penetration			
Description of Core Drive			
Refusal Encountered?			
Total Core Length			

Core Characteristics

Sediment Type	cobble, gravel, sand C M F , silt clay, organic matter	cobble, gravel, sand C M F , silt clay, organic matter	cobble, gravel, sand C M F , silt clay, organic matter
Sediment Color	gray, black, brown brown surface, olivine	gray, black, brown brown surface, olivine	gray, black, brown brown surface, olivine
Sediment Odor	None, slight, mod, strong H_2S, petroleum, septic	None, slight, mod, strong H_2S, petroleum, septic	None, slight, mod, strong H_2S, petroleum, septic
Any Layering Homogeneous			
Comments:			

Recorded by: ______________________________________