

REMEDIAL DESIGN WORK PLAN

SPOKANE RIVER METALS SITES:
ISLAND COMPLEX, MURRAY ROAD, AND
HARVARD ROAD NORTH

SPOKANE, WASHINGTON

PREPARED FOR

WASHINGTON STATE DEPARTMENT OF ECOLOGY



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HARVARD ROAD NORTH
SPOKANE, WASHINGTON

Prepared for
Washington State Department of Ecology

Prepared by
RIDOLFI Inc.

December 2006

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LIST OF ABBREVIATIONS AND ACRONYMS

ARAR	applicable or relevant and appropriate requirement
Bunker Hill	Bunker Hill Mining and Metallurgical Complex
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act of 1980
CWA	Clean Water Act
DAHP	Washington State Department of Archaeology and Historic Preservation
DAs	depositional areas
DNR	Washington Department of Natural Resources
Ecology	Washington State Department of Ecology
EPA	U.S. Environmental Policy Agency
ESA	Endangered Species Act
fps	feet per second
HPA	hydraulic project approval
IF	Inter-Fluve, Inc.
MTCA	Model Toxics Control Act
NAGPRA	Native American Graves Protection Act
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act of 1966
NOAA	National Oceanic and Atmospheric Administration
NWP	nationwide permit
OU3	operable unit 3
RCW	2006 Revised Code of Washington
RD	remedial design
ROD	record of decision
Ridolfi	RIDOLFI Inc.
SEPA	State Environmental Protection Act
SHPO	State Historic Preservation Office
the river	Spokane River
THPO	Tribal Historic Preservation Office
USACE	U.S. Army Corps of Engineers
USGS	U.S. Geological Survey
WDFW	Washington Department of Fish and Wildlife
WQC	water quality certification

1.0 INTRODUCTION

Historical mining practices in the Coeur d'Alene basin in Idaho have resulted in sediment and soil contamination along the shoreline of the Spokane River (the river) in Washington, between the Washington – Idaho state line and Upriver Dam. Lead, arsenic, cadmium, zinc and other contaminants exceed human health- and ecological-based criteria at multiple locations.

Although there are impacts from historic mining practices throughout this reach of the Spokane River, the Washington State Department of Ecology (Ecology) and the U.S. Environmental Protection Agency (EPA) have prioritized nine recreational areas for cleanup: Starr Road, Island Complex, Murray Road, Harvard Road North, Barker Road North and South, Flora Road, Myrtle Point, and the Islands Lagoon. These recreational areas are shown in Figure 1. These sites were selected out of a larger group of shoreline locations based on contaminant levels, recreational use, and ecological significance.

With funding from the Washington State Legislature, Ecology is proceeding with accelerated cleanup actions at Island Complex, Murray Road, and Harvard Road North. In addition, Ecology is conducting additional sampling and characterization at Barker Road South, Flora Road, Myrtle Point, and the Islands Lagoon. EPA was the lead agency for the cleanup at Starr Road, which was completed with assistance from Ecology in late September 2006. Cleanup at Barker Road North will likely be achieved in conjunction with construction of a new bridge by the City of Spokane Valley.

This Remedial Design (RD) Work Plan addresses the remedial actions at the Island Complex, Murray Road, and Harvard Road North sites. These sites have been prioritized due to contaminant concentrations and potential risks posed to ecological receptors and recreational users. The objective of this RD Work Plan is to provide the framework and schedule for developing the design documents, including plans and specifications, for the selected remedy at these three sites. Remedial actions at the remaining 5 sites are expected to be addressed via addendum to this Work Plan, likely in 2007.

1.1 Site Location and Description

1.1.1 Island Complex

The Island Complex recreational area encompasses approximately 9.5 acres and is located at approximate river mile 95.0 about 1.0 mile west of the Idaho State line in Spokane County, Washington (Figure 2). The site is located on land owned by the State of Washington and managed by the Washington Department of Natural Resources (DNR), and can be accessed via a 0.5-mile trail through parkland owned by Spokane County. The trailhead is located at a parking lot adjacent to the river near Exit 299 on I-90.

The site appears to be comprised of a remnant detached portion of floodplain that is flanked by fluvial bar deposits and is separated from the south bank of the Spokane River by a seasonal channel (Figure 3). The seasonal channel is dry during periods of low flow in the late summer and fall, and becomes increasingly wetted with higher flows in the winter and spring. The seasonal channel may have captured a remnant channel section of Cable Creek, which currently joins the Spokane River from the southeast near the head of the island, after passing through a culvert under the Centennial Trail (Inter-Fluve, 2006).

1.1.2 Murray Road

The Murray Road site encompasses approximately 1.5 acres and is located on the north side of the Spokane River at approximate river mile 94.3 about 1.7 miles west of the Idaho State line in Spokane County, Washington (Figure 4). The Murray Road Site is adjacent to River Road and is associated with State Park recreational land. The site is accessed via a recreational trail that originates on River Road.

The area of concern at the Murray Road site is characterized by a backwater area with the presence of fine-grained sediments. During periods of moderate to high flow, the area of concern is submerged; however, it is exposed during periods of low flow in the summer and fall. Surrounding the site to the north is a small area of trees surrounded by small brush located on the steep slope directly adjacent to the Site to the north. In the upriver direction of the Site is a recreational trail area that is sparsely covered by trees and small brush, which the river flows

through during times of high flow. The river bar area bordering the fine-grained depositional area to the south, acting as a barrier to the main flow of the Spokane River, is heavily armored with river cobble. It is not expected to require remedial action.

1.1.3 Harvard Road North

The Harvard Road North recreational area encompasses approximately 3 acres and is located at approximate river mile 92.7 about 3.3 miles west of the Idaho state line in Spokane County, Washington (Figure 5). The site is located on Washington State Parks and Recreation land that is easily accessed via a short gravel driveway leading directly off Harvard Road to the west, just north of the Spokane River.

The site is comprised of a gently sloping sand and gravel section on the north bank of the river. The site experiences relatively low-velocity hydraulic conditions due to its location just upstream of a cobble outcropping and on the inside of a bend in the river. Under low-flow conditions, river flow is predominantly along the south bank, with the north bank largely dry or under shallow water. Under high-flow conditions (approximately the annual flood), velocity profile data indicate relatively low river velocities along the north bank (2 to 4 feet per second [fps]) compared with the main channel flow velocity along the south bank (8 to 10 fps).

1.2 Site Background

The Bunker Hill Mining and Metallurgical Complex National Priorities List Site (Bunker Hill) is located in Northern Idaho's Coeur d'Alene River Basin. It was listed on the National Priorities list in 1983. Since the late 1880s, mining activities in the Upper Coeur d'Alene Basin contributed an estimated 100 million tons of mine waste to the river system. Until as late as 1968, tailings were deposited directly in the river. Over time, these wastes have been distributed throughout more than 150 miles of the Coeur d'Alene and Spokane Rivers, lakes, and floodplains (EPA, 2006).

In 2004, the U.S. Army Corps of Engineers (USACE) conducted sampling at the Starr Road and Island Complex sites to determine the extent of contamination and to collect field data for remedial design and cleanup activities. The results of the investigation are documented in the

Washington Recreational Sites, Starr Road and Island Complex Field Sampling Report, dated January 7, 2005 (USACE, 2005). In addition, the Spokane Regional Health District issued a health advisory warning against frequent contact with contaminated sediment (SRHD, 2006).

Ecology has prioritized the remediation of the Island Complex recreation area primarily due to the presence of lead above the human health action level in the Bunker Hill Operable Unit 3 (OU3) Record of Decision (ROD). The site is relatively accessible for recreational use by the public and public use is likely to increase in the near future. In addition, the release of contaminated sediments from the site to the Spokane River pose a risk to wildlife, notably rainbow trout that spawn nearby.

Murray Road is a priority site due to the potential risk posed to ecological receptors and recreational users. A soil sampling effort conducted by Ecology in July 2006 identified the presence of arsenic and lead at concentrations that exceed the respective human health action levels in the Bunker Hill OU3 ROD (Table 1). Soil samples collected in July 2006 also identified the presence of cadmium, lead, and zinc at levels above preliminary site-specific ecological risk thresholds developed by Ecology for screening purposes (Table 1).

Harvard Road North has been identified by Washington Department of Fish and Wildlife (WDFW) as a key spawning site for rainbow trout. The relatively low energy hydraulic conditions along the north bank of the river have resulted in sand and gravel deposits that provide ideal spawning habitat. An intensive soil sampling effort by Ecology in the fall of 2005 identified the presence of zinc and cadmium in the areas used for spawning at levels significantly above preliminary ecological risk thresholds developed by Ecology (Table 1). The site is also a heavily used recreational access point that includes a gravel boat launch area. Ecology's sampling efforts also identified the presence of arsenic in certain areas of the site exceeding human health action levels presented in the ROD.

2.0 PROJECT ORGANIZATION

Key personnel associated with this project are listed below.

2.1 Lead Agency

Ecology is the lead agency for these projects. Ecology's project manager is Zach Hedgpeth, P.E. He is located in the Ecology's Eastern Regional Office in Spokane.

2.2 Design Team

RIDOLFI Inc. (Ridolfi) is the design engineering firm for the Island Complex, Murray Road and Harvard Road North projects. Ridolfi's project manager is the key point of contact for Ecology. Key design team members are listed below:

Principal-in-Charge – Colin Wagoner, P.E., L.HG., Ridolfi

Project Manager – Sheila Fleming, P.E., Ridolfi

Design Engineer – Andy Sorter, EIT, Ridolfi

Fisheries Biologist – Sherrie Duncan, Ridolfi

Restoration Ecologist – Jina Chan, Ridolfi

Hydraulics and Hydrology – Noel Bormann, PhD, P.E., Gonzaga University

Quality Assurance Specialist – Tom Bowden, R.G., Ridolfi

Health and Safety Officer – Bruno Ridolfi, P.E., Ridolfi

2.3 Other Stakeholders

Stakeholders for Island Complex, Harvard Road North and the other impacted recreational areas along the Spokane River include EPA; the Spokane and Coeur d'Alene Tribes; the Washington State Parks and Recreation Commission; the Washington State Department of Natural Resources; the Washington State Department of Fish and Wildlife; Spokane County; the Cities of Spokane, Liberty Lake, Millwood, and Spokane Valley; and the Washington Citizens Advisory Committee, which is a community advisory group for the Spokane River.

Stakeholders relative to each specific site will be determined following development of the 90% design documents and during the permitting and substantive requirements process.

3.0 REMEDIAL OBJECTIVES

The primary remedial objective for the cleanup of the Bunker Hill sites is protection of human health and the environment. This RD Work Plan addresses the remedial design for the area identified as the Island Complex Floodplain and Banks, Depositional Areas (DAs) 5, 6, 7, and 8 in the OU3 ROD (EPA, 2002), as well as the Murray Road and Harvard Road North sites. Cleanup objectives for the Spokane River sites include limiting human exposure to soils and sediments containing elevated levels of lead and/or arsenic; stabilizing river banks to prevent re-distribution of contaminants; returning the rivers and tributaries to conditions that will fully support healthy fish and other aquatic receptors; and maintaining or enhancing the riparian, riverine, and upland habitats to conditions protective of aquatic species, waterfowl, migratory birds, and other plants and animals that live in these areas.

The remedy identified in the ROD consists of a combination of access controls, capping, and removals, as appropriate for each site. In general, the remedial design for the Island Complex site will include stabilization of portions of the downstream bank to minimize the re-distribution of contaminants in the river; enhancement and capping of trail sections and stable banks to prevent contact with contaminated soil; installation of signage, vegetation or physical barriers, such as boulders or fencing, to better define the trails; and enhancement (or avoidance of disturbance) to the uplands, riparian, and aquatic habitat. The remedial design for the Murray Road site will generally include a combination of capping of contaminated soil and sediment and revegetation to prevent human contact and reduce impacts to ecological receptors. At the Harvard Road North site, the remedial design will include a combination of removal and capping of contaminated soils to prevent human contact and reduce impacts to ecological receptors as appropriate; motor vehicle access controls and infrastructure improvements to focus boat launch activity and protect primary spawning habitat; and limited enhancement of upland plant communities.

3.1 Design Criteria, Codes, and Standards

In spring 2006, USACE, on behalf of EPA, prepared a preliminary engineering analysis, topographic survey and conceptual design drawings for the Island Complex site (USACE, 2006a). In July 2006, Inter-Fluve, Inc. (IF), on behalf of Ecology, prepared a technical

memorandum which described the hydrology and hydraulics in the vicinity of the Island Complex site, summarized design criteria, and presented design concepts for the bank stabilization portion of the project (IF, 2006). In May 2006, the U.S. Geological Survey (USGS) performed water velocity measurements at multiple locations at Island Complex and Harvard Road North and produced water velocity profiles at key locations for what is estimated to be the annual flood event. In July 2006, Ecology conducted soil sampling at the Murray Road site to determine the nature and extent of contamination. Ridolfi will consider these previously collected data and associated studies during development of the final remedial design for each site.

The design criteria identified for the Island Complex, Murray Road, and Harvard Road North sites include meeting the goals of the Shoreline Management Act comprehensive plan for the Spokane River, the substantive requirements of a state hydraulic permit as administered by the WDFW, any substantive requirements imposed by the appropriate approval by USACE, and the requirements applicable to cleanup actions performed under the Model Toxics Control Act (MTCA). Additional design criteria may be introduced by project stakeholders or through public outreach. The final remedy will satisfy design criteria related to engineering stability, contaminated soil and sediment control, fish and wildlife habitat, and recreation corridor aesthetics (IF, 2006).

4.0 DESIGN PROCESS AND DELIVERABLES

4.1 Design Process

During the design phase, the design team will review current site conditions, such as sediment size, bank slopes, vegetation type, and the likely range of hydraulic conditions. This information will be used to evaluate mechanisms that may be leading to erosion such as bank-toe undercutting, root failure, or over-island flow, as well as to develop appropriate material size distribution specifications for capping materials. Design criteria will be established based on this evaluation, including flood-recurrence interval and allowable shear stress, in order to assemble a range of feasible remediation alternatives. To the extent possible, the design efforts will build on existing data and previous design efforts. For example, topographic surveys are available for the Island Complex and Harvard Road North sites, and can be used to calculate bank slopes among other design tasks. At Island Complex, the topographic survey (conducted by USACE) has notations describing the sediment grain size, e.g., 1-3 inch cobbles, in various areas. For Harvard Road North, Ecology conducted material size distribution analysis on bulk samples collected at the site. The USACE assembled a HEC-RAS hydraulic model for the Starr Road project, which includes the Island Complex site within the extent of the model. After verifying the model geometry at Island Complex the model can be used to predict velocities and shear stresses at the project site. These parameters can be used to identify appropriate bank stabilization measures, and to select the type and size of materials used to stabilize the bank.

4.2 Deliverables

The required deliverables for the remedial design phase of the project include:

- Remedial Design Work Plan (this document)
- 30% design package for each site, including a memorandum documenting the design process as described above
- Draft 90% design submittal (drawings and specifications)

- Final 90% design package (drawings and specifications)
- 100% design package (drawings and specifications)
- As-built drawings
- Project closeout, including remedial action completion reporting

Other submittals may be prepared to support the following project tasks: public outreach; permitting; construction cost estimating; contractor procurement and selection; construction oversight and inspection; meeting minutes; and schedule updates.

5.0 SCHEDULE

The remedial design process for the Island Complex and Murray Road sites, including development of plans and specifications, design review, and the public comment period, is scheduled to be completed by late spring or early summer 2007. The design process for Harvard Road North is expected to lag this preliminary schedule by approximately 3 to 6 months. The design phase will be followed by contractor procurement and construction. The construction of the remedy at Island Complex and Murray Road is tentatively scheduled for late summer and early fall 2007 during the period of low river flow. A schedule for the remedial design, contractor procurement and remedial construction at Island Complex, Murray Road and Harvard Road North sites is presented in Figure 6. The schedule will be updated, as needed, if project milestones change.

6.0 APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

Applicable or relevant and appropriate requirements (ARARs) were developed by USACE for the Starr Road remedial action and were presented in the Starr Road Final Design Analysis Report (USACE, 2006b). Due to the proximity of the sites in question, and the similarity of site contaminants, sources, remedial action objectives and remedial alternatives, the Starr Road ARARs are generally applicable to the Island Complex, Murray Road, and Harvard Road North projects. Specific regulatory approaches to incorporation of ARARs within each remedial design will vary from that taken for the Starr Road site due to several factors including Ecology's role as lead agency rather than EPA. For example, state-lead projects must obtain a permit from the USACE where federal-lead projects may rely on the substantive requirements process. The Starr Road ARARs are summarized below. As the remedial design for the Island Complex, Murray Road, and Harvard Road North sites are developed, the chemical-, location- and action-specific ARARs for each site will be refined.

6.1 U.S. Army Corps of Engineers Nationwide Permit

Permitting by the U.S. Army Corps of Engineers (USACE) is required for projects located within waters of the United States. Projects having minimal impact to the environment are permitted under the Nationwide Permit (NWP) program. Specifically, toxics cleanup projects have been assigned a specific type of NWP termed a NWP 38. Based on past project experience, it is expected that Island Complex, Harvard Road North and the other Spokane River shoreline metals cleanup projects will be permitted under the NWP 38.

As part of the NWP 38 approval process, state-lead projects are required to comply with the Endangered Species Act of 1973 (ESA). Specific requirements of the ESA, as well as other permit requirements, will be identified and Ecology will ensure that each project is carried out in a manner that satisfies all requirements.

As part of the design process for the Starr Road remediation project, the segment of the Spokane River that will be affected by the Island Complex remediation was evaluated by USACE for the presence of threatened and/or endangered species. The following is the list of federally designated threatened and endangered species that may exist within the vicinity of the project:

- Grizzly Bear (*Ursus arctos horribillis*) – Threatened
- Gray Wolf (*Canus lupus*) – Endangered
- Canada lynx (*Lynx Canadensis*) – Threatened
- Bald Eagle (*Haliaeetus leucocephalus*) – Threatened
- Water Howellia (*Howellia aquatilis*) – Threatened
- Ute ladies'-tresses (*Spiranthes diluvialis*) – Threatened

The results of this biological evaluation are documented in Appendix 4 of the Starr Road Final Design Report (USACE, 2006b). USACE has determined that the project will have *no effect* on any of these listed species.

Consultations with the WDFW identified the presence of locally important spawning habitat for rainbow trout in the Spokane River, specifically the gravel bar area targeted for remediation at the Starr Road site. No threatened and/or endangered fish species are present in the Spokane River.

6.2 Clean Water Act, Section 401/404 Compliance

The Clean Water Act (CWA) requires that any 'discharge' to waters of the United States demonstrate consistency with State water quality standards (as developed by each state). The remedy for the Island Complex site may include excavation or placement of fill material within the Spokane River, which is considered a water of the United States under the CWA. Normally, a project including these actions would be required to obtain USACE permits under Sections 401 and 404, including the requirement to obtain a Water Quality Certification (WQC) from the appropriate state agency (Ecology). However, for toxics cleanup projects, permitting by USACE under the NWP 38 program is common. Projects permitted under the NWP 38 are not required to obtain a state WQC. Regardless of whether a WQC is required, Ecology will identify any appropriate water quality monitoring requirements for the remedy and ensure that these requirements are included in the construction documents for these projects.

6.3 Cultural Resources and Historic Preservation

The State Environmental Policy Act (SEPA) as well as the Governor's Executive Order No. 05-05 require that state agencies and local governments consider impacts to cultural resources during their public environmental review process on capital projects. Ecology will ensure that the shoreline metals remediation projects are completed in a manner that respects cultural resources and complies with applicable state law, regulations, and guidance including necessary surveys or assessments of the cultural resources and consultation with affected tribes. The Coeur d'Alene and Spokane Tribes are the potentially affected tribal governments for these projects.

All cultural resource assessment documentation will be provided to the appropriate stakeholders to include at a minimum the tribes cited above as well as the Washington State Department of Archaeology and Historic Preservation (DAHP) for their review.

6.4 Hydraulic Project Approval

Under Washington State Law (Revised Code of Washington [RCW] 77.55), any construction project to be conducted within waters of the State (hydraulic project) must obtain a permit from the WDFW in the form of a Hydraulic Project Approval (HPA). Permits issued under this statute may be conditioned by WDFW in order to protect fish life.

Under RCW 70.105D.090, remedial actions conducted by Ecology are exempt from the procedural requirements of chapters 70.94 [Air], 70.95 [Solid Waste], 70.105 [Hazardous Waste], 77.55 [Hydraulic Permit], 90.48 [Water Quality], 90.58 [Shorelands], and the procedural requirements of any laws requiring or authorizing local government permits or approvals for the remedial action. Ecology has developed policy concerning the implementation of these permit exemptions to ensure that such remedial actions comply with the substantive requirements adopted pursuant to such laws, and that consultation with the state agencies and local governments charged with implementing these laws occurs.

Any substantive requirements identified by the WDFW will be identified during the stakeholder review process (approximately the 90% design level) and addressed in the design.

6.5 Shoreline Management Act (and local shoreline regulations)

As discussed above, the substantive requirements of state or local permits must be satisfied by remedial actions performed by Ecology, including shoreline permitting requirements.

Depending on project location, shoreline requirements originating in the State of Washington Shoreline Management Act, and implemented through local Shoreline Master Programs may apply via the appropriate local municipal government agency (Spokane County, City of Spokane, City of Spokane Valley, or City of Liberty Lake).

Any substantive requirements identified by Ecology or a local authority as cited above will be identified during the stakeholder review process (approximately the 90% design level) and addressed in the design.

7.0 REFERENCES

- Federal Emergency Management Agency. 1992. *Flood Insurance Study: Spokane County*.
- Hoitsma, T. R. and E.M. Payson. 1998. *The Use of Vegetation in Bioengineered Streambanks: Shear Stress Resistance of Vegetal Treatments*. ASCE Wetlands Engineering and River Restoration Conference. Denver, Colorado, USA.
- Inter-Fluve, Inc. (IF) 2006. *Spokane River – Island Complex Bank Stabilization Design Concepts*. Memorandum to Zachary Hedgpeth, P.E., Washington Dept. of Ecology; from Michael Burke, P.E., Inter-Fluve. July 10.
- Kadlec, M. 2000. *Ecological Risk Analysis Of Elevated Metal Concentrations In The Spokane River, Washington*. Prepared for Washington State Department of Ecology. November.
- Long E.R. and L.G. Morgan. 1991. The potential for biological effects of sediment-sorbed contaminants tested in the National Status and Trends Program. NOAA Technical Memorandum NOS OMA 52, National Oceanic and Atmospheric Administration, Seattle, WA.
- MacDonald D. D., C.G. Ingersoll and T.A. Berger. 2000. Development and evaluation of consensus-based sediment quality guidelines for freshwater ecosystems. *Arch. Environ. Contam. Toxicol.* 39, 20-31.
- Michelsen, T. 2003. Phase II Report: Development and recommendations of SQV's for freshwater sediments in Washington State. Avocet Consulting. Publication Number: 03-09-088.
- Spokane Regional Health District (SRHD). 2006. *Environmental Hazards, Spokane River Health Advisories*. Available: <http://www.srhd.org/safety/environment/default.asp>. Accessed August 16, 2006.
- U.S. Army Corps of Engineers (USACE). 1991. *Hydraulic Design of Flood Control Channels*. EM 1110-2-1601. Washington, D.C.

- U.S. Army Corps of Engineers (USACE). 2005. *WA Recreational Sites, Starr Road and Island Complex Field Sampling Report*. Prepared for U.S. EPA. January 7.
- U.S. Army Corps of Engineers (USACE). 2006a. *65% Design Drawings and Hydraulic calculations in support of conceptual design for Washington Recreational Sites – Island Complex Project*. Seattle District. January.
- U.S. Army Corps of Engineers (USACE). 2006b. *Final Design Analysis Report: Washington Recreation Sites – Starr Road Site, Bunker Hill Mining and Metallurgical Complex OU 3, Spokane River, Washington*. Prepared for U.S. EPA. March 21.
- U.S. Environmental Protection Agency (EPA). 2002. *Record of Decision, Bunker Hill Mining and Metallurgical Complex Operable Unit 3*. September.
- U.S. Environmental Protection Agency (EPA). 2006. *Region 10 Superfund: Bunker Hill Site Wide*. Available: <http://yosemite.epa.gov/R10/CLEANUP.NSF/sites/bh>. Accessed August 16, 2006.
- U.S. Geological Survey (USGS). 2006. *Selected flow measurements in the vicinity of the Island Complex project site*.
- Washington Department of Fish and Wildlife. 2003. *Design of Road Culverts for Fish Passage*.
- Washington State Department of Ecology (Ecology). 1998. *Final 1998 Section 303(d) List*. Available: http://www.ecy.wa.gov/programs/wq/303d/1998/wrias/1998_water_segs.pdf. Accessed August 16, 2006.
- Washington, Unincorporated Areas. Community Number 530174.

FIGURES

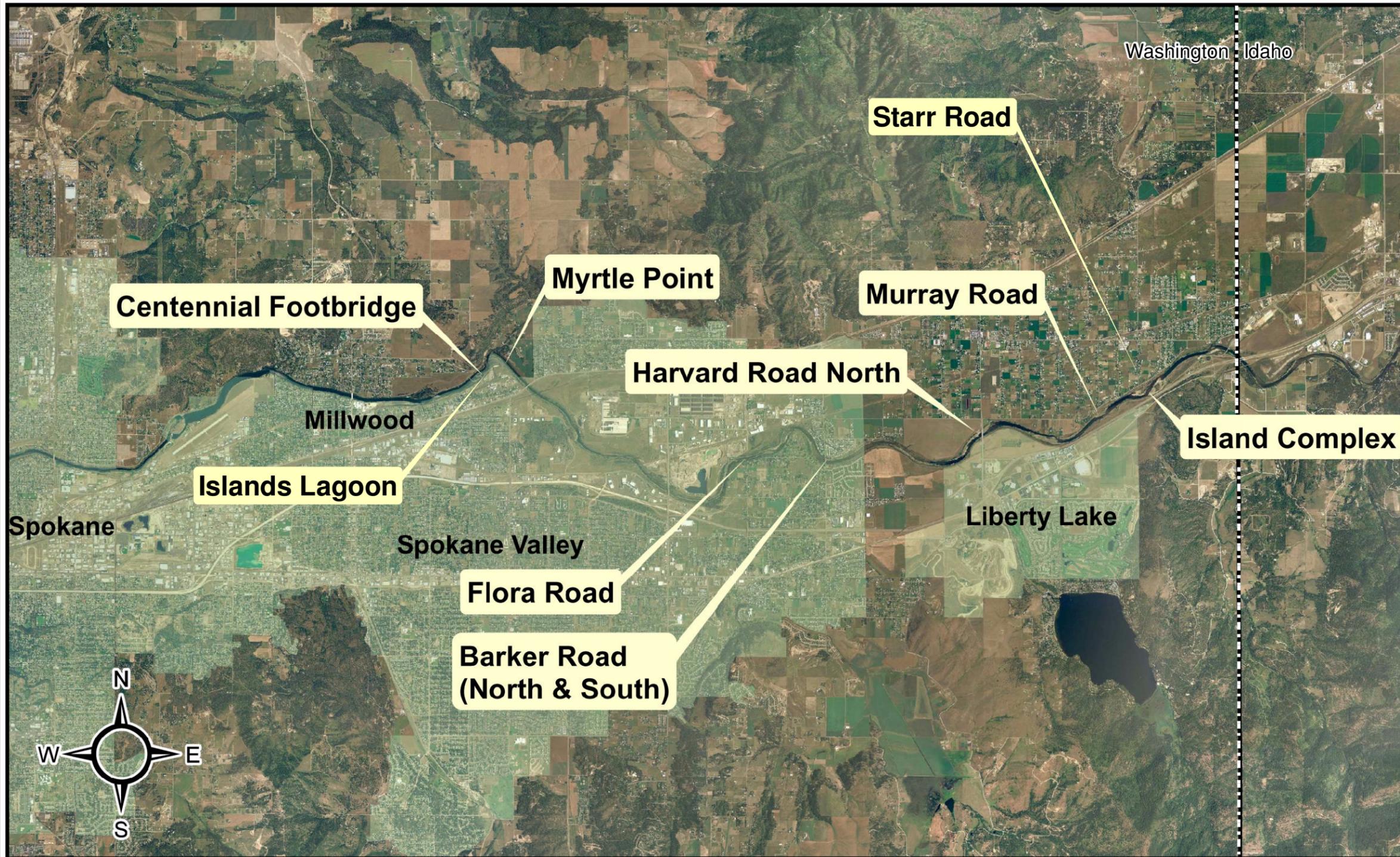


Figure 1
Priority Shoreline Sites

Island Complex, Murray Road,
and Harvard Road North Sites
Spokane River, WA

December 2006

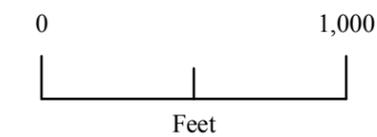


Figure 2
Island Complex
Site Location Map

Island Complex, Murray Road,
and Harvard Road North Sites
Spokane River, WA

December 2006

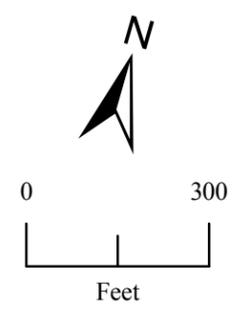


Figure 3
Island Complex
Aerial View

Island Complex, Murray Road,
and Harvard Road North Sites
Spokane River, WA

December 2006

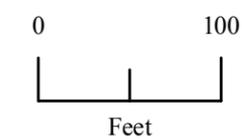


Figure 4
Murray Road Site

Island Complex, Murray Road,
and Harvard Road North Sites
Spokane River, WA

December 2006

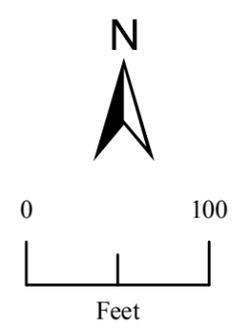
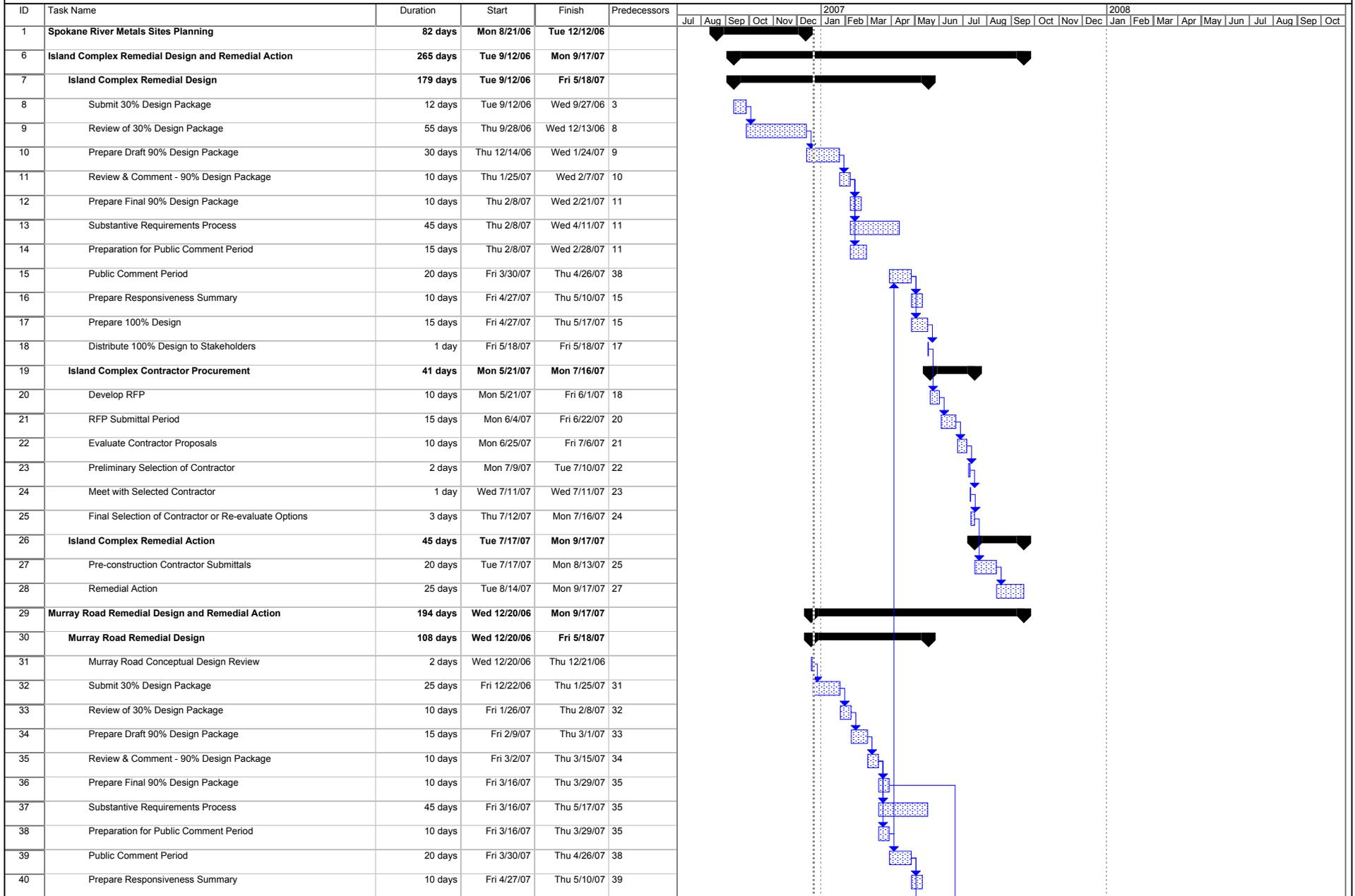


Figure 5
Harvard Road North Site

Island Complex, Murray Road,
and Harvard Road North Sites
Spokane River, WA

December 2006

Figure 6
Island Complex, Murray Road, and Harvard Road North Sites
Remedial Design Schedule



Project: IC RD schedule
Lat Updated: Fri 12/22/06

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



MEMORANDUM

DATE: December 12, 2006
TO: Sheila Fleming
FROM: Colin Wagoner
SUBJECT: Hydraulic Evaluation for Island Complex Site, Revision 1

Background

Ridolfi is under contract to the Washington State Department of Ecology (Ecology) to develop remedial designs for the Island Complex site on the Spokane River. The data that are necessary for the development of the remedial designs include the predicted velocities, shear stresses, and water surface elevations at various flow regimes, for example, a 20-year flood event. A summary of the data review and evaluation that was conducted for design development is presented below.

Data Sources and Assumptions

- HEC-RAS model files were obtained from the U.S. Army Corps of Engineers (USACE), Seattle District. The USACE assembled a hydraulic model to evaluate restoration design issues on the Starr Road site, which is located just downstream of Island Complex. The hydraulic model was assembled to build upon previous efforts conducted for a Federal Emergency Management Agency (FEMA) Flood Insurance Study (FIS) prepared for unincorporated areas of Spokane County (FEMA, 1992).
- Data for the Liberty River gage on the Spokane River were obtained from the U.S. Geological Service (USGS). These data are used by the USGS to calculate discharge, measured in cubic feet per second (cfs), as a function of stage, measured in feet, in the river.
- Estimates of discharge for events with various flood recurrence intervals were tabulated by the USACE in the Engineering Analysis section of the Starr Road Restoration project. The first return interval is listed as n/a or not applicable because it is a relatively low value that is frequently exceeded in winter. Table 1 summarizes these values.
- Vertical datum conversion. The FIS study and USGS records are tabulated in the National Geodetic Vertical Datum of 1929 (NGVD29). Topographic surveying at the Island Complex and Starr Road sites was performed using the North American Vertical Datum of 1988 (NAVD88). There is a 3.81-foot offset between these datums such that one adds 3.81 feet to a value reported in NGVD29 to convert it to a NAVD88 basis.



- USGS 1:24,000 topographic map Liberty Lake Quadrangle (1973) shows river miles for the Spokane River and the location of the Liberty Bridge gage. Note that the river miles shown on the map are not spaced one mile apart. So, these river miles cannot be used to establish the location of the HEC-RAS model cross-sections
- Input and output files for the original WSP-2 model completed for the FIS were obtained from FEMA in PDF format. Review of this information along with review of the WSP-2 User's manual, provided primary evidence for locating the model cross-sections. The first WSP-2 file lists each cross-section and bridge within the model domain and lists the distance in feet between each cross-section. These values were used to post the cross-sections on a map, working from upstream to downstream, as shown on Figures 1 and 2. Table 3 summarizes the spatial information. It should be noted that the cross-section labels shown as "River Miles" are apparently inaccurate because they are inconsistent with the distances used in the WSP-2 and HEC-RAS models.

Analytical Approach

The HEC-RAS model files obtained from the USACE were opened in HEC-RAS and the model was executed to verify that the results reported by the USACE could be duplicated. Based on a visual comparison between a longitudinal profile presented in a memorandum prepared by the USACE and a similar output from the model, it appeared that the results were duplicated. An evaluation of the model indicated that it was set up with the parameters shown in Table 2. The measured cross-sections are those that were used in the original FIS. The USACE interpolated between the measured cross sections, generally at 100-foot intervals, although sometimes at other intervals. Note that there is a discrepancy between the extent of the model shown in Table 2 if the river miles are converted to feet: $3.1 \text{ miles} \times 5,280 \text{ feet/mile} = 16,369 \text{ feet}$, which is over 10 percent different than the model length shown in Table 2 (18,650 feet). This problem is exacerbated because the maps in the FIS do not indicate the locations of the cross-sections. Furthermore, the river mile markers shown on the USGS topographic quadrangles for the area are not spaced at one mile intervals. These discrepancies make it difficult to line up specific model cross-sections with features on the ground.

The rating curve was used to adjust boundary conditions for the model. The rating curve provides an elevation for the discharges corresponding to events with a specified return interval. For example, the 20-year event has a discharge of 41,900 cfs for a gage height of 2,029.9 feet. The preliminary model obtained from the USACE indicated that the predicted water surface elevation for the 20-year event was 9.5 feet lower at RM 93.8 relative to RM 94.9 (the gage). Therefore, a boundary condition of $2,020.9 \text{ ft} - 9.5 \text{ ft} = 2,011.4 \text{ ft}$, was used for the 20-year event.

Figures 1 and 2 show representative cross-sections, above and below the Island Complex site as output from HEC-RAS. The cross sections are both oriented looking downstream so that the south, southeast side of the river is on the left. The cross-sections show predicted water levels for 0.5-year, 20-year and 100-year events. The color shading is an indication of the predicted velocities in strips across the river for the 20-year event. The values reach a maximum of almost 10 feet per



second. Figure 3 compares the geometry obtained from the topographic survey of the Island Complex with the geometry in the HEC-RAS model. The comparison is approximate because of the difficulty in aligning the two data sets.

Because of the uncertainty in the model geometry, the modeling alone was deemed to be insufficient to be used as a basis for design purposes such as selecting the size of rock to withstand a particular design event such as a 20-year recurrence interval flood. While the model gives reasonable estimates of the predicted maximum velocities under different flow regimes, it isn't as useful in predicting where the maximal velocities will occur in a cross-section through the Island Complex. Specifically, we interpret that the model underestimates the velocity in the back-channel. Consequently, the model predictions will be supplemented with the USGS acoustic Doppler velocity measurements recorded during a high flow (reportedly a one-year recurrence interval) event. Those measurements are described in more detail below.

Chevron Stabilization Design Considerations

One of the areas identified for erosion control through bank stabilization is located at the downstream edge of the Island Complex. It is informally called the "chevron" because of its shape. The chevron is characterized by an exposed embankment of sand with gravel (Photograph 1).

The central portion of the chevron is unvegetated but there is low-lying vegetation on either side. The steepest portion of the slope is approximately 3:1 horizontal to vertical; the top of the slope is at approximately 2,030 ft. NAVD88; and the base of the slope is at 2,024 ft. Fine-grained recent deposits (silt-clay fraction) were noted on the base of the chevron suggesting deposition in quiescent conditions.



Photograph 1. The Chevron looking northeast.

The USGS conducted an acoustic Doppler velocity survey of the east-west channel in the vicinity of the chevron on May 25, 2006. In that survey they measured relatively low velocities, on the order of 1 ft/s and noted a complex flow pattern of eddies. A sketch of the survey area indicated "ponded water" in the vicinity of the chevron. The USGS observations were made when discharge at the Liberty Bridge gage was 16,700 cfs, approximately a one-year return interval event. Although it is possible that during a larger event, the Island will overtop, it is difficult to predict the velocities across the chevron under those conditions because the flow patterns are likely to be three-dimensional (i.e., significant cross-channel and vertical components).



Taken together, these observations suggest that the energy at the chevron is generally low and granular materials of the same approximate size as the native materials should be sufficiently stable for restoration purposes. The proposed design consists of a foundation consisting of a toe structure constructed of angular quarry spalls. On the lower section of the structure, rounded gravels will be used to blanket the quarry spalls and blend into the sand and gravel that are present in the flat area at the base of the chevron. Willow bundles will be placed on the quarry spalls followed by Coir-wrapped organic rich soil building up toward the upper edge of the chevron. Native plants will be installed into the soil to provide root structure and stability. The plants will be irrigated for at least the first two years after installation to increase the probability of successful root establishment.



TABLES



Table 1. Recurrence Intervals for Flood Events on the Spokane River

Return Interval (years)	Discharge (cfs)	Height at the Liberty Bridge Gage: RM 94.9 (ft NGVD29)	Height at Downstream Model Boundary: RM 93.8 (ft NGVD29)
n/a	6,500	2,012.7	2,003.2
1.2	15,800	2,015.7	2,006.2
2	23,700	2,017.6	2,008.1
5	32,100	2,019.2	2,009.7
10	37,500	2,020.2	2,010.7
20	41,900	2,020.9	2,011.4
50	47,000	2,021.6	2,012.1
100	52,000	2,022.0	2,012.5
500	65,000	2,022.5	2,013.0



Table 2. HEC-RAS Model Parameters

Parameter Name	Value	Units
Upstream Model Extent (100 feet downstream of Highway 10, centennial trail, bridge)	95.9	River Miles (nominal)
Downstream Model Extent (Upstream side of Harvard Road Bridge)	92.8	River Miles (nominal)
Model Length	3.1	River Miles (nominal)
Model Length	18,650	Feet
Number of measured cross-sections	8	--
Total number of cross-sections	188	--



Table 3. Cross Section Locations for WSP2 and HEC-HAS Models

Cross Section ID	Cross-Section "River- Mile"	Interval (feet)	Cumulative Distance (feet)
V (upstream edge of Harvard Road Bridge)	92.8	3,000	18,650
W	93.2	2,900	15,650
X	93.7	3,000	12,750
Y	94.3	3,100	9,750
Z	94.7	3,000	6,650
AA	95.3	2,900	3,650
AB	95.8	750	750
AC (100 feet downstream of Highway 10)	95.9	0	0



FIGURES

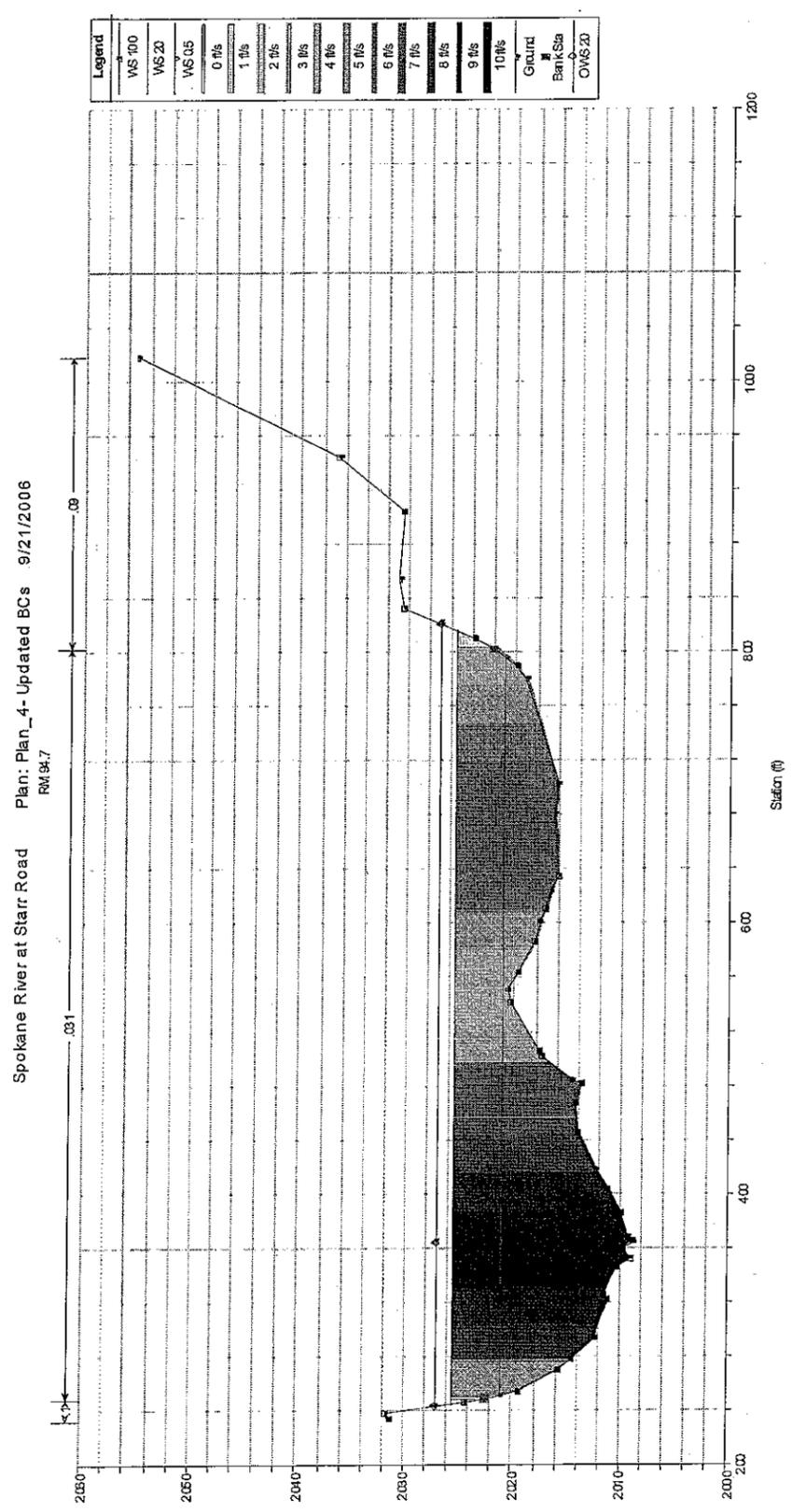


Figure 1. FIS Cross Section "Z" or 94.7 located near the Starr Road site.

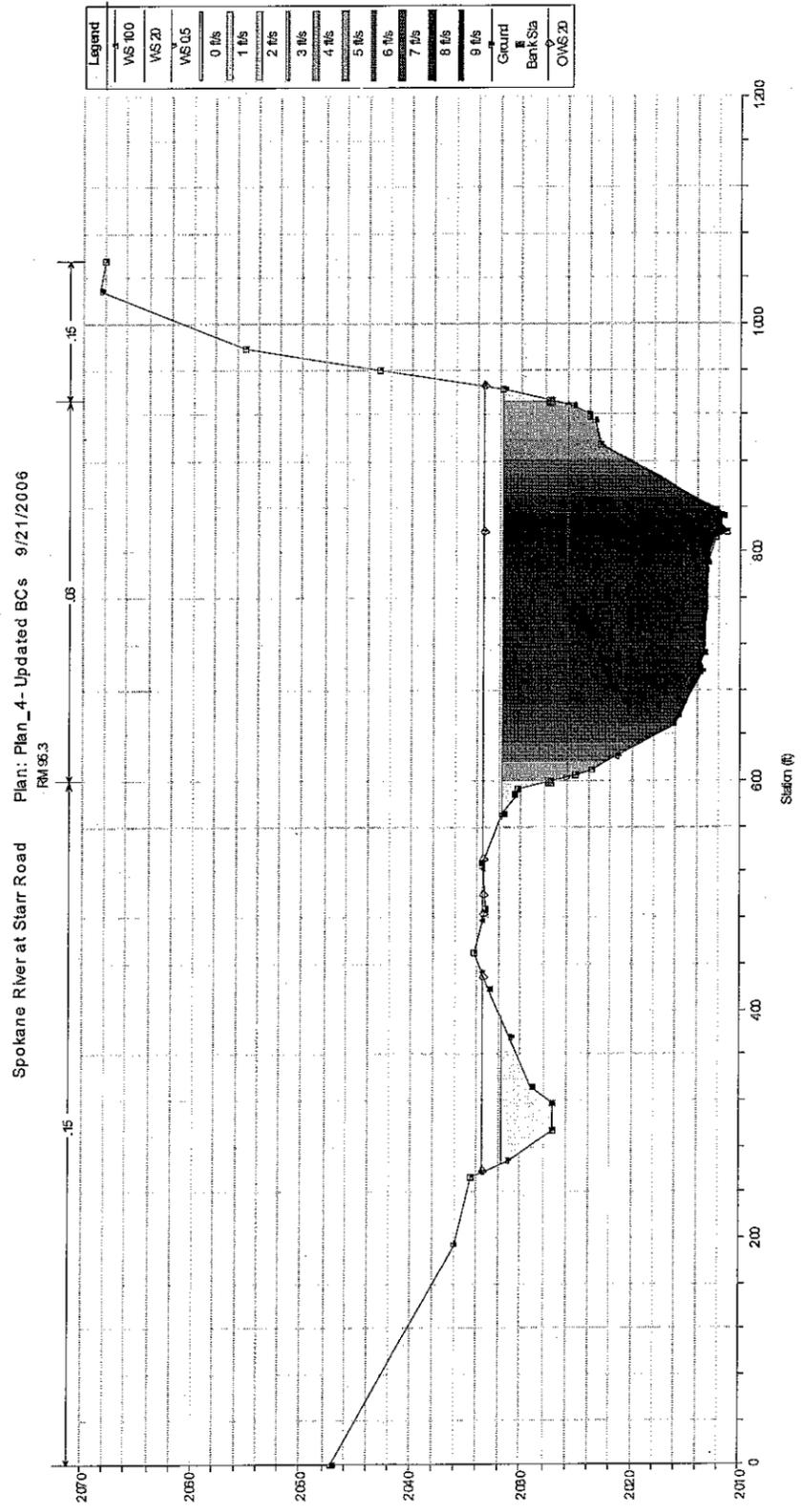


Figure 2. FIS Cross Section "AA" or 95.3 located upstream of the Island Complex site.

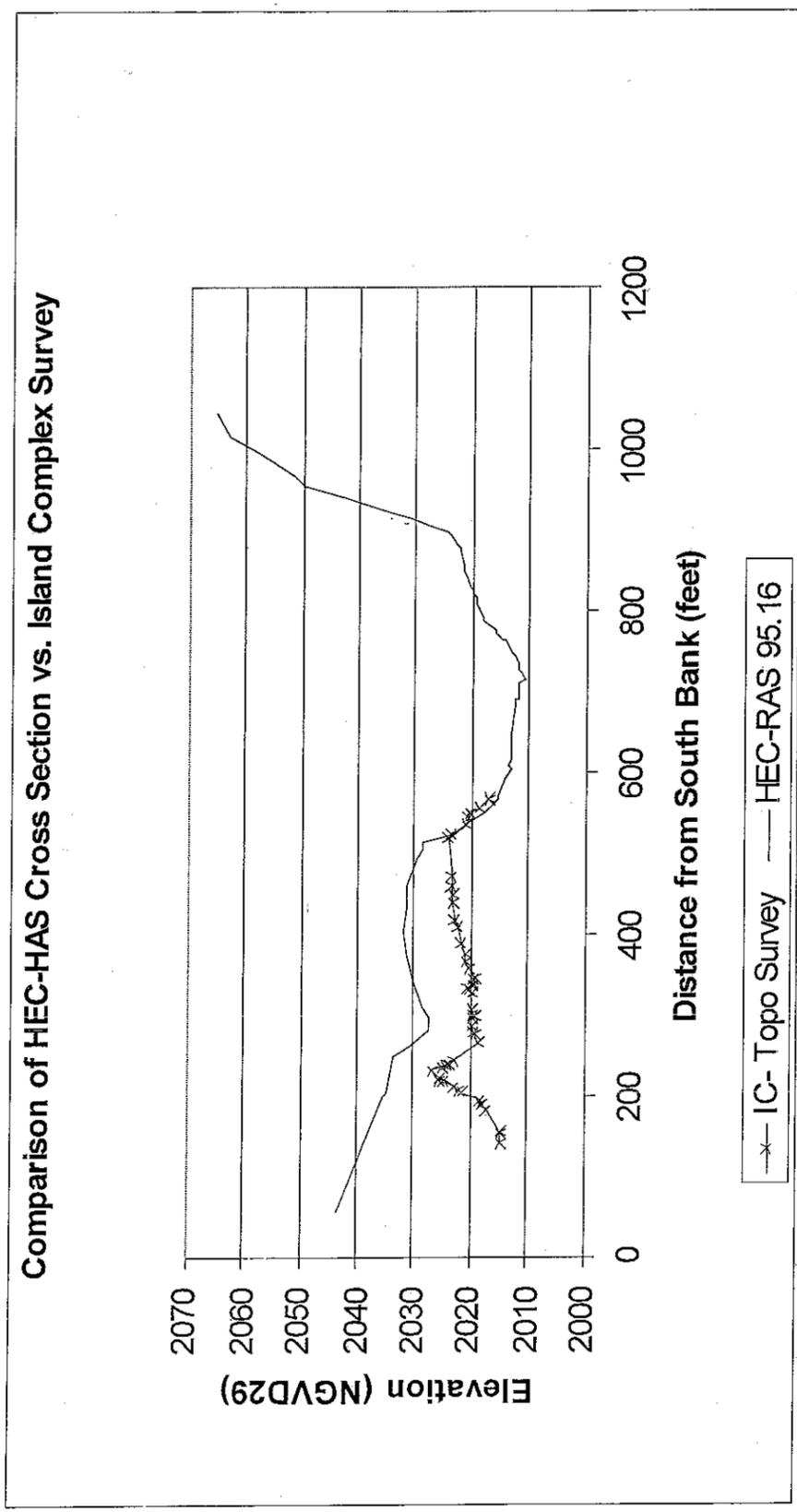


Figure 3. Comparison of Island Complex topographic survey to HEC-RAS interpolated cross-section.

TABLES

Table 1. Human Health Action Levels and Preliminary Site-specific Ecological Risk Threshold Values for the Spokane River Metals Sites: Island Complex, Murray Road, and Harvard Road North

Contaminant of Concern	Human Health Action Level ¹ (mg/kg)	Preliminary Site-specific Ecological Risk Threshold ² (mg/kg)
Arsenic	10	33 - 51
Cadmium	49	3 - 5
Lead	700	128 - 430
Zinc	17,109	270 - 459

¹EPA Superfund Record of Decision: Bunker Hill Mining & Metallurgical Complex Operable Unit 03, EPA/ROD/R10-02/032, September 2002.

²Washington State has not promulgated freshwater sediment cleanup levels for the protection of ecological health. Ecology has developed an estimated range of preliminary site-specific ecological risk thresholds for these sites. These values are based on the following literature:

- Long E R. and L.G Morgan (1991). The potential for biological effects of sediment-sorbed contaminants tested in the National Status and Trends Program. NOAA Technical Memorandum NOS OMA 52, National Oceanic and Atmospheric Administration, Seattle, WA.
- MacDonald D. D., C.G. Ingersoll and I A. Berger. (2000). Development and evaluation of consensus-based sediment quality guidelines for freshwater ecosystems. Arch. Environ. Contam. Toxicol. 39, 20-31.
- Michelsen, I. (2003) Phase II Report: Development and recommendations of SQV's for freshwater sediments in Washington State. Avocet Consulting. Publication Number: 03-09-088.

Island Complex, Murray Road, and River Road North Sites Remedial Design Schedule

ID	Task Name	Duration	Start	Finish	Predecessors
1	Spokane River Metals Sites Planning	82 days	Mon 8/21/06	Tue 12/12/06	
6	Island Complex Remedial Design and Remedial Action	285 days	Tue 9/12/06	Mon 9/17/07	
7	Island Complex Remedial Design	179 days	Tue 9/12/06	Fri 5/18/07	
8	Submit 30% Design Package	12 days	Tue 9/12/06	Wed 9/27/06	3
9	Review of 30% Design Package	55 days	Thu 8/23/06	Wed 12/13/06	8
10	Prepare Draft 80% Design Package	30 days	Thu 12/14/06	Wed 1/24/07	9
11	Review & Comment - 80% Design Package	10 days	Thu 1/25/07	Wed 2/7/07	10
12	Prepare Final 90% Design Package	10 days	Thu 2/8/07	Wed 2/21/07	11
13	Substantive Requirements Process	45 days	Thu 2/8/07	Wed 4/11/07	11
14	Preparation for Public Comment Period	15 days	Thu 2/8/07	Wed 2/28/07	11
15	Public Comment Period	20 days	Fri 3/30/07	Thu 4/26/07	38
16	Prepare Responsiveness Summary	10 days	Fri 4/27/07	Thu 5/10/07	15
17	Prepare 100% Design	15 days	Fri 4/27/07	Thu 5/17/07	15
18	Distribute 100% Design to Stakeholders	1 day	Fri 5/18/07	Fri 5/18/07	17
19	Island Complex Contractor Procurement	41 days	Mon 5/21/07	Mon 7/16/07	
20	Develop RFP	10 days	Mon 5/21/07	Fri 6/1/07	18
21	RFP Submittal Period	15 days	Mon 6/4/07	Fri 6/22/07	20
22	Evaluate Contractor Proposals	10 days	Mon 6/25/07	Fri 7/6/07	21
23	Preliminary Selection of Contractor	2 days	Mon 7/9/07	Tue 7/10/07	22
24	Meet with Selected Contractor	1 day	Wed 7/11/07	Wed 7/11/07	23
25	Final Selection of Contractor or Re-evaluate Options	3 days	Thu 7/12/07	Mon 7/16/07	24
26	Island Complex Remedial Action	45 days	Tue 7/17/07	Mon 9/17/07	
27	Pre-construction Contractor Submittals	20 days	Tue 7/17/07	Mon 8/13/07	25
28	Remedial Action	25 days	Tue 8/14/07	Mon 9/17/07	27
29	Murray Road Remedial Design and Remedial Action	154 days	Wed 12/20/06	Mon 9/17/07	
30	Murray Road Remedial Design	108 days	Wed 12/20/06	Fri 5/18/07	
31	Murray Road Conceptual Design Review	2 days	Wed 12/20/06	Thu 12/21/06	
32	Submit 30% Design Package	25 days	Fri 12/22/06	Thu 1/25/07	31
33	Review of 30% Design Package	10 days	Fri 1/26/07	Thu 2/8/07	32
34	Prepare Draft 90% Design Package	15 days	Fri 2/9/07	Thu 3/1/07	33
35	Review & Comment - 90% Design Package	10 days	Fri 3/2/07	Thu 3/15/07	34
36	Prepare Final 90% Design Package	10 days	Fri 3/16/07	Thu 3/29/07	35
37	Substantive Requirements Process	45 days	Fri 3/16/07	Thu 5/17/07	35
38	Preparation for Public Comment Period	10 days	Fri 3/16/07	Thu 3/29/07	35
39	Public Comment Period	20 days	Fri 3/30/07	Thu 4/26/07	38
40	Prepare Responsiveness Summary	10 days	Fri 4/27/07	Thu 5/10/07	39



Figure 6
Island Complex, Murray Road, and Harvard Road North Sites
Remedial Design Schedule

ID	Task Name	Duration	Start	Finish	Predecessors
41	Prepare 100% Design	15 days	Fri 4/27/07	Thu 5/1/07	38
42	Distribute 100% Design to Stakeholders	1 day	Fri 5/18/07	Fri 5/18/07	41
43	Murray Road Contractor Procurement	41 days	Mon 6/21/07	Mon 7/16/07	
44	Develop RFP	10 days	Mon 6/21/07	Fri 6/22/07	42
45	RFP Submittal Period	15 days	Mon 6/25/07	Fri 6/22/07	44
46	Evaluate Contractor Proposals	10 days	Mon 6/25/07	Fri 7/6/07	45
47	Preliminary Selection of Contractor	2 days	Mon 7/9/07	Tue 7/10/07	46
48	Meet with Selected Contractor	1 day	Wed 7/11/07	Wed 7/11/07	47
49	Final Selection of Contractor or Re-evaluate Options	3 days	Thu 7/12/07	Mon 7/16/07	46
50	Murray Road Remedial Action	45 days	Tue 7/17/07	Mon 9/17/07	
51	Pre-construction Contractor Submittals	20 days	Tue 7/17/07	Mon 8/13/07	49
52	Remedial Action	25 days	Tue 8/14/07	Mon 9/17/07	51
53	Harvard Road North Remedial Design and Remedial Action	312 days	Fri 6/22/07	Mon 9/1/08	
54	Harvard Road North Remedial Design	191 days	Fri 6/22/07	Fri 3/14/08	
55	Submit 30% Design Package	30 days	Fri 6/22/07	Thu 8/2/07	36F&80 days
56	Review of 30% Design Package	20 days	Fri 8/3/07	Thu 8/30/07	55
57	Prepare Draft 90% Design Package	30 days	Fri 8/31/07	Thu 10/11/07	56
58	Review & Comment - 90% Design Package	20 days	Fri 10/12/07	Thu 11/8/07	57
59	Prepare Final 90% Design Package	15 days	Fri 10/12/07	Thu 11/1/07	57
60	Substantive Requirements Process	45 days	Fri 10/12/07	Thu 12/13/07	57
61	Preparation for Public Comment Period	15 days	Fri 12/14/07	Thu 13/8/08	60
62	Public Comment Period	20 days	Fri 1/4/08	Thu 1/31/08	61
63	Prepare Responsiveness Summary	15 days	Fri 2/1/08	Thu 2/21/08	62
64	Prepare 100% Design	15 days	Fri 2/22/08	Thu 3/13/08	63
65	Distribute 100% Design to Stakeholders	1 day	Fri 3/14/08	Fri 3/14/08	64
66	Harvard Road North Contractor Procurement	71 days	Mon 3/17/08	Mon 6/23/08	
67	Develop RFP	20 days	Mon 3/17/08	Fri 4/11/08	65
68	RFP Submittal Period	20 days	Mon 4/14/08	Fri 5/9/08	67
69	Evaluate Contractor Proposals	15 days	Mon 5/12/08	Fri 5/30/08	68
70	Preliminary Selection of Contractor	5 days	Mon 6/2/08	Fri 6/6/08	69
71	Meet with Selected Contractor	1 day	Mon 6/9/08	Mon 6/9/08	70
72	Final Selection of Contractor or Re-evaluate Options	10 days	Tue 6/10/08	Mon 6/23/08	71
73	Harvard Road North Remedial Action	50 days	Tue 6/24/08	Mon 9/1/08	
74	Pre-construction Contractor Submittals	30 days	Tue 6/24/08	Mon 8/4/08	72
75	Remedial Action	20 days	Tue 8/5/08	Mon 9/1/08	74

Project: IC RD schedule
Last Updated: Fri 12/22/06

Task Split

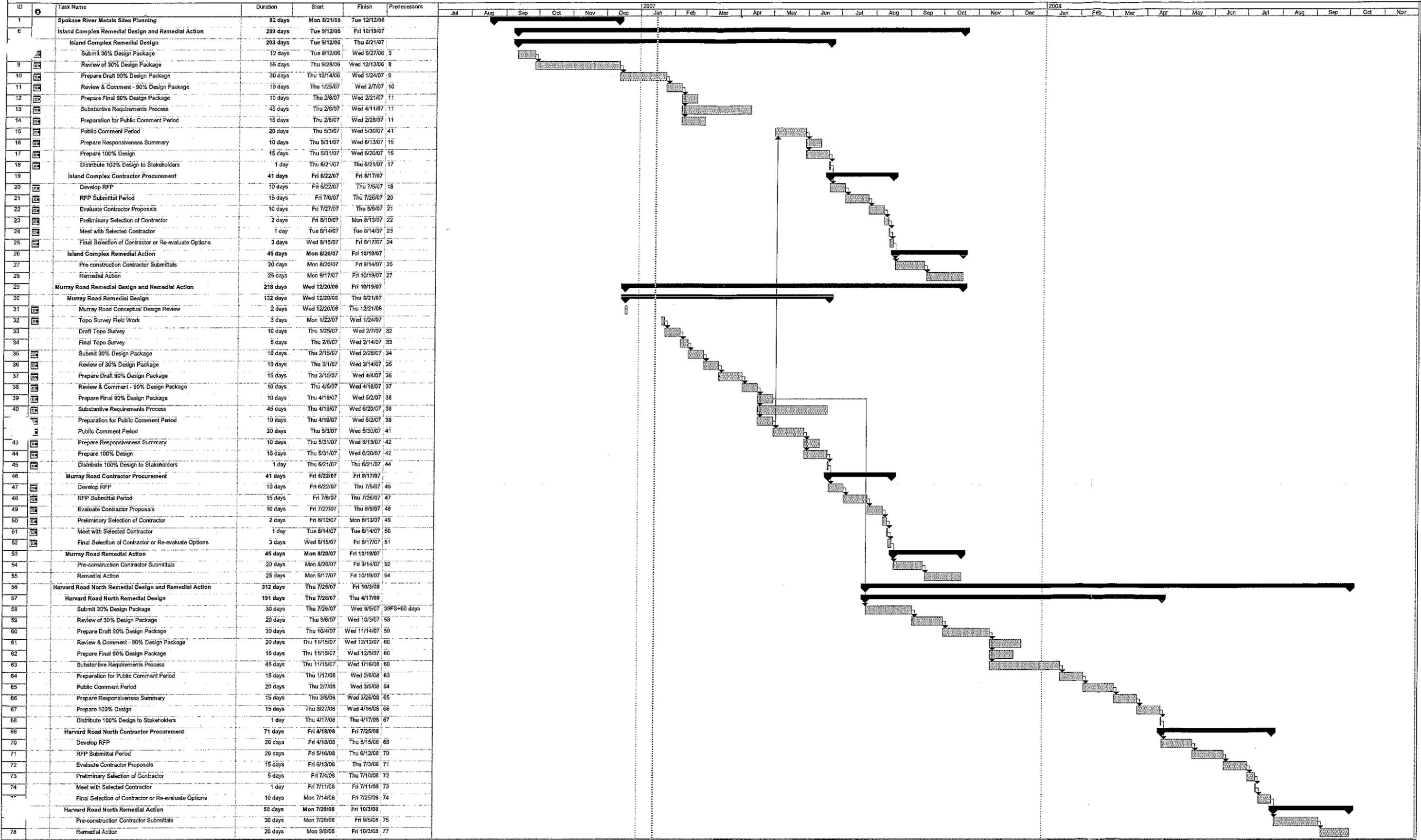
Progress Milestone

Summary Project Summary

External Tasks External Milestone

Deadline

Figure 5
Island Complex, Murray Road, and Harvard Road North Sites
Remedial Design Schedule



DRAFT

CONSTRUCTION SPECIFICATIONS

*SPOKANE RIVER METALS SITES:
ISLAND COMPLEX AND MURRAY ROAD REMEDIAL ACTIONS
SPOKANE, WASHINGTON*

PREPARED FOR
WASHINGTON STATE DEPARTMENT OF ECOLOGY



DRAFT
CONSTRUCTION SPECIFICATIONS
SPOKANE RIVER METALS SITES:
ISLAND COMPLEX AND MURRAY ROAD REMEDIAL ACTIONS
SPOKANE, WASHINGTON

Prepared for
Washington State Department of Ecology

Prepared by
RIDOLFI Inc.

April 10, 2007

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SECTION 01010: SUMMARY OF WORK

1 PART 1 GENERAL

1.1 SECTION INCLUDES

- A. General description of Work covered by contract documents.
- B. Site location and access.
- C. Background information.
- D. Utility location.
- E. Permit requirements.
- F. Contractor use of site and premises.
- G. Work by Ecology.
- H. Construction sequencing.
- I. Construction time limits.

1.2 GENERAL DESCRIPTION OF WORK COVERED BY CONTRACT DOCUMENTS

- A. The Washington State Department of Ecology (Ecology) is conducting remedial actions at the Island Complex Recreational Area (IC) and the Murray Road sites as part of a Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) action. The Work included in this specification is for the IC and Murray Road sites only.
- B. Construct the work under a [contract type] contract.
- C. The Work consists of the construction of the Island Complex Remedial Action and the Murray Road Remedial Action in Spokane County, Washington. Complete the construction in accordance with the Drawings, Specifications, and other documents as referenced or included.
- D. Construction includes, but is not limited to furnishing all materials, labor, disposal of all waste materials, and all other work necessary to complete the work as defined in the Contract Documents.
- E. The specific elements of Work at the **Island Complex Site** include, but are not limited to:

1. Establishing pre-construction topographic site control surveying and staking
 2. Constructing a multilayer rock, gravel and soil cap with coir lifts over metals-contaminated soil as depicted on the project Drawings
 3. Capping an existing recreational trail with geotextile fabric and gravel and placing large boulders as trail markers
 4. Site earthwork and grading
 5. Environmental protection measures
 6. Protection of existing vegetation
 7. Construction Quality Control
 8. Soil Preparation to allow for planting
 9. Erosion and sedimentation control
 10. Survey of final grades and elevations of capped area
- F. The specific elements of Work at the **Murray Road Site** include, but are not limited to:
1. Establishing pre-construction topographic control surveying and staking
 2. Construction of four specific cap treatments for metals contaminated soils within four regions as delineated in the project Drawings
 3. Site earthwork and grading
 4. Environmental protection measures
 5. Protection of existing vegetation
 6. Construction Quality Control
 7. Soil preparation to allow for planting or hydroseeding
 8. Hydroseeding
 9. Erosion and sedimentation control
 10. Survey of final grades and elevations of capped areas
- G. Except as specifically noted, provide and pay for:
1. All labor, materials, and equipment
 2. All tools, incidentals, construction equipment, and machinery
- H. Pay legally required sales, consumer and use taxes.
- I. Give required notices.
- J. Comply with codes, ordinances, rules, regulations, orders, and other legal requirements of public authorities that bear on performance of the Work.
- K. Do not extend Work activity into areas not designated for construction or staging under this Contract.

1.3 SITE LOCATION AND ACCESS

- A. The Island Complex site is located within the banks of the Spokane River at approximate river mile 95.0 about 1.0 mile west of the Idaho State line in Spokane County, Washington. The site is located on land owned by the State of Washington and managed by the Washington Department of Natural Resources, and can be accessed via a 0.5-mile trail through parkland owned by Spokane County. The trailhead is located at a parking lot adjacent to the river near Exit 299 on I-90. Refer to the project Drawings for a site location map. During periods of seasonal low flow in the late summer and fall, the riverbed channels around the island are dry and the site is accessible by personnel and equipment.
- B. The Murray Road site is approximately 3 miles from the Island Complex Recreation Area. From the Island Complex site, the Murray Road project location can be accessed by going east on East Appleway Lane. East Appleway Lane crosses over the Spokane River and becomes West Seltice Way. From West Seltice Way, turn left at East Wellesly Avenue. From East Wellesly Avenue, turn left at North Murray Road. The site is at the corner of East River Road and North Murray Road. Refer to the project Drawings for a site location map.
- C. Prospective bidders are encouraged to visit the sites and attend the pre-bid meeting held at the sites to become familiar with existing conditions.

1.4 BACKGROUND INFORMATION

- A. Soil investigations have been performed in support of these projects to identify the nature and extent of metals-contaminated soil. The following reports, sampling and analysis results maps and surveys are available for review at www.ridolfi.com/spokaneriver:
 - 1. The Washington Recreational Sites Starr Road and Island Complex- Final Field Sampling Report, prepared, by U.S. Army Corps of Engineers, January 7, 2005.
 - 2. Spokane River Shoreline Site at Murray Road- Sampling and Testing Report, prepared by Ecology, December 2006.
 - 3. Three sampling analysis results maps:
 - a. Island Complex Back Channel: Approximate sampling locations and XRF results, prepared by Ecology, August 24, 2006.
 - b. Total Metals Sampling Results (Map) for Island Complex and Starr Road Sites, prepared by the U.S. Army Corps of Engineers (USACE), August 2003.
 - c. Arsenic and Lead Results (Map) for Island Complex and Starr Road Sites, prepared by the USACE, August 2003.
 - 4. Topographic surveys representing existing conditions at both sites.

1.5 UTILITY LOCATION

- A. Contractor is responsible for locating all buried utilities prior to commencing subsurface work. Contractor shall contact utility locating service at 800-424-5555 at least 48 hours prior to excavating.

1.6 PERMIT REQUIREMENTS

- A. The remedial actions at the Island Complex site and the Murray Road site are state-lead cleanup actions. The Washington State Department of Ecology will obtain permits or ensure that substantive permit requirements are met in lieu of a permit. The following permits or substantive permit requirements will apply:

Local

- Shoreline Management Act shoreline permitting substantive requirements - Spokane County
- Spokane County Parks access agreement

State

- Washington State Department of Fish and Wildlife State Hydraulic Permit substantive requirements
- Washington State Department of Natural Resources Right of Entry

Federal

- U.S. Army Corps of Engineers Nationwide Permit 38

- B. Copies of these permits and approvals are available for review at the following location:

Washington State Department of Ecology, Eastern Regional Office
N. 4601 Monroe
Spokane, WA 99205-1295

- C. All Work is to be performed in compliance with permit requirements and conditions.

1.7 CONTRACTOR USE OF SITE AND PREMISES

- A. Limit activities to the designated work areas as indicated on the Plans.
- B. Restore any damage to areas located outside of the limits of Work, including all access areas, to the satisfaction of Ecology's Representative.

1.8 WORK BY ECOLOGY

- A. Ecology will provide oversight to verify the Construction Contractor's Quality Control. These measures are for the sole benefit of the Ecology and do not relieve the contractor of responsibility for providing adequate quality control measures.

The presence or absence of Ecology's Quality Assurance staff does not relieve the contractor from any contact requirement.

- B. Ecology may, at its discretion, work with individuals, other Contractors, or groups to perform other Work on site. Ecology's Representative will coordinate all such work with the Contractor, a minimum of 48 hours before these efforts.
- C. Coordinate all Work in this Contract with work by Ecology.

1.9 CONSTRUCTION SEQUENCING

- A. The Contractor is required to submit a construction sequence schedule under Section 01300 - Submittals. The schedule must include a pre-construction meeting with Ecology and its representatives. Schedule must be based on recommended sequencing as described within this Specification set and Plan drawings.

1.10 CONSTRUCTION TIME LIMITS

- A. Work is to begin within five (5) working days after the notice to proceed, and be complete within 45 calendar days, beginning the date given in the notice to proceed by Ecology's Representative. The 45-day work window may be further limited depending on weather and resulting river flow rate. Based on past experience and discussions with the river management authority (Avista Corporation), Ecology expects the back channel to be accessible (dry) from early August through mid-September. Time limit applies to pre-construction submittal and review requirements, construction, and irrigation system installation.

2 PART 2 PRODUCTS

Not Used.

3 PART 3 EXECUTION

Not Used.

END OF SECTION

SECTION 01300: SUBMITTALS

1 PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Submittal procedures.
- B. Construction progress schedules.
- C. Proposed products list.
- D. Product data.
- E. Shop drawings.
- F. Samples.
- G. Design data.
- H. Test reports.
- I. Certificates.
- J. Manufacturer's field reports.
- K. Samples of manufactured materials.
- L. Samples for testing.

1.2 RELATED SECTIONS

- A. Section 01400 - Construction Quality Control/Quality Assurance.
- B. Section 01700 - Contract Closeout.

1.3 REFERENCES

Not Used.

1.4 SUBMITTAL PROCEDURES

- A. Transmit each submittal with Ecology-accepted transmittal form.
- B. Sequentially number the transmittal form. Revise submittals with original number and a sequential alphabetic suffix.

- C. Identify Project, Contractor, Subcontractor or supplier; pertinent plan and detail number; and specification section number, as appropriate.
- D. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of Products required, field dimensions, adjacent construction Work, and coordination of information is in accordance with the requirements of the Work and Contract Documents.
- E. Schedule submittals to expedite the Project and deliver to Ecology's Representative. Coordinate submission of related items.
- F. For each submittal, allow 10 days for review excluding delivery time to and from the Contractor.
- G. Identify variations from Contract Documents and Product or system limitations that may be detrimental to successful performance of the completed Work.
- H. Provide space for Ecology's Representative review stamps.
- I. When revised for resubmission, identify all changes made since previous submission.
- J. Maintain a submittal log noting submittal number, dates action taken, and personnel involved.
- K. Schedule A (attached) provides a Summary Submittal List for this project.

1.5 CONSTRUCTION PROGRESS SCHEDULES

- A. Submit initial schedule in duplicate within 14 calendar days after issuance of Notice of Award.
- B. Revise and resubmit as required.
- C. Submit revised schedules weekly as well as with each Application for Payment, identifying changes since previous version. Indicate estimated percentage of completion for each item of Work at each submission as well as work expected to be completed during upcoming week.
- D. Show complete sequence of construction by activity, identifying Work of separate stages and other logically grouped activities.
- E. Indicate submittal dates required for shop drawings, product data, samples, and product delivery dates, including those furnished by Ecology.

1.6 PROPOSED PRODUCTS LIST

- A. Within 14 days after date of Notice of Award, submit list of major Products proposed for use, with name of manufacturer, trade name, and model number of each Product.
- B. For Products specified only by reference standards, give manufacturer, trade name, model or catalog designation, and reference standards.

1.7 PRODUCT DATA

- A. Product Data:
 - 1. Submit to Ecology's Representative for review for the limited purpose of checking for conformance with specifications and contract documents.
- B. Product Data For Project Close-out:
 - 1. Submitted to Ecology's Representative during and within 14 days after final inspection.
- C. Submit the number of copies that the Contractor requires, plus two copies that will be retained by Ecology's Representative.
- D. Mark each copy to identify applicable Products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.
- E. After review, distribute in accordance with the Submittal Procedures article above and provide copies for record documents described in Section 01700 - Contract Closeout.

1.8 SHOP DRAWINGS

- A. Shop Drawings:
 - 1. Submitted to Ecology's Representative for review for the limited purpose of checking for conformance with the contract documents.
 - 2. After review, produce copies and distribute in accordance with SUBMITTAL PROCEDURES article above and for record documents purposes described in Section 01700 - Contract Closeout.
- B. Submit the number of opaque reproductions that Contractor requires, plus two copies that will be retained by Ecology's Representative.

1.9 SAMPLES

- A. Samples:

1. Submit to Ecology's Representative for review for the purpose of checking for general conformance with the contract documents.
 2. Submit to Ecology's Representative to allow Quality Assurance testing by Ecology. Ecology may or may not perform testing at their discretion. Provide samples as described in Section 01400 - Construction Quality Control/Quality Assurance.
 3. After review, produce duplicates and distribute in accordance with SUBMITTAL PROCEDURES article above and for record documents purposes described in Section 01700 - Contract Closeout.
- B. Submit samples to illustrate functional and aesthetic characteristics of the Product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
- C. Include identification on each sample, with full Project information.
- D. Submit the number of samples specified in individual specification sections; one of which will be retained by Ecology's Representative.
- E. Review samples that may be used in the Work are indicated in individual specification sections.

1.10 DESIGN DATA

- A. Submit for Ecology's Representative records.
- B. Submit information for the purpose of verifying general conformance with the design concept expressed in the Contract Documents.
- C. Data indicating inappropriate or unacceptable Work may be subject to action by Ecology's Representative.

1.11 TEST REPORTS

- A. Submit test reports from Construction Quality Control activities as outlined in Section 01400 for Ecology's Representative records.
- B. Submit test reports for information for the purpose of verifying general conformance with the design concept expressed in the Contract Documents.

1.12 CERTIFICATES

- A. When specified in individual specification sections, submit certifications by the manufacturer, installation/ application subcontractor or Contractor to Ecology's Representative in quantities specified for Product Data.

- B. Indicate material or product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
- C. Certificates may be recent or previous test results on material or Product, but must be acceptable to Ecology's Representative.

1.13 MANUFACTURER'S FIELD REPORTS

- A. Submit reports for Ecology's Representative records.
- B. Submit report in duplicate within 30 calendar days of observation to Ecology's Representative for information.
- C. Submit for information for the purpose of assessing conformance with information given and the design concept expressed in the contract documents.

1.14 SAMPLES OF MANUFACTURED MATERIALS

- A. Provide Ecology's Representative with samples of manufactured materials to allow quality assurance testing in accordance with Specification Section 01400 - Construction Quality Control/Quality Assurance.

1.15 MEASUREMENT AND PAYMENT

- A. Measurement refers to acceptable versions of each submittal. Payment is a [lump sum or unit cost] based on receipt by Ecology of acceptable submittals, including monthly Application for Payment.

2 PART 2 PRODUCTS

Not Used.

3 PART 3 EXECUTION

Not Used.

END OF SECTION

SCHEDULE A
SUBMITTAL LIST

The submittal list is a tabulation of requirements identified in other specification sections:

SUBMITTAL NO.	DESCRIPTION	SPECIFICATION SECTION
1	Construction Quality Control/Quality Assurance Plan	01400
2	Health and Safety Plan	01500
3	Construction Survey	01450
4	Contract Closeout	01700
5	Earthwork	02200
6	Irrigation System Design and Specification	02900

SECTION 01400: CONSTRUCTION QUALITY CONTROL / QUALITY ASSURANCE

1 PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Construction quality control - control of installation.
- B. Tolerances.
- C. Construction quality control testing services by contractor.
- D. Construction quality assurance - testing services by Ecology.
- E. Manufacturers' field services.

1.2 RELATED SECTIONS

- A. Section 01300 - Submittals.
- B. Section 01700 - Project Closeout: Certifications and Project Records.

1.3 REFERENCES AND STANDARDS

- A. For Products or workmanship specified by association, trade, or other consensus standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.
- B. Conform to reference standard by date of issue current on date of Contract Documents, except where a specific date is established by code.
- C. Obtain copies of standards where required by product specification sections.

1.4 SUBMITTALS

- A. Mark all submittals in accordance with provisions of Section 01300.
- B. Provide Ecology's Representative with test results and certifications from Manufacturer's Quality Control Plan a minimum of ten calendar days prior to installation of materials on site.
- C. Duplicate Samples: Provide Ecology's Representative with duplicates for all samples as specified within the appropriate technical specifications.



- D. Construction Quality Control Plan: Submit the following in writing:
 - 1. Authorities and responsibilities of inspection and testing personnel.
 - 2. Experience and qualifications of inspection and testing personnel to be assigned and name and location of the testing facility to be used.
 - 3. Description of the testing facilities and information on when and where each of the required materials tests will be performed.
- E. Chain-of-Custody Forms: Provide Ecology's Representative with copies of chain-of-custody forms along with test results and laboratory quality assurance documentation.
- F. Equipment Calibration Certification: Within ten (10) calendar days prior to commencing with work requiring testing, provide Ecology's Representative with certification of laboratory equipment calibration to meet appropriate ASTM standards.

1.5 CONSTRUCTION QUALITY CONTROL (CQC) - CONTROL OF INSTALLATION

- A. Actively monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce work of specified quality.
- B. Comply with manufacturers' instructions, including performance of each step in sequence.
- C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Ecology's Representative before proceeding.
- D. Comply with specified standards as minimum quality for the work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
- E. Perform work by persons qualified to produce required and specified quality.
- F. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.
- G. Secure Products in place with positive anchorage designed and sized to withstand stresses, vibration, physical distortion, or disfigurement from river flow, exposure to sun, or other natural forces.

1.6 TOLERANCES

- A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.

- B. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from Ecology's Representative before proceeding.
- C. Adjust products to appropriate dimensions; position before securing Products in place.

1.7 CONSTRUCTION QUALITY CONTROL TESTING SERVICES BY CONTRACTOR

- A. Contractor will appoint, employ, and pay for specified services of an independent firm qualified to perform Construction Quality Control (CQC) testing in accordance with the testing guidelines of Project Specifications.
- B. The Contractor's CQC testing firm will perform tests and other services specified in individual specification sections.
- C. All samples will be obtained in duplicate. One set of samples will be provided to Ecology's Representative within 24 hours of collection to allow for Quality Assurance verification testing by Ecology's Representative.
- D. Testing and source quality control may occur on or off the project site. Ecology's Representative is to be notified of all in-situ sampling or other tests at least 24 hours prior to testing activities.
- E. Reports will be submitted by the CQC testing firm to Ecology's Representative, in duplicate, indicating observations and results of tests and indicating compliance or non-compliance with Contract Documents.
- F. Coordinate Work with Contractor's CQC testing firm; furnish samples of materials, design mix, equipment, tools, storage, safe access, and assistance by incidental labor as requested:
 - 1. Notify Ecology's Representative and independent CQA testing firm 24 hours prior to expected time for operations requiring services.
 - 2. Any tests, or other services provided by the Contractors CQC testing firm, performed without prior knowledge of Ecology's Representative will be automatically rejected and materials tested may be subject to rejection and removal. Re-testing on these materials will be performed at no cost to Ecology, and with Ecology's Representative present.
- G. Construction Quality Control testing does not relieve Contractor from performing Work to Contract requirements.



- H. Maintain a log of all test and samples conducted: Indicated date, time, location (on-site tests), reference specification method and personnel present at time of sampling/testing.
- I. Maintain accurate, thorough file of sample chain-of-custody forms.

1.8 CONSTRUCTION QUALITY ASSURANCE TESTING SERVICES BY ECOLOGY

- A. Ecology will appoint, employ, and pay for specified services of an independent firm qualified to perform construction quality assurance (CQA) testing.
- B. Cooperate with the Ecology's CQA testing firm; furnish duplicate samples of materials, design mix, equipment, tools, storage, safe access, and assistance by incidental labor as requested:
 - 1. Notify Ecology's Representative 24 hours prior to expected time for operations requiring testing services.
- C. Testing by Ecology does not in any way relieve Contractor to perform Work to Contract requirements including, but not limited to, CQC tests and documentation.
- D. Test results by Ecology's CQA testing firm will be compared with those prepared by the Contractor's CQC test firm. Test results that indicate variance of more than 10 per cent, or non-conformance with the specified requirements will require retesting. Costs for Contractor retesting will be the responsibility of the Contractor.

1.9 MEASUREMENT AND PAYMENT

- A. Work under Section 01400 - Construction Quality Control / Quality Assurance is considered incidental and included in other work; no separate payment will be made. Includes provision of independent testing laboratory services, field and laboratory testing and analyses, suitable equipment, materials and personnel to provide the quantity and types of test required in the Technical Specifications.

2 PART 2 PRODUCTS

Not Used.

3 PART 3 EXECUTION

3.1 EQUIPMENT CALIBRATION

- A. All equipment utilized for CQC/QA field testing, QC testing, and laboratory tests are to be calibrated according to the applicable and appropriate American Society for Testing of Materials (ASTM) standards within the immediate 12 months prior to use for this project. If applicable and appropriate ASTM standards are not available, use of the equipment manufacturer's recommended methods is acceptable.
- B. Certification of equipment calibration by the CQC testing personnel is to be submitted to Ecology's Representative a minimum of ten (10) calendar days prior to use for this project.
- C. Should significant variance in test data or measurements occur, and there is reason to believe that it may be attributed to the equipment rather than to the material or test procedures, re-calibration will be required, and subsequent documentation of satisfactory calibration activities will be submitted.
- D. Documentation is required for all re-calibration efforts performed on equipment used for this project.
- E. Ecology's Representative may inspect both the sampling and testing procedures prior to implementation for this work. The testing laboratory (including and equipment and personnel) should be fully operational and available for inspection at least 48 hours (two working days) prior to utilization for on-site quality control testing support.

3.2 EXAMINATION

- A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent Work. Beginning new Work means acceptance of existing conditions.
- B. Verify that existing substrate is capable of structural support or attachment of new Work being applied or attached.
- C. Examine and verify specific conditions described in individual specification sections.
- D. Immediately notify Ecology's Representative of discrepancies or unacceptable site conditions prior to commencing with new Work.

3.3 PREPARATION

- A. Prepare substrate surfaces prior to applying next material or substance.
- B. Apply manufacturer required or recommended materials prior to applying any new material or substance in contact or bond.

3.4 PROTECTION

- A. Protect completed work elements from damage during ongoing construction operations.
- B. Protect completed work from sediment, debris, or other materials found on-site.
- C. Store and handle products in accordance with the manufacturer’s instructions.

3.5 INSPECTIONS

- A. Provide inspections of Work as specified in the Technical Specifications.

3.6 TESTING

- A. Provide testing of Work as specified.
- B. A Summary of tests and responsibilities follows in Table A.

Table A. Summary of conformance sample and test requirements.

Work Element	Spec. Sect.	Key Property	Sample/ Test	Sampling Plan/ Frequency	Standard Test Method
Site Earthwork					
Topsoil	02200	Gradation	CT/COR	1/source	ASTM D422
		Organics, nitrogen screen, micro-macro nutrients	CT/PE/COR	1/source	Western States ASTM D5268 ASTM D4972
			CT/PE/COR	1/source	
		pH	CT/PE/COR	1/source	ASTM D1557
Geotextile Fabric and Coir Materials	02200	Grab tensile strength	CT/MFR	1/source	ASTM D4632
Trail and Chevron Cap Materials	02200	Gradation	CT/COR	1/source	ASTM D422

* Responsibility for sampling/testing:

- CT - Contractors personnel (CQC activity)
- PE - Sampling and testing under direction & certification of Registered Professional Engineer (CQC activity)
- COR - Sampling, testing, measuring and/or data performed by Ecology’s Representative (QA activity)
- MFR - Manufacturer

END OF SECTION



SECTION 01450: CONSTRUCTION SURVEY

1 PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Control points.
- B. Construction staking.
- C. As-built survey.

1.2 REFERENCE STANDARDS

- A. Revised Code of Washington Chapter 58.09 RCW: Survey Recording Act [1973 c50 §1].
- B. Revised Code of Washington Chapter 58.20.120 RCW: Washington Coordinate System [1989 c54 §9].
- C. Datum: State Plane coordinates based on Washington State Department of Transportation Highway Monuments GP32090-52 and GP32090-53 NAD 1983/91 Washington North Zone. Vertical NAVD 88 Orthometric Heights based on WSDOT Highway Monuments GP32090-49 and GP32090-53 and GP32090-52 longitude and latitude NAD 83/91.
- D. Coordinates: Horizontal and vertical coordinates shall be in feet.

1.3 RELATED SECTIONS

- A. Section 01300 - Submittals.
- B. Section 02200 - Earthwork.

1.4 QUALIFICATIONS

- A. All surveys must be performed by or under the direct supervision of a Professional Land Surveyor, currently registered by Washington State Department of Licensing, Board of Registration for Professional Engineers and Land Surveyors.
- B. All surveys must be performed within the National Map Accuracy Standards of accuracy when related to the control survey data upon which it is based.

1.5 MEASUREMENT AND PAYMENT

- A. Construction Survey: Section 01450 - Construction Survey is considered incidental and included in other work; no separate payment will be made. Work includes all survey activities for the Island Complex site, including but not limited to: provision of suitable equipment, materials and personnel to provide establishment of permanent horizontal and vertical control for the site from established benchmarks, cross section staking, and layout of primary project elements.

1.6 SUBMITTALS

- A. Construction Staking: Provide one reproducible copy of construction staking locations bearing seal of the Professional Land Surveyor in responsible charge.
- B. As-built Survey: Provide one reproducible copy of topographic survey of the project area after construction has been completed bearing seal of the Professional Land Surveyor in responsible charge.

2 PART 2 PRODUCTS

2.1 MATERIALS

- A. Use materials and equipment suitable for satisfactory completion of the Work.

3 PART 3 EXECUTION

3.1 CONTROL POINTS

- A. Control Points: Locate survey control points as indicated on the site topographic survey available at www.ridolfi.com/spokaneriver.
- B. Notify Ecology's Representative if the control points indicated in plans are not found in the field.

3.2 CONSTRUCTION STAKING

- A. From established survey controls as shown on the survey, provide construction staking of corners, centerlines, limits of capping, edge of trails to be capped, limits and other critical points as necessary to commence with Work within this Contract. Incidental location adjustments, as directed by Washington Department of Ecology's Representative, may be required based on site-specific conditions.
- B. Contractor is responsible for maintaining construction staking throughout project duration. Re-establishment of disturbed stakes, or re-survey of site control due to disturbed site survey stakes, are both incidental to construction staking.

3.3 AS-BUILT SURVEY

- A. From established survey control as shown on the drawings, conduct a topographic survey of the project area after construction is complete. Survey shall include locations of capped areas, trails, irrigation system and other physical features installed during the construction effort.
- B. Collect sufficient survey data to accurately represent the project area.
- C. Generate one-foot contours throughout the site and show breaks in slope and other notable features.

3.4 FORMAT FOR DELIVERABLES

- A. Digital Survey data for the as-built survey should include:
 - 1. Copy of field notes and sketches of the survey.
 - 2. Hard copy description of layers.
 - 3. Signed and sealed hard copy base map and contour plot.
 - 4. Provide digital information on compact disk with hardcopy printout; information should be provided in .DWG format (AutoCAD 2005 or earlier). Data should be provided in 3D format (northing, easting, elevation, or Y,X,Z).
 - 5. Drawing scale: Minimum one (1) inch = fifty (50) feet.
 - 6. Preferred layering:
 - a. Repetitive symbols made into blocks, and defined on layer 0.
 - b. All entities shall be drawn “by layer” as opposed to individual properties.
 - c. Use one line type and one color per layer as opposed to numerous colors/linetypes on a single layer.
 - d. Preface each layer with the initials of the Survey company (example, Survey Company: SC “layername”).
 - e. Database text annotation will be coordinated so the text will be right-reading.
 - f. Place text on separate layers.

END OF SECTION

SECTION 01500: CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

1 PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Worker health and safety.
- B. Site safety.
- C. Temporary Utilities.
- D. Temporary Controls.
- E. Construction Facilities.

1.2 REFERENCES AND STANDARDS

- A. Hazardous Waste Operations and Emergency Response (29 CFR 1910.120).
- B. "Safety and Health Regulations for Construction" promulgated by Secretary of Labor under Section 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C. 327 et seq.) as currently amended.
- C. Hazardous Waste Operations: Chapter 296-843, Washington Administrative Code.

1.3 RELATED SECTIONS

- A. Section 01300 - Submittals.
- B. Section 01700 - Contract Closeout.

1.4 SUBMITTALS

- A. Contractor is to provide Ecology's Representative with two (2) copies of site Health and Safety Plan (HASP) a minimum of 14 days prior to commencing with Work. One copy of this plan is to be available on-site at all times.

1.5 WORKER HEALTH AND SAFETY

- A. Soil sampling conducted at the site indicates the presence of heavy metals, including arsenic, cadmium, lead and zinc. A summary of soil metals concentrations is available at www.ridolfi.com/spokaneriver.

- B. Site workers must have OSHA 1910.120 (40-hour HAZWOPER) training and the HASP must have procedures to maintain worker safety in the presence of metals-contaminated soil.
- C. Contractor is to provide and maintain appropriate personnel protection equipment for employee use during operations on-site.
- D. Keep additional personnel protection equipment on hand for use by visitors to the site.
- E. Contractor is to provide documentation that employees working on-site have read the Health and Safety Plan for the site.
- F. Provide Ecology's Representative with two copies of any subsequent changes to the Health & Safety Plan.

1.6 SITE SAFETY

- A. The Contractor will use high visibility fencing, barricades and/or signage to prevent the public from entering Work areas, including but not limited to: stockpiles, equipment, partially completed work and active construction areas.
- B. The Contractor shall not require any employee to work under conditions that are unsanitary, hazardous, or dangerous to the employee's health or safety, as determined under "Safety and Health Regulations for Construction" promulgated by the Secretary of Labor under Section 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C. 327 et seq.), as amended.
- C. The Contractor shall fully comply with "Safety and Health Regulations for Construction" promulgated by the Secretary of Labor, which may be obtained from the Superintendent of Documents, Government Printing Office, Washington D.C. 20402-9325.

1.7 TEMPORARY UTILITIES

- A. Electricity: There is no electrical service at the site.
- B. Water Service: There is no water service at the site. Water required for construction operations and personnel use must be provided by the contractor.
- C. Sanitary Facilities: Provide and maintain required temporary sanitary facilities at time of project mobilization. Maintain in clean and sanitary condition. Upon completion of construction, remove temporary sanitary facilities.

1.8 TEMPORARY CONTROLS

- A. Dust Control:
 - 1. Use dust palliatives, sprinkling, or other measures.
- B. Housekeeping:
 - 1. Provide suitable facilities for cleaning personnel, equipment, and vehicles.
 - 2. Do not allow equipment or personnel vehicles to track soil off-site.

1.9 CONSTRUCTION FACILITIES

- A. Temporary Construction Entrance:
 - 1. Utilize construction equipment that can be accommodated on existing access trail to the site.
 - 2. Provide means of removing mud from vehicle wheels before entering streets consistent with local regulations.
 - 3. Restore access trail to the site prior to completion. *[We may need to add specifics based on access discussions with County Parks]*
- B. Parking:
 - 1. There is a parking lot at the head of the trail leading to the site near Exit 299 on I-90.
- C. Progress Cleaning and Waste Removal:
 - 1. Maintain areas free of waste materials, debris, and rubbish. Maintain site and access areas in a clean and orderly condition.
 - 2. Remove debris and rubbish from the site. Do not bury debris or rubbish.
 - 3. Collect and remove waste materials, debris, and rubbish from site at least weekly and legally dispose off-site.
- D. Removal of Temporary Utilities, Facilities, and Controls:
 - 1. Remove temporary utilities, equipment, facilities, and materials prior to Final Application for Payment inspection.

1.10 MEASUREMENT AND PAYMENT

- A. Work under Section 01500 - Construction Facilities and Temporary Controls is considered part of mobilization / demobilization and will be paid under that line item.

2 PART 2 PRODUCTS

Not Used.

3 PART 3 EXECUTION

Not Used.

END OF SECTION

SECTION 01700: CONTRACT CLOSEOUT

1 PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Closeout procedures.
- B. Final cleaning.
- C. Project record documents.

1.2 RELATED SECTIONS

- A. Section 01500 - Construction Facilities and Temporary Controls.
- B. Section 01400 - Construction Quality Control/Quality Assurance.

1.3 CLOSEOUT PROCEDURES

- A. Final Inspection:
 - 1. The Contractor shall request the scheduling of a final inspection in writing at least 10 calendar days prior to the scheduled completion date. The project shall be in a state in which all Work under the Contract, including modification work, is or will be 100 percent complete prior to inspection by Ecology's team members. Ecology's Representative will either confirm in writing the date of inspection requested or will make arrangements for a mutually acceptable date.
 - 2. If, during this inspection, deficiency items are discovered, those items will be developed into a punch-list and provided to the Contractor for completion within a reasonable specified time frame. A formal "punch list" will be forwarded to the Contractor within seven (7) calendar days with the time frame established for completion of all items. A "back-check" inspection will be conducted to verify all deficient items were completed. If deficiencies are not completed by the Contractor and accepted by Ecology within the time frame established, Ecology may take the necessary steps to complete all outstanding Work items under another source and deduct that amount from the Contract by modification.
 - 3. If after conclusion of the "final inspection" it is determined that the facility is not in a state for "final acceptance," but has a high percentage of the Work complete and the project area is available for the purpose for which it was intended with no omission in essential parts, Ecology's Representative may conclude that the Contract Work is substantially complete. Ecology's Representative will establish by letter the actual substantial completion date (which limits the assessment of liquidated

damages upon the Contractor) and establish a time frame upon which the punch-list items are to be completed.

4. If after the conclusion of the "final inspection" it is determined that the facility is neither in a state for "final acceptance," nor can substantial completion be established within the Contract performance period, the Contractor will be placed on notice that **liquidated damages** will be assessed. Reinspection will take place upon request and assurance by the Contractor that all Work has been completed, per procedures outlined above. The results of the completed inspection will form the basis of requirements for final acceptance.

- B. Reinspection: If the reinspection of deficient or incomplete items becomes necessary, the cost of reinspection will be at the expense of the Contractor.
- C. Provide final submittals to Ecology's Representative that are required by Ecology or other authorities in the condition and within the time frames stated within the Contract Documents.

1.4 FINAL CLEANING

- A. Execute final cleaning prior to final project assessment.
- B. Completely remove waste, surplus materials, rubbish, and construction facilities from the site.

1.5 PROJECT RECORD DOCUMENTS

- A. Maintain on site one set of the following record documents; record actual revisions to the Work:
 1. Drawings
 2. Specifications
 3. Addenda
 4. Change Orders and other modifications to the Contract
 5. Reviewed Product Data and Samples
 6. Manufacturer's instruction for assembly, installation, and adjusting
 7. Quality Control documentation and test results per Section 01400
- B. Ensure entries are complete and accurate, enabling future reference by Ecology's Representative.
- C. Store record documents separate from documents used for construction.
- D. Record information concurrent with construction progress.

- E. Specifications: Legibly mark and record at each Product section description of actual Products installed, including the following:
 - 1. Manufacturer's name and product model and number.
 - 2. Product substitutions or alternates utilized.
 - 3. Changes made by Addenda and modifications.
- F. Record Drawings: Legibly mark each item to record actual construction including:
 - 1. Field changes of dimension and detail.
 - 2. Details not on original Drawings.
- G. Submit all record documents to Ecology's Representative prior to Final Application for Payment.

1.6 MEASUREMENT AND PAYMENT

- A. There is no separate measurement and payment for the Work under this Section. All labor, materials, tools and equipment necessary to satisfactorily complete the work are considered to be incidental to and included in the prices bid for the various items of work.
- B. Final Payment Request: A release of claims must be submitted before final payment. The final payment request will be rejected and returned to the Contractor if all items required under the Contract have not been completed, submitted, approved, and accepted prior to the receipt of the request, i.e., deficient Work items, record drawings, payrolls, reports, etc.

1.7 FINAL ACCEPTANCE

- A. Final acceptance of the Contract Work occurs when acceptance of all requirements under the Contract have been completed and accepted by Ecology.

2 PART 2 PRODUCTS

Not Used.

3 PART 3 EXECUTION

Not Used.

END OF SECTION

SECTION 02200: EARTHWORK

1 PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Site grading.
- B. Topsoil.
- C. Cap materials.

1.2 RELATED SECTIONS

- A. Section 01300 - Submittals.
- B. Section 01400 - Construction Quality Assurance/Quality Control.
- C. Section 02110 - Site Preparation.

1.3 REFERENCES

- A. ASTM D1556 - Density and Unit Weight of Soil in Place by the Sand-Cone Method.
- B. ASTM D2922 - Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
- C. ASTM D6475 - Test Method for Measuring Mass Per Unit Area of Erosion Control Blankets.
- D. ASTM D5199 - Standard Test Method for Measuring the Nominal Thickness of Geosynthetics.
- E. ASTM D5035 - Test Method for Breaking Strength and Elongation of Textile Fabrics (Strip Method).
- F. ASTM D4632 - Standard Test Method for Grab Breaking Load and Elongation of Geotextiles.
- G. ASTM D3786 - Standard Test Method for Hydraulic Bursting Strength of Textile Fabrics- Diaphragm Strength Tester Method.

- H. ASTM D4833 - Test Method for Index Puncture Resistance of Geotextile, Geomembranes and Related Products.
- I. ASTM D4533 - Standard Test Method for Trapezoid Tearing Strength of Geotextiles.
- J. ASTM D4355 - Standard Test Method for Deterioration of Geotextiles form Exposure to Ultraviolet Light and Water.
- K. ASTM D4751 - Standard Test Method for Determining Apparent Opening Size of a Geotextile.
- L. ASTM D4491 - Standard Test Methods for Water Permeability of Geotextiles by Permittivity.
- M. ASTM D422 - Standard Test Method for Particle-Size Analysis of Soils.
- N. ASTM D4972 - Standard Test Method for pH of Soils.

1.4 DEFINITIONS

- A. Topsoil: Natural surface soil possessing characteristics that produce and sustain trees, shrubs, grass, forbs, and other vegetative growth.
- B. Cap Materials: Clean material from commercially available sources that is free of debris, concrete, sod, or clumps.
- C. Compaction: Compaction of soil materials consists of rolling, sprinkling, tamping and otherwise working the soil to achieve the specified Standard Proctor density test results.
- D. Grading: Operations required for smoothing disturbed areas and bringing site grade to lines and grades indicated on the Plans.

1.5 BACKGROUND DATA

- A. A soil investigation has been performed in support of this project to identify the nature and extent of metals-contaminated soil. The Washington Recreational Sites Starr Road and Island Complex- Final Field Sampling Report prepared by U.S. Army Corps of Engineers, January 7, 2005 and the Spokane River Shoreline Site at Murray Road- Sampling and Testing Report, prepared by Washington Department of Ecology, December 2006 are available for review at www.ridolfi.com/spokaneriver.

1.6 REGULATORY REQUIREMENTS

- A. Work performed under this Contract shall comply with OSHA requirements in 29 CFR 1910 and 29 CFR 1926, especially OSHA's Hazardous Waste Operations and Emergency Response Standard 29 CFR 1926.65/29 CFR 1910.120 and state specific OSHA requirements where applicable.
- B. Interpretation of standards shall be submitted to the appropriate agency for resolution prior to commencing with the Work.
- C. Where requirements of this specification, applicable laws, criteria, ordinances, regulations and referenced vary, the most stringent requirements shall apply.

1.7 PROTECTION

- A. Protect trees, shrubs, ground cover, and other features to remain. Limited vegetation removal may be necessary to construct the coir lift. Field consultation with Ecology's representative will be necessary to determine specific plant species to be protected and extent of protection. Specific coir lift anchoring and locations will be field determined in consultation with Ecology's representative in order to maximize existing plant protection. See design Plans for more information on plant protection.
- B. Protect bench marks, site control, and access trail to remain.
- C. Construction activity must be limited to the specific remedial areas specified in the design. Access to these areas and material/equipment staging must occur within the dry river channels. Restore all disturbed areas not designated for improvements. Areas excluded from all construction activity will generally include all upland areas with the exception of the trail.
- D. Provide dust control measures adequate to satisfy regulatory standards.

1.8 SUBMITTALS

- A. Provide Ecology's Representative with duplicates of all samples as outlined in Section 01400 - Construction Quality Control/Quality Assurance.
- B. Mechanical Analysis: Provide one per material type or change in material, in accordance with ASTM D422.
- C. Topsoil: Provide Ecology's Representative with topsoil source location information and copies of agricultural laboratory Western States' Standard Fertility Screen test results indicating suitability of material as topsoil.

1. Provide 1 test minimum per topsoil source. Analyze to ascertain percentage of nitrogen (nitrate, ammonia and Kjeldahl), phosphorus, potash, calcium, boron, manganese, and zinc soluble salts, organic matter content, textural class; and pH value. Measure soil pH in accordance with ASTM D4972.
 2. Submit minimum 1-gallon bag sample of proposed topsoil material to Ecology's Representative.
 3. Field moisture and laboratory moisture results.
- D. Moisture/Density - Provide Ecology's Representative with moisture/density test results for all field and laboratory tests.
- E. A sample of the coir material and manufacturer specifications, which meet the following specifications, shall be provided to Ecology's representative a minimum of 14 days prior to installation. Material must be approved before installation can proceed.
- F. A sample of the trail enhancement geotextile fabric and manufacturer specifications, which meet the following specifications, shall be provided to Ecology's representative a minimum of 14 days prior to installation. Material must be approved before installation can proceed.
- G. A representative wooden stake to be used for securing coir fabric shall be provided to Ecology's representative a minimum of 14 days prior to installation. Stake material must be approved before installation can proceed.

1.9 MEASUREMENT AND PAYMENT

- A. Topsoil: Measurement is by the cubic yard of actual quantity of material delivered and placed. Includes testing, supply and delivery of suitable topsoil materials, stockpiling, scarifying substrate surface, placing where required, light compaction and ripping of over compacted areas. Payment is by the unit price per cubic yard bid for topsoil.
- B. Cap Materials: Measurement is by the ton of actual quantity of material delivered and placed. Cap material will be measured by the ton in the haul vehicle at the point of delivery or as set forth by the load ticket. Includes Cap Material testing, on-site stockpiling as necessary, loading, haul, placement and compaction. Payment is by the unit price per ton bid for Cap Material.

2 PART 2 PRODUCTS

2.1 TOPSOIL

A. Use imported topsoil consisting of a fertile friable well-drained sandy loam suitable for the growth of plants. Use topsoil free from subsoil, clay, brush, noxious weeds, rocks and dirt clods larger than 1 inch in diameter, and free from materials that would be toxic or harmful to growth. Provide topsoil conforming to the following requirements:

1. Provide topsoil with a grading analysis per ASTM D422 as follows:

Sieve Size	Percent Passing by Weight
1/2"	100
No. 4	97-100
No. 10	85-95
No. 30	65-80
No. 50	30-50
No. 100	20-40
No. 200	10-30

- 2. The minimum and maximum pH values shall be 6 and 8, respectively as measured by ASTM D4972.
- 3. Provide topsoil containing a minimum of 10 percent and a maximum of 20 percent organic matter as determined by loss on ignition of samples.
- 4. Prior to stripping, topsoil shall have demonstrated that it is of good quality and reasonably free draining, by the occurrence upon it of healthy crops, grass, or other plant growth.

2.2 CAP MATERIALS: ISLAND COMPLEX

- A. Obtain suitable cap materials that meet the specification requirements from off-site areas as approved by Ecology’s Representative.
- B. Provide cap material that is free of trash, vegetation, corrosive, organic or decomposable material, or metals in excess of background concentrations.
- C. Cap materials shall consist of granular material, either naturally occurring or processed. It shall be essentially free from wood waste or other extraneous or objectionable materials.
- D. The maximum particle size shall not exceed 2/3 of the depth of the layer being placed.

- E. Trail cap materials shall meet the following requirements for grading and quality when placed in hauling vehicles for delivery to the site or during manufacture and placement into a temporary stockpile. The exact point of acceptance will be determined by Ecology’s representative.

Trail Cap Material 3/8-inch minus crushed gravel	
Sieve Size	Percent Passing by Weight
3/8 inch	100
No. 4	44-66
No. 40	8-24
No. 200	10 max.

- F. Gravel for chevron cap shall consist of naturally occurring rounded granular material consistent in appearance with materials located at the project site. It shall be free from various types of wood waste or other extraneous or objectionable materials. It shall have such characteristics of size and shape that it will compact and shall meet the following specifications for grading and quality:

Chevron Cap Material 1-inch minus	
Sieve Size	Percent Passing by Weight
1-inch	100
5/8-inch	75-100
1/2-inch	50-100
No. 4	20-80
No. 40	3-24
No. 200	10 max.

- G. Material for chevron cap shall be screened 3-inch minus natural, rounded rock with less than 10% fine material:

Chevron Cap Material 3-inch minus	
Sieve Size	Percent Passing by Weight
3-inch	100-60
2-inch	80-45
1-inch	65-30
1/2-inch	50-25
No. 4	35-15
No. 10	25-10
No. 40	10-0
No. 200	5-0

- H. Angular quarry spall for chevron cap shall be hard, sound, durable, light-colored granitic rock. It shall be free from fracture, seams, cracks, and other discontinuities tending to adversely impact its resistance to weathering. Quarry spalls shall meet the following gradation requirements:

Chevron Cap Material 4- to 6-inch angular quarry spall	
Sieve Size	Percent Passing by Weight
6-inch	100
4-inch	40 max.
2-inch	5 max.

- I. Obtain suitable cap materials that meet the specification requirements from off-site areas as approved by Ecology’s Representative.
- J. Provide cap material that is free of trash, vegetation, corrosive, organic or decomposable material, or metals in excess of background concentrations.
- K. Coir Fabric Lift Material:
 1. Provide 100% fabric with a 100% coconut fiber matrix with functional longevity of a minimum of 24 months.
 2. The fabric shall be of consistent thickness with the coconut fiber evenly distributed over the entire area of the blanket. The blanket shall be covered on the top, bottom and sides with 100% biodegradable woven, natural, organic fiber netting.
 3. The top netting shall consist of machine directional strands formed from two intertwined yarns with cross directional strands interwoven through the twisted machine strands (commonly referred to as a Leno weave) to form an approximate 0.50 x 1.00 inch mesh. The blanket shall be sewn together on 1.50 inch centers with biodegradable thread. Do not use coir fabric that contains nylon or plastic materials.
 4. Provide coir fabric materials that meet the minimum average roll values (MARVs) specified in the following table.

Physical Properties for Coir Fabric Material			
PROPERTY	TEST VALUE		TEST METHOD
	Greater than	Less than	
Mass/Unit Area, (oz/SY)	8	-	ASTM D6475
Thickness (inches)	0.25	-	ASTM D5199
Resiliency (percent)	75%	-	*ECTC Guidelines
Recommended Flow Velocity (fps)		10 fps	Manufacturer
Swell (percent)		40%	ECTC Guidelines
Water Absorption (percent)	125%		
Machine Direction Tensile Strength (lbs/ft)	340		ASTM D5035
Machine Direction Elongation (percent)		7.60%	ASTM D5035
Transverse Direction Tensile Strength (lbs/ft)	200		ASTM D5035
Transverse Direction Elongation (percent)		11.10%	ASTM D5035
Manning's "n" Factor	0.014	.022	Manufacturer
Permissible Shear Stress, (lbs/sq.ft)	3.0	-	Manufacturer

*ECTC- Erosion Control Technology Council

- L. Trail Enhancement Geotextile Fabric:
 1. Provide woven or non-woven geotextile fabric which meet or exceed the following performance or physical specifications:

Physical Properties for Trail Enhancement Geotextile Fabric Material		
PROPERTY	TEST VALUE	TEST METHOD
Grab Tensile Strength (lb)	115	ASTM D4632
Grab Tensile Elongation (%)	50	ASTM D4632
Mullen Burst (psi)	230	ASTM D3786
Puncture (lb)	70	ASTM D4833
Trapezoidal Tear (lb)	50	ASTM D4533
UV Resistance (% @ 500 hours)	70%	ASTM D4355
Apparent Opening Size (US Sieve)	70	ASTM D4751
Permittivity(sec ⁻¹)	1.8	ASTM D4491
Flow Rate (gal/min/ft ²)	130	ASTM D4491

- M. Wood stakes:
 1. Provide clean soft wood stakes for installation of erosion mat in accordance with manufacturers installation instructions.
 2. Manufactured biodegradable soft wood stakes providing the necessary stake cross-section may be substituted for erosion mat material anchorage.
 3. Stakes are to be a minimum of 1' in length.

2.3 CAP MATERIALS: MURRAY ROAD SITE

- A. Obtain suitable cap materials that meet the specification requirements from off-site areas as approved by Ecology’s Representative.
- B. Provide cap material that is free of trash, vegetation, corrosive, organic or decomposable material, or metals in excess of background concentrations.
- C. Cap materials shall consist of granular material, either naturally occurring or processed. It shall be essentially free from various types of wood waste or other extraneous or objectionable materials.
- D. The maximum particle size shall not exceed 2/3 of the depth of the layer being placed.
- E. Cap material designated in Drawings as “Cap A- Gravel Mix” shall conform to the following gradation requirements:

Murray Road “Cap A- Gravel Mix”	
Sieve Size	Percent Passing by Weight
3-inch	100
2-inch	100-85
1-inch	95-60
1/2-inch	85-50
No. 4	60-30
No. 10	45-20
No. 40	15-5
No. 200	5-0

- F. Cap material designated in Drawings as “Cap B- Upland Mix” shall conform to the following gradation:

Murray Road “Cap B- Upland Mix”	
Sieve Size	Percent Passing by Weight
3-inch	100-60
2-inch	80-45
1-inch	65-30
1/2-inch	50-25
No. 4	35-15
No. 10	25-10
No. 40	10-0
No. 200	5-0

- G. Cap material designated in Drawings as “Cap C- Dual Layer Cap” consists of a one-foot layer of Cap B as specified above, topped with 6-inches of topsoil as specified below:
1. Use imported topsoil consisting of a fertile friable well-drained sandy loam suitable for the growth of plants. Use topsoil free from subsoil, clay, brush, noxious weeds, rocks and dirt clods larger than 1 inch in diameter, and free from materials that would be toxic or harmful to growth. Provide topsoil conforming to the following requirements.
 2. Provide topsoil with a grading analysis per ASTM D422 as follows:

Murray Road “Cap C- Dual Layer Cap” TOPSOIL COMPONENT	
Sieve Size	Percent Passing by Weight
½”	100
No. 4	97-100
No. 10	85-95
No. 30	65-80
No. 50	30-50
No. 100	20-40
No. 200	10-30

- a. The minimum and maximum pH values shall be 6 and 8, respectively as measured by ASTM D4972.
 - b. Provide topsoil containing a minimum of 10 percent and a maximum of 20 percent organic matter as determined by loss on ignition of samples.
 - c. Prior to stripping, topsoil shall have demonstrated that it is of good quality and reasonably free draining, by the occurrence upon it of healthy crops, grass, or other plant growth.
- H. Trail Enhancement Boulders:
1. Boulders provided for the Trail Enhancement Area shall be hard, sound, durable, light-colored granitic rock. They shall be free from fracture, seams, cracks, and other discontinuities tending to adversely impact its resistance to weathering. Boulders shall be a minimum “two-man rock” weighing (400-600 lbs, 18” to 28” in average dimension).
- I. Trail Enhancement Geotextile Fabric:
1. Provide woven or non-woven geotextile fabric which meet or exceed the following performance or physical specifications:

Physical Properties for Trail Enhancement Geotextile Fabric Material		
PROPERTY	TEST VALUE	TEST METHOD
Grab Tensile Strength (lb)	115	ASTM D4632
Grab Tensile Elongation (%)	50	ASTM D4632
Mullen Burst (psi)	230	ASTM D3786
Puncture (lb)	70	ASTM D4833
Trapezoidal Tear (lb)	50	ASTM D4533
UV Resistance (% @ 500 hours)	70%	ASTM D4355
Apparent Opening Size (US Sieve)	70	ASTM D4751
Permittivity(sec ⁻¹)	1.8	ASTM D4491
Flow Rate (gal/min/ft ²)	130	ASTM D4491

2.4 WATER

- A. Provide clean potable water, free from deleterious substances, trash and vegetation.

2.5 EQUIPMENT

- A. Provide equipment of suitable size, weight and traction necessary to perform the Work specified herein and that can access the site via the existing trail from the parking area and traverse the dry gravel/cobble river channel.

3 PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify site conditions under provisions of Section 02110 - Site Preparation.
- B. Verify that survey benchmarks, control elevations and intended elevations for the Work are as indicated.
- C. Notify Ecology's Representative immediately of discrepancies between survey information and information in Drawings, should any such discrepancies be identified. Under this circumstance, commence with earthwork operations only as directed by Ecology's Representative.

3.2 PREPARATION

- A. Identify required lines, levels, contours, and datum.
- B. Protect benchmarks, survey control points and other features from excavating equipment and vehicular traffic.

3.3 STOCKPILING

- A. Stockpile clean materials on liners in non-vegetated areas that are convenient to work-in-progress. Verify location selection with Ecology's Representative.
- B. Stockpile in sufficient quantities to meet project schedule and requirements.
- C. Separate differing materials with dividers or stockpile apart to prevent mixing.
- D. Direct surface water away from stockpile site to prevent erosion or deterioration of materials.
- E. Cover stockpiles to prevent wind-erosion.
- F. Do not stockpile topsoil greater than 8-feet in height nor for a time period of greater than 1 month.
- G. Upon project completion, remove excess stockpile material and liners, leave area in a clean and neat condition.

3.4 CAP PLACEMENT AND COMPACTION

- A. Place cap materials in six-inch lifts. Uniformly operate hauling and spreading equipment over the full width of each lift to prevent differential compaction.
- B. Complete compaction of all lifts of each cap material before placing next layer.
- C. Feather cap, material to existing river bed grade in chevron area.
- D. Trail cap to be compacted to a minimum of approximately 90% standard Proctor density. Ecology's Representative will field verify compaction and determine if testing is required. If testing is required, the in-place density of the cohesion-less materials shall be determined in accordance with ASTM D1556 or ASTM D2922.
- E. Trail enhancement geotextile fabric shall be protected against damage during storage and installation. Damaged materials are not to be used in constructing trail enhancement.

3.5 TOPSOIL PLACEMENT, COMPACTION

- A. Avoid topsoil placement and compaction during heavy rain.

- B. Install and attach coir fabric to minimize disturbance to existing vegetation as field directed by Ecology's representative.
- C. Place topsoil in maximum of 6-inch lifts within coir fabric and lightly compact between lifts. Do not compact upper lift of topsoil.
- D. Thoroughly water final surface after placement to consolidate topsoil. Do not over water to create rills and gullies from runoff water.

3.6 TOLERANCES

- A. Provide a final grade that is plus or minus 0.20 foot from required elevation.

3.7 QUALITY CONTROL

- A. Section 1400 - Quality Control: Field inspection and testing.
- B. Topsoil Material Testing:
 - 1. Gradation in accordance with ASTM D422, 1 per material source.
 - 2. Standard Agricultural Fertility Screen: 1 per material source.
 - 3. pH in accordance with ASTM D4972; 1 per material source.
- C. If tests indicate that the Work does not meet specified requirements, remove Work, replace and retest. Coordinate any retesting with Ecology's Representative.
- D. Provide duplicate samples to Ecology's Representative for CQA testing as outlined in Section 01400.

END OF SECTION

SECTION 02374: EROSION CONTROL

1 PART 1 GENERAL

1.1 SUMMARY

- A. Related Sections:
1. Section 02200 - Earthwork

1.2 REFERENCES

- A. ASTM International:
1. ASTM D4632 - Standard Test Method for Grab Breaking Load and Elongation of Geotextiles.
 2. ASTM D3786 - Standard Test Method for Hydraulic Bursting Strength of Textile Fabrics.
 3. ASTM D4833 - Standard Test Method for Hydraulic Bursting Strength of Textile Fabrics.
 4. ASTM D4533 - Standard Test Method for Trapezoid Tearing Strength of Geotextiles.
 5. ASTM D4355 - Standard Test Method for Trapezoid Tearing Strength of Geotextiles.
 6. ASTM D4751 - Standard Test Method for Determining Apparent Opening Size of a Geotextile.
 7. ASTM D4491 - Standard Test Methods for Water Permeability of Geotextiles by Permittivity.

1.3 SUBMITTALS

- A. Section 01300 - Submittals: Requirements for submittals.
- B. Erosion and Sedimentation Control Plan and maintain one copy of document on site.
- C. A sample of the silt fence geotextile material and manufacturer specifications, which meet the following specifications, shall be provided to Ecology's representative a minimum of 10 days prior to installation. Material must be approved before installation can proceed.

2 PART 2 PRODUCTS

2.1 GEOTEXTILE MATERIALS

- A. Provide woven or non-woven geotextile silt fence material which meets or exceeds the following performance or physical specifications:

Physical Properties for Silt Fence Geotextile Material		
PROPERTY	TEST VALUE	TEST METHOD
Grab Tensile Strength (lb)	124 lbs	ASTM D4632
Grab Tensile Elongation (%)	20%	ASTM D4632
Mullen Burst (psi)	300	ASTM D3786
Puncture (lb)	65	ASTM D4833
Trapezoidal Tear (lb)	65	ASTM D4533
UV Resistance (% @ 500 hours)	80%	ASTM D4355
Apparent Opening Size (US Sieve)	30	ASTM D4751
Permittivity(sec-1)	0.1	ASTM D4491
Flow Rate (gal/min/ft ²)	8	ASTM D4491

2.2 SITE STABILIZATION

- A. Incorporate erosion control devices indicated on the Plans into the Project at the earliest practicable time.
- D. Construct, stabilize and activate erosion controls before site disturbance within tributary areas of those controls.
- E. Stockpile and waste pile heights shall not exceed 8 feet. Slope stockpile sides at 2: 1 or flatter.
- F. Stabilize any disturbed area of affected erosion control devices on which activity has ceased and which will remain exposed for more than 20 days.
 - 1. Stabilize disturbed areas which are either at finished grade or will not be disturbed within one year in accordance with Section 02924 permanent seeding specifications.
- G. Stabilize diversion channels, sediment traps, and stockpiles immediately.

2.3 FIELD QUALITY CONTROL

- A. Inspect erosion control devices on a weekly basis and after each runoff event.
- B. When inspection indicates erosion control devices are not effective, make necessary repairs to ensure controls are in good working order.

2.4 PROTECTION

- A. Section 02200 - Earthwork Requirements: Requirements for protecting finished Work.

END OF SECTION

SECTION 02924: HYDROSEEDING (MURRAY ROAD ONLY)

1 PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Fertilizing
 - 2. Seeding
 - 3. Hydroseeding
 - 4. Mulching
 - 5. Maintenance
- B. Related Sections:
 - 1. Section 02200 - Earthwork
 - 2. Section 02811 - Landscape Irrigation

1.2 REFERENCES

- A. ASTM International:
 - 1. ASTM C602 - Standard Specification for Agricultural Liming Materials.

1.3 DEFINITIONS

- A. Weeds: Vegetative species other than specified species to be established in given area.

1.4 SUBMITTALS

- A. Section 01300 - Submittal Procedures: Requirements for submittals.
- B. Product Data: Submit data for seed mix, fertilizer, mulch, and other accessories.
- C. Manufacturer's Certificate: Certify Products specified requirements.

1.5 CLOSEOUT SUBMITTALS

- A. Section 01700 - Contract Closeout: Requirements for submittals.

1.6 QUALITY ASSURANCE

- A. Grasses, legumes, or cover crop seed of the type specified shall conform to the Standards for "Certified" grade seed or better as outlined by the State of Washington Department of Agriculture "Rules for Seed Certification," latest edition. Seed shall be furnished in standard containers on which shall be shown the following information:



1. Common and botanical names of seed.
2. Lot number.
3. Net weight.
4. Percentage of purity.
5. Percentage of germination (in case of legumes percentage of germination to include hard seed), and percentage of weed seed content and inert material clearly marked for each kind of seed in accordance with applicable State and Federal laws. Upon request, the Contractor shall furnish to Ecology's representative duplicate copies of a statement signed by the vendor certifying that each lot of seed has been tested by a recognized seed testing laboratory within six months before the date of delivery on the project. Seed that has become wet, moldy, or otherwise damaged in transit or storage will not be accepted.

1.7 QUALIFICATIONS

- A. Seed Supplier: Company specializing in manufacturing Products specified in this section with minimum three years experience. All seed installers must have a business license issued by the Washington State Department of Licensing with a "seed dealer" endorsement. Upon request, the contractor shall furnish the Engineer with copies of the applicable licenses and endorsements.
- B. Installer: Company specializing in performing work of this section with minimum three years documented experience and/or approved by manufacturer.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver grass seed mixture in sealed containers. Seed in damaged packaging is not acceptable.
- B. Deliver fertilizer in waterproof bags showing weight, chemical analysis, and name of manufacturer.

2 PART 2 PRODUCTS

2.1 SEED MIXTURE

- A. Furnish materials in accordance with State of Washington Department of Transportation standards.



B. Seed Mixture:

Grass Species	Pounds Pure Live Seed (PLS) per acre
Bluebunch Wheatgrass	7.55
Sandberg Bluegrass	1.38
Thickspike Wheatgrass	4.86
Sand dropseed	0.10
Crested Wheatgrass	2.08
Total Lbs PLS/Acre (Drill Seed)	16.00
Total Lbs PLS/Acre (Hydroseed)	25.00

2.2 ACCESSORIES

- A. Mulching Material: Oat or wheat straw, free from weeds, foreign matter detrimental to plant life, and dry. Hay or chopped cornstalks are not acceptable.
- B. Fertilizer shall be supplied in one of the following forms:
 - 1. A dry free-flowing granular fertilizer, suitable for application by agricultural fertilizer spreader.
 - 2. A soluble form that will permit complete suspension of insoluble particles in water, suitable for application by power sprayer.
 - 3. A homogeneous pellet, suitable for application through a ferti-blast gun.
 - 4. A tablet or other form of controlled release with a minimum of a 6 month release period.
- C. Lime: ASTM C602, Class T agricultural limestone containing a minimum 80 percent calcium carbonate equivalent.
- D. Tackifier: Tackifiers used as a tie-down for seed and mulch shall be applied in quantities sufficient to equal the retention properties of guar when applied at the rate of 60 pounds per acre for slopes less than 2:1 and 120 pounds per acre for slopes greater than 2:1. Tackifier shall contain no growth or germination inhibiting materials nor significantly reduce infiltration rates. Tackifier shall hydrate in water and readily blend with other slurry materials. Tackifier options include:
 - 1. Type A - Organic tackifier derived from natural organic plant sources.
 - 2. Type B - Synthetic tackifier having an MSDS sheet that demonstrates to the satisfaction of Engineer that the product is not harmful to aquatic life.
- E. Water: Clean, fresh and free of substances or matter capable of inhibiting vigorous growth of grass.

3 PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify existing conditions with Ecology's representative before starting work. Report to Ecology's representative, any discrepancies between Existing conditions described on plans or Specifications before beginning Work.
- B. Verify with Ecology's representative that prepared soil base is ready to receive the Work of this section.

3.2 HYDROSEEDING

- A. Apply fertilizer, mulch, tackifier and seeded slurry with hydraulic seeder at rate that will meet seed mix specifications presented in 4.1 B of this Section. Hydroseed mix must be evenly spread in one pass.
- B. After application, apply water with fine spray immediately after each area has been hydroseeded. Saturate to 4 inches of soil and maintain moisture levels two to four inches.

3.3 SEED PROTECTION

- A. Identify seeded areas with stakes and string or other approved equivalent around area periphery.

END OF SECTION

