Salmon River Habitat Restoration Project

Environmental Assessment and Finding of No Significant Impact

Environmental Assessment Number DOI-BLM-OR-SO40-2010-0002-EA

May 2010

T. 2S, R. 6E, Section 25 and T. 2S, R. 7E, Sections 30 and 31

United States Department of the Interior
Bureau of Land Management, Salem District
Clackamas County, Oregon

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BLM
Salem District

As the Nation's principal conservation agency, the Department of Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering economic use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interest of all people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

FINDING OF NO SIGNIFICANT IMPACT

The Bureau of Land Management (BLM) has conducted an environmental analysis for a proposal to restore aquatic and fisheries habitats on about 3 miles of the lower Salmon River. The project is located on BLM lands in T. 2S, R. 6E, Section 25, and T. 2S, R. 7E, Sections 30 and 31; W.M. in Clackamas County, Oregon. The *Salmon River Habitat Restoration Project Environmental Assessment* (EA) (# DOI-BLM-OR-S040-2010-0002-EA) documents the environmental analysis of the proposed habitat restoration actions. The EA is attached to and incorporated by reference in this Finding of No Significant Impact determination. The EA and FONSI will be made available for public review from May 19, 2010 to June 4, 2010 (*EA section 5.3*).

The analysis in this EA is site-specific and supplements analyses found in the *Salem District Proposed Resource Management Plan/Final Environmental Impact Statement*, September 1994 (RMP/FEIS). The proposed habitat restoration activities have been designed to conform to the *Salem District Record of Decision and Resource Management Plan*, May 1995 (RMP) and related documents which direct and provide the legal framework for management of BLM lands within the Salem District (*EA Section 1.3*). Approximately 240 of these acres are in the Matrix land use allocation (LUA), and 240 acres are in the Riparian Reserve LUA as described in the RMP.

Finding of No Significant Impact

Based upon review of the Salmon River Habitat Restoration Project EA and supporting documents, I have determined that the proposed action is not a major federal action and would not significantly affect the quality of the human environment, individually or cumulatively with other actions in the general area. No environmental effects meet the definition of significance in context or intensity as defined in 40 CFR 1508.27. Therefore, supplemental or additional information to the analysis in the RMP/FEIS in the form of a new environmental impact statement is not needed. This finding is based on the following discussion:

Context [40 CFR 1508.27(a)]***:*** Potential effects resulting from the implementation of the proposed action have been analyzed within the context of the project area boundaries, and the following 6th field watersheds: Lower Salmon River, and Wildcat Creek – Sandy River. This project would affect approximately 1 percent of the 38,838 acre combined 6th field watersheds listed above.

Intensity refers to severity of impact [40 CFR 1508.27(b)]. The following text shows how that the proposed project would not have significant impacts with regard to ten considerations for evaluating intensity, as described in 40 CFR 1508.27(b).

1. [40 CFR 1508.27(b) (1)] – Impacts that may be both beneficial and adverse: The habitat restoration project is unlikely to have significant adverse impacts (*EA section 3.0*) for the following reasons:
    - Project design features described in *EA section 2.2.1* would reduce the risk of effects to affected resources to be within RMP standards and guidelines and to be within the effects described in the RMP/EIS.
    - *Floodplains and Riparian Areas (EA section 3.2):* Effects to this resource are not significant because the proposed action is expected to have beneficial effects on floodplain habitat and the river's ability to access its floodplain.

- *Threatened/Endangered (T&E) Fish Species and Critical Habitat (EA sections 3.3, 5.2.1):* Effects to this resource are not significant because the proposed action would improve Critical Habitat both in the short and long term. Impacts to juvenile T&E fish from increases in turbidity from in-stream work and their displacement from project sites would be both short-term and localized to the project area. Adult T&E fish would not be impacted because restoration work would be conducted during the in-water work period when adult T&E fish are absent from the project reach.
- *Essential Fish Habitat (EA section 3.4):* Effects to this resource are not significant because the proposed action would improve Essential Fish Habitat in the both the short and long-term.
- *Vegetation/Silviculture (EA section 3.5):* Effects to this resource are not significant because source stands used to supply trees for large wood habitat structures would continue to grow trees for future harvest.
- *Soils (EA section 3.6):* Effects to this resource are not significant because no permanent impacts to the soil's physical and biological properties are expected. On temporary access routes to project sites, surface duff layers would be mixed and pulverized into the sandy subsoil by repeated vehicle traffic across the surface, with a slight increase in soil bulk density. Full recovery to pre-disturbance conditions would likely take several years.
- *Water Quality and Channel Function (EA section 3.7):* Effects to this resource are not significant because the proposed action would improve water quality and channel function in the long term. In-channel work would produce short term (periods up to an hour) plumes of turbidity as a result of bed and bank disturbance. The increased turbidity is unlikely to be visible or measurable beyond 800 meters below the site of the disturbance. Turbidity levels would likely decrease as disturbed surfaces (and the channel bed) become "armored" (i.e., fines are removed).
- *Wild and Scenic Rivers/Recreation (EA section 3.8):* Effects to this resource are not significant because there would be no long term impacts to the Scenic Classification of the river, or the Outstandingly Remarkable Values of Scenery and Wildlife. The proposed action would have no effect on recreational river users and their ability to navigate by watercraft through the project area. In the short term (for about one year) the primitive appearance of the reach would be slightly impacted by soil and vegetation disturbance resulting from transport of restoration materials on temporary access routes, and disturbance associated with the construction of habitat structures. Upon project completion, native plant species would be planted where access routes terminate near the river to speed vegetation growth to visually screen the river corridor. Over the long term impacts to primitiveness would by negligible as logs weather and other LW accumulates from upstream reaches and access routes are revegetated.
- *Wildlife (EA section 3.9):* Effects to this resource are not significant because due to the location, nature, timing, and short duration of the activities at the project sites and the 2010 source stands, there would be no adverse effects to spotted owls. Effects to other migratory birds and habitat are expected to be low due to the nature, duration and timing of the project. The project would not be implemented until late summer when the majority of bird species have nested. Effects on Oregon slender salamander due to disturbance of down coarse woody debris and the forest floor are expected to be minimal because the project would be of short duration and would occur during the summer when salamander activity is low.

2. [40 CFR 1508.27(b) (2)] - The degree to which the proposed action affects public health or safety: The proposed project would not adversely affect public health or safety because all actions would follow established safety procedures for operating equipment, minimizing emissions, and avoiding fuel spills (*EA sections, 2.2.1 and 3.10*).

3. [40 CFR 1508.27(b) (3)] - Unique characteristics of the geographic area such as proximity to historic or cultural resources, park lands, prime farmlands, wetlands, wild and scenic rivers, or ecologically critical areas: The proposed project would not affect historical or cultural resources, parklands, prime farmlands, wilderness, or ecologically critical areas because these resources are not located within the project area (*EA Section 3.10*).

4. [40 CFR 1508.27(b) (4)] - The degree to which the effects on the quality of the human environment are likely to be highly controversial: The proposed project is not unique or unusual. The BLM has experience implementing similar actions in similar areas without highly controversial effects.

5. [40 CFR 1508.27(b) (5)] - The degree to which the possible effects on the human environment are highly uncertain or involve unique or unknown risks: The effects associated as a result of the project do not have not uncertain, unique or unknown risks because the BLM has experience implementing similar actions in similar areas without these risks and project design features would minimize the risks associated with the project (*EA section 2.2.1*). See # 4, above.

6. [40 CFR 1508.27(b) (6)] - The degree to which the action may establish a precedent for future actions with significant effects or represents a decision in principle about a future consideration: The proposed action would not establish a precedent for future actions nor would it represent a decision in principle about a further consideration for the following reasons: 1/ The project is in the scope of proposed activities document in the RMP EIS, 2/ the BLM has experience implementing similar actions in similar areas without setting a precedent for future actions or representing a decision about a further consideration. See # 4, 5, above.

7. [40 CFR 1508.27(b) (7)] - Whether the action is related to other actions with individually insignificant but cumulatively significant impacts: The Interdisciplinary Team (IDT) evaluated the project area in context of past, present and reasonably foreseeable actions and determined that there is a potential for cumulative effects on water quality and fisheries. These effects are not expected to be significant for the following reasons:

   The proposed action is expected to cumulatively improve fisheries habitat and water quality in the Salmon River over the long term. The proposed habitat restoration actions in conjunction with past and planned future restoration actions would be expected to improve Critical Habitat for T&E fish species, Essential Habitat for coho salmon and Chinook salmon, and water quality of the Salmon River (*EA Sections 3.3, 3.4, and 3.7*). No adverse cumulative effects are expected as a result of the restoration actions for the following reasons: 1/ Any sediment increase resulting from in-channel work will be of short duration (hours) and largely restricted to the project area, 2/ the limited magnitude (less than 1 percent of the total 6th field watershed sediment supply, an undetectable change) of the likely change in sediment levels resulting from the restoration actions.

Cumulatively, the proposed action and connected actions would be unlikely to result in any short-term detectable change in water quality on a sixth or seventh field watershed scale. (*EA Section 3.7*)

8. [40 CFR 1508.27(b) (8)] - The degree to which the action may adversely affect districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places or may cause loss or destruction of significant scientific, cultural, or historical resources: The project would have no effect on this element because no cultural resources were determined to be present in the proposed project areas. (*EA section 3.10*)

9. [40 CFR 1508.27(b) (9)] - The degree to which the action may adversely affect an endangered or threatened species or its habitat that has been determined to be critical under the Endangered Species Act (ESA) of 1973: The proposed project is not expected to have significant adverse effects to ESA listed species or critical habitat for the following reasons:
   - *ESA Wildlife - Northern spotted owl (EA Section 3.9):* Effects to the species are not significant because: due to the location, nature, duration and timing of this project, no adverse effects to northern spotted owls or their habitat are anticipated (no effect from habitat modification or disturbance). No suitable or dispersal habitat would be removed or downgraded, and the project would not reduce the overall function of any habitat for the spotted owl. The project would have no disturbance effects to the spotted owl because the project would occur mostly outside of the critical nesting season for spotted owls (after July 1), and is not located within disturbance distance of any known spotted owl sites. The project would have no effects on Critical Habitat because the project sites and source stand are not located in Critical Habitat. ESA Consultation is described in *EA section 5.1.1.*
   - *ESA Fish – LCR Chinook salmon, LCR coho salmon, and LCR steelhead trout (EA Section 3.3):* Effects to ESA fish are not significant because adverse impacts of in-channel work required to implement habitat restoration projects would be short term (hours) in duration. Adverse impacts include displacement of juvenile salmonids from near shore habitats and main channel project sites during project construction, and disruption of feeding (unable to see prey items) during short term increases in turbidity (*EA sections 3.3, and 3.7*). No long-term adverse effects of the restoration projects on ESA listed fish or their habitat are expected because turbidity levels would return to background levels soon after cessation of in-water work. Additionally, no sediment is expected to move from access routes to the river long-term because soils are sandy and well-drained (*EA section 3.6*) and the routes would be revegetated upon completion of the project (*EA section 2.2*). Adult ESA fish would not be impacted because restoration work would be conducted during the in-water work period when adult ESA listed fish are absent from the project reach. Habitat quantity and quality for ESA fish would improve over the short to long term as a result of the restoration actions (see *EA sections 3.3 and 3.4*). ESA Consultation is described in *EA section 5.1.2.*

10. [40 CFR 1508.27(b) (10)] - Whether the action threatens a violation of Federal, State, or local law or requirements imposed for the protection of the environment: The proposed thinning activities have been designed to follow Federal, State, and local laws (*EA sections 1.3, 3.10*).

Approved by: Cindy Enstrom 5/17/2010

Cindy Enstrom, Cascades Resource Area Field Manager Date

ENVIRONMENTAL ASSESSMENT

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1.0 INTRODUCTION

Since the mid-1990's the Bureau of Land Management (BLM) has been working cooperatively with multiple local, state, federal, and non-governmental organizations to identify and implement restoration actions in the Sandy River Basin to benefit threatened steelhead trout and salmon populations. This group of cooperating agencies and organizations is referred to as the Sandy River Basin Partners (SRBP; www.sandyriverpartners.org). In 2007, the SRBP completed a hierarchical framework (SRBWG 2007) to guide restoration actions in the Sandy Basin, and in 2008 began implementing the first of many large-scale restoration actions planned for the Salmon River, a major tributary to the Sandy River (USDA 2008). Initial projects primarily focused on restoring river flows and fish access to side channels of the Salmon River that were blocked after the river was diked by the Army Corps of Engineers following flooding in 1964 (USDA 2009, 2008). Juvenile salmon began to use the restored side channel habitats immediately after they were reconnected to Salmon River flows, and adult coho salmon were spawning in the side channels by fall 2009.

In 2009, The Freshwater Trust with the SRBP, contracted with River Design Group Inc. (RDG) to prepare a habitat restoration plan (RDG 2009) for an 11 mile long reach of the lower Salmon River to expand on the initial restoration actions implemented in 2008-2009. In particular, RDG was asked to develop restoration actions which would restore flows to side channels in areas where the river channel appeared to have lost connectivity to its floodplain in response to channel alteration and diking activities implemented after the 1964 flood, add large wood to improve habitat complexity and cover for fish, and to increase the amount of pool habitat in the main channel available for use by threatened salmon and steelhead trout.

In 2010, the SRBP propose to begin implementing the restoration actions identified in the Salmon River Restoration Plan (RDG 2009). The Salmon River Habitat Restoration (SRH Restoration) project would implement restoration actions described in the Salmon River Habitat Restoration Plan within the project area described in EA section 1.1.1 and Map 1. Implementation of the SRH Restoration project is expected to occur from 2010 to 2015. The actions proposed for 2010-2015 implement recommendations made by large river restoration experts with National Marine Fisheries Service (NMFS), U.S. Fish and Wildlife Service (USFWS), and U.S. Forest Service (USFS), who were asked by the SRBP to review the restoration plan in fall 2009.

This EA covers all 2010 to 2015 SRH Restoration project actions with the exception of the acquisition of trees to be used for the habitat structures. This EA only covers tree acquisition for the 2010 project actions. Tree acquisition on 2011-2015 project actions will be analyzed in future environmental analyses.

1.1 Summary of the Proposed Project

The SRH Restoration project includes: 1) restoring riffle-pool-riffle habitat sequences on the lower Salmon River to both increase main channel pool habitat and restore river flows to side channels for use by steelhead trout and salmon; 2) excavating depositional materials (gravel, fine sediment) at the entrance of side channels to restore year-round flows in the channels;

3) constructing log jams to maintain channel scouring at restored pool-riffle sequences and to increase spawning and rearing habitat; 4) placing large wood (logs or trees with attached roots) at existing main channel pools to improve habitat quality and complexity; and 5) placing large wood in side channel habitats to maintain channel openings and provide high quality rearing habitat for listed Chinook salmon, coho salmon, and steelhead trout. Additionally, riparian tree seedlings would be planted on islands between main and side channels to stabilize floodplains and provide long-term supplies of LW to the Salmon River.

1.1.1 Project Area Location

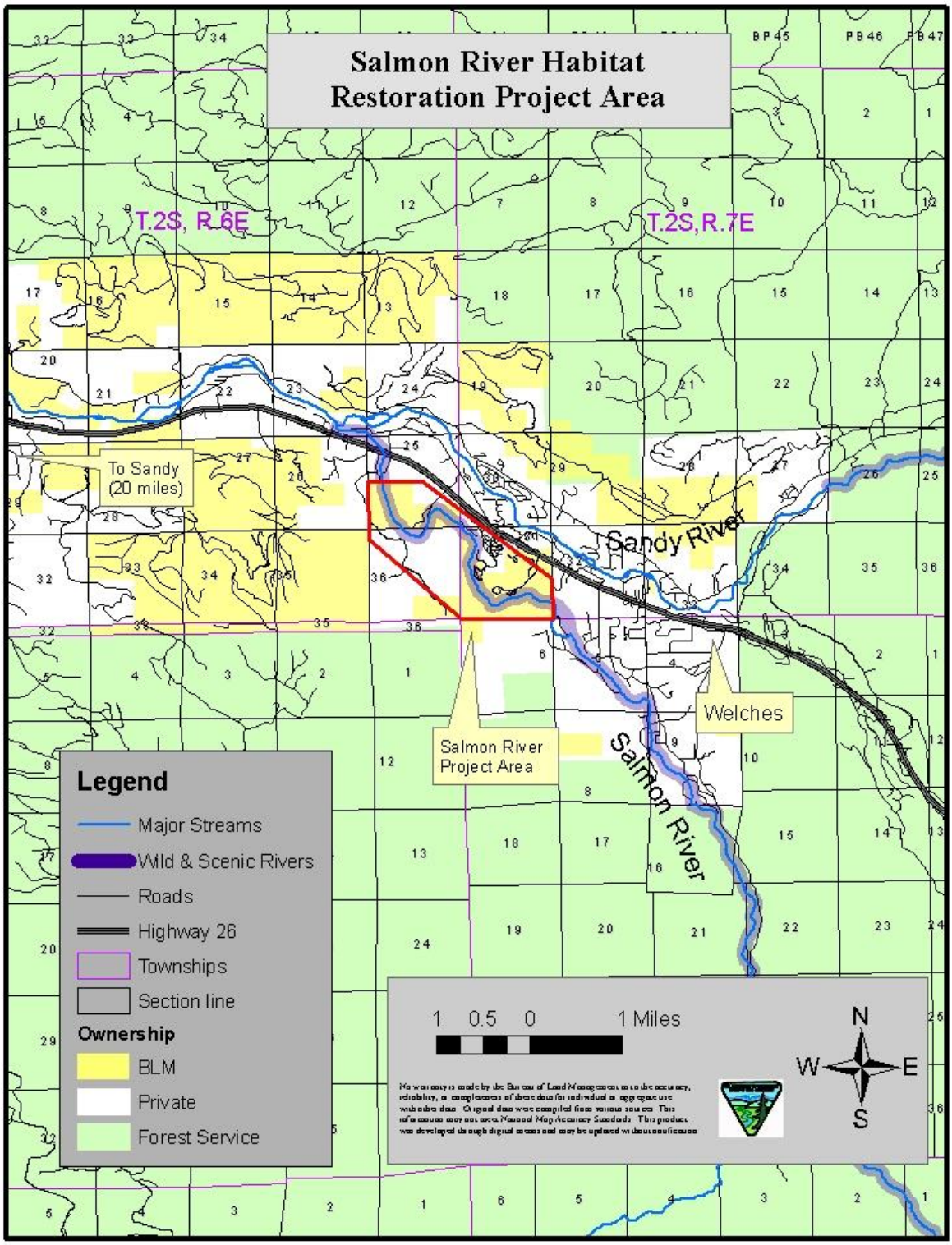
The project is located on BLM lands within Township 2S, Range 6E, Section 25, and Township 2S, Range 7E, Sections 30 and 31, Willamette Meridian; within the Salmon River 5th field watershed, approximately 24 miles east of the City of Sandy, Oregon (Map 1). The project area is located approximately 1 mile upstream of the confluence of Salmon River with the Sandy River starting at approximately river mile (RM) 1 and extends upstream to RM 4 (East boundary of T 2S, R 7E, Section 31). The 2010 tree source area is located on BLM land in T.2S, R.6E, Section 33.

1.2 Purpose of and Need for Action

Lower Columbia River (LCR) spring Chinook salmon, coho salmon, and winter steelhead trout are all listed as threatened under the Endangered Species Act of 1973 (ESA). Winter steelhead trout and coho salmon populations in the Sandy River subbasin of the LCR evolutionary significant unit (ESU) are considered to be at high risk of extinction, whereas the Sandy River spring chinook salmon population has a moderate risk of extinction (McElhany et al. 2007). Salmon and steelhead trout populations in the Lower Columbia River ESU are substantially reproductively isolated from other populations and are an important component in the evolutionary legacy of those species (NOAA 2005).

Threats to salmon and steelhead populations in the Sandy River subbasin (including the Salmon River) include overharvest, and habitat degradation and loss (SRBP 2005). USDA (1995) found pool frequency in the lower reach of the Salmon River was low, and attributed loss of pool habitat in the middle and lower reaches of the watershed to the channelization of the river following large-scale floods in the 1960s and 1970s. In particular, following the flood of 1964, federal, State, and other public and private entities worked cooperatively to straighten and deepen the channel of the lower Salmon River. Substantial habitat diversity and complexity were lost as meanders, oxbows, and side channels were disconnected and large wood (LW) was removed from the channel and floodplain (SRBP 2005). LW amounts continue to be low in the lower Salmon River, and over 50 percent of adjacent riparian areas have low to moderate LW recruitment potential (USDA 1995). The lower to middle reaches of the Salmon River are characterized by channels with a "plane bed" form with little pool or glide habitat (RDG 2009). The channel and resulting fish habitat is degraded because of the combined effects of channelization and diking associated with flood control efforts, and the removal of LW needed for the formation of complex aquatic habitats through channel scouring, pool formation, and gravel retention (RDG 2009, SRBP 2005).

Map 1: Vicinity Map



Restoration of aquatic habitats in the Salmon River is needed to increase production of threatened salmon and steelhead populations and thereby reduce their risk of extinction (McElhany et al. 2007).

The Sandy River Basin Work Group (SRBWG 2007) developed a hierarchical framework (Roni et al. 2002) to guide restoration actions in the Sandy Basin, so that restoration actions would be implemented in a priority sequence to address the habitat factors limiting salmon and steelhead production in the basin. This restoration strategy focuses on maintaining and restoring the remaining, relatively intact riverine habitat (anchor habitats) that currently support a disproportionate share of wild salmon and steelhead in the basin (SRBWG 2007, 2006). Highest priority restoration actions include reconnecting isolated habitats (ie. remove passage barriers, and reconnect side channel habitats), and the restoration of long-term processes (ie. restore channel and floodplain function and connectivity) were identified as the next priority (SRBWG 2007). Restoring long-term processes of riparian vegetation (ie. providing for long-term LW supplies) was the third priority tier of restoration actions identified, with restoration of short-term process (in-stream habitat) comprising the fourth tier of restoration actions (SRBWG 2007).

In 2008-2009, the SRBP began implementing tier 1 restoration actions on the lower Salmon (reconnecting side channel habitats that had been isolated by channelization and diking). The SRH Restoration project would continue the implementation of high priority restoration actions identified in the Sandy River basin and Salmon River restoration plans (RDG 2009, SRBWG 2007). The purpose of the SRH Restoration project is to improve aquatic habitat quality and access to side channel habitats for threatened steelhead and salmon populations. The addition of LW, reconnection of side channel habitats, and increasing the complexity of pool, glide, and riffle habitats in the lower Salmon River would provide high quality spawning and rearing habitat in mainstem and side-channels habitats for salmon and steelhead, and restore channel and floodplain functions that create and maintain complex aquatic habitats. The purpose of planting riparian tree seedlings is to maintain stable floodplains and supply LW to Salmon River over the long term (Beechie et al. 2000).

An additional purpose of the restoration actions is to improve water quality for designated beneficial uses, including salmonid spawning and rearing, and comply with the Total Maximum Daily Load (TMDL) for temperature for the Salmon River sub-basin (USDI 2009a). The Salmon River is listed as water quality impaired due to elevated stream temperatures. The Water Quality Restoration Plan (WQRP) for the Sandy River Basin (USDI 2009a) identified the need to maintain and enhance species composition and structural diversity of riparian plant communities to provide adequate summer and winter thermal regulation, nutrient filtering, and normal rates of soil erosion, bank erosion, and channel migration. Best Management Practices identified in the WQRP to decrease stream temperature and increase effective shade include planting riparian tree seedlings, and increasing stream channel complexity through development and input of large wood (USDI 2009a). The restoration actions are consistent with BLM's Resource Management Plan (RMP) objectives to "promote the rehabilitation and protection of at-risk fish stocks and their habitat", and "restore and maintain water quality to protect beneficial uses in district watersheds" (USDI 1995).

Decision Criteria/Project Objectives

The Cascades Resource Area Field Manager will use the following criteria/objectives in selecting the alternative to be implemented. The field manager will select the alternative that would best meet these criteria. The selected action would:

- Meet the purpose and need of the project (*Section 1.2*);
- Increase access to side channel habitats of Lower Salmon River and increase aquatic habitat complexity;
- Provide high quality spawning and rearing habitat in main channel and side-channel habitats for anadromous fish;
- Facilitate the development of riparian forest stands to shade stream channels and supply LW to Salmon River over the long term;
- Improve channel and floodplain function to maintain complex aquatic habitat over time; and
- Minimize erosion and impacts to soil productivity.

1.3 Conformance with Land Use Plan, Statutes, Regulations, and other Plans

The Salmon River Habitat Restoration Project proposal conforms to the following documents that direct and provide the legal framework for management of BLM lands within the Salem District and for this project: The 1/ *Salem District Record of Decision and Resource Management Plan***,** May 1995 (RMP); 2/ *Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents within the Range of the Northern Spotted Owl and Standards and Guidelines for Management of Habitat for Late-Successional and Old-Growth Forest Related Species within the Range of the Northern Spotted Owl*, April 1994 (the Northwest Forest Plan, or NWFP); and the 3/ *Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines*, January 2001.

The analysis in the Salmon River Habitat Restoration Project EA is site-specific and supplements analyses found in the *Salem District Proposed Resource Management Plan/Final Environmental Impact Statement*, September 1994 (RMP/FEIS). The RMP/FEIS includes the analysis from the *Final Supplemental Environmental Impact Statement on Management of Habitat for Late-Successional and Old-Growth Forest Related Species within the Range of the Northern Spotted Owl*, February 1994 (NWFP/FSEIS). The RMP/FEIS is amended by the *Final Supplemental Environmental Impact Statement for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines*, November 2000.

The following documents provide additional direction in the development to the proposed action:

1. Salmon River Watershed Analysis (USFS 1995)
2. Water Quality Restoration Plan for the Sandy River Basin (USDI 2009a)
3. Salmon River Restoration Plan (RDG 2009)
4. Sandy River Basin Aquatic Habitat Restoration Strategy (SRBWG 2007)
5. Sandy River Basin Integrated Management Plan (USDI 2009b)

The above documents are incorporated by reference in this environmental analysis and are available for review in the Salem District Office.

Survey and Manage Species Review

The SRH Restoration project is consistent with court orders relating to the Survey and Manage mitigation measure of the Northwest Forest Plan, as incorporated into the Salem District Resource Management Plan.

On December 17, 2009, the U.S. District Court for the Western District of Washington issued an order in Conservation Northwest, et al. v. Rey, et al., No. 08-1067 (W.D. Wash.) (Coughenour, J.), granting Plaintiffs' motion for partial summary judgment and finding a variety of NEPA violations in the BLM and USFS 2007 Record of Decision eliminating the Survey and Manage mitigation measure. Previously, in 2006, the District Court (Judge Pechman) had invalidated the agencies' 2004 RODs eliminating Survey and Manage due to NEPA violations.

Following the District Court's 2006 ruling, parties to the litigation had entered into a stipulation exempting certain categories of activities from the Survey and Manage standard (hereinafter "Pechman exemptions").

Judge Pechman's Order from October 11, 2006 directs: "Defendants shall not authorize, allow, or permit to continue any logging or other ground-disturbing activities on projects to which the 2004 ROD applied unless such activities are in compliance with the 2001 ROD (as the 2001 ROD was amended or modified as of March 21, 2004), except that this order will not apply to:

A. Thinning projects in stands younger than 80 years old:
B. Replacing culverts on roads that are in use and part of the road system, and removing culverts if the road is temporary or to be decommissioned;
C. Riparian and stream improvement projects where the riparian work is riparian planting, obtaining material for placing in-stream, and road or trail decommissioning; and where the stream improvement work is the placement large wood, channel and floodplain reconstruction, or removal of channel diversions; and
D. The portions of project involving hazardous fuel treatments where prescribed fire is applied. Any portion of a hazardous fuel treatment project involving commercial logging will remain subject to the survey and management requirements except for thinning of stands younger than 80 years old under subparagraph a. of this paragraph."

Following the Court's December 17, 2009 ruling, the Pechman exemptions are still in place. Judge Coughenour deferred issuing a remedy in his December 17, 2009 order until further proceedings, and did not enjoin the BLM from proceeding with projects. Nevertheless, I have reviewed the SRH Restoration project in consideration of both the December 17, 2009 and October 11, 2006 order.

I have made the determination that the SRH Restoration project meets Exemption C of the Pechman Exemptions (October 11, 2006 Order) (Riparian and stream improvement projects where the riparian work is riparian planting, obtaining material for placing in-stream, and road or trail decommissioning; and where the stream improvement work is the placement large wood, channel and floodplain reconstruction, or removal of channel diversions). Therefore the SRH Restoration project may still proceed even if the District Court sets aside or otherwise

enjoins use of the 2007 Survey and Manage Record of Decision since the Pechman exemptions would remain valid in such case.

1.3.1 Relevant Statutes/Authorities

This section is a summary of the relevant statutes/authorities that apply to this project. Additional statutes/authorities that apply to this project are shown in Table 2 (section 3.10).

- **National Environmental Policy Act (NEPA) 1969** – Requires the preparation of environmental impact statements for Federal projects which may have a significant effect on the environment.
- **Endangered Species Act (ESA) 1973** – Directs Federal agencies to ensure their actions do not jeopardize threatened and endangered species.
- **Federal Land Policy and Management Act (FLPMA) 1976** – Defines BLM's organization and provides the basic policy guidance for BLM's management of public lands.
- **Clean Water Act (CWA) 1987** – Establishes objectives to restore and maintain the chemical, physical, and biological integrity of the nation's water.
- **Clean Air Act (CAA) 1990** – Provides the principal framework for national, state, and local efforts to protect air quality.

1.4 Scoping

The BLM sent out a scoping letter describing the planned 2010 Salmon River Habitat Restoration Project actions to federal, state and municipal government agencies, nearby landowners, tribal authorities, and interested parties on the Cascades Resource Area mailing list on February 11, 2010, and to 10 additional nearby landowners on April 13, 2010. Five scoping comments were received, expressing general support for the project.

2.0 ALTERNATIVES

2.1 Alternative Development

Pursuant to Section 102 (2) (E) of the National Environmental Policy Act (NEPA) of 1969, as amended, Federal agencies shall "…study, develop, and describe appropriate alternatives to recommended courses of action in any proposal which involves unresolved conflicts concerning alternative uses of available resources."

No unresolved conflicts concerning alternative uses of available resources (section 102(2) (E) of NEPA) were identified. One alternative was identified that would meet the purpose and need of the project and have meaningful differences in environmental effects from the Proposed Action.
Therefore, this EA will analyze the effects of the "Proposed Action", "Action Alternative 1", and the "No Action Alternative" in this project area.

2.2 Proposed Action

All SRH Restoration Project Actions

The BLM proposes in cooperation with the SRB Partners to implement the following habitat restoration actions on BLM land on the lower Salmon River in 2010-2015:

- restore year-round flows to three side channels (>0.5 mile of side channel habitat) by increasing the elevation of the river bed at the side channel entrances when restoring main channel riffle-pool-riffle habitat sequences, and by excavating depositional materials and placing LW at the side-channel entrances,

- increase pool habitat and spawning areas at pool tail-outs by restoring three additional main channel riffle-pool-riffle habitat sequences,

- construct engineered log jams (ELJs) or LW structures at six restored riffle-pool sites to maintain scouring of the newly created pools,

- restore year-round flows to another three side channels (>0.3 mile of side channel habitat) by excavating depositional materials at the channel entrance and placing LW at the channel openings to create scouring flows to maintain the opening,

- add LW structures or ELJs to 35 additional main channel sites (primarily pool or backwater areas) to improve fish cover and habitat complexity for both adult and juvenile salmonids,

- add LW to six side channels to provide high quality spawning and rearing habitat,

- plant riparian tree seedlings to stabilize floodplains and provide long-term wood supplies.

RDG will design all channel and LW structures to withstand 100-year flood events and supervise their construction.

2010 Project Actions

The 2010 project actions include restoring riffle and pool habitat features, reactivating flows to side channels of the Salmon River, placing large wood in the Salmon River and within its floodplain, and planting tree seedlings.

Most 2010 project actions would be implemented on about 3,000 feet long reach of the lower Salmon River on BLM managed land in T.2S, R.6E, Section 25, starting at approximately RM 1.1 (Map 2). Several of these actions are located on BLM land in T.2S, R.7E, Section 31, at approximately RM 3.8 (Map 2).

Riffle-Pool Restoration

A riffle-pool-riffle habitat sequence in the main channel of the Salmon River would be restored by excavating a pool (approximately 325' long by 40' wide) in a glide habitat unit located between two riffles adjacent to the entrance to side channel 1 (Map 2; Appendix B – Drawing Numbers 3.0 and 4.0).

Boulders and engineered log jams (ELJs) would be placed at the lower end of the upstream riffle and along the pool to direct river flows into the excavated pool area, and to maintain scouring flows through the pool (prevent gravel and bedload deposition in the pool; Appendix B – Drawing Number 3.0).

Boulders and river rock fill would be used to create a riffle at the tail-out of the pool to increase the residual depth of the pool by about 1 foot, and to dissipate energy of river flows and increase the water surface elevation to increase floodplain connection and stream flows to side channel 1 (Appendix B – Drawing Numbers 3.0 and 6.0).

Approximately, 700 cubic yards of fill would be removed from pool area, and approximately 100 cubic yards of fill added to construct the pool tail out riffle (Appendix B – Drawing Numbers 2.0, and 6.0). If useable, the excavated material from the pool would be used to construct the riffle at the pool tail-out (Appendix B – Drawing Number 6.0), and ballast ELJs. River bed materials excavated from the pool and not needed for riffle or ELJ construction would be hauled to and stockpiled on BLM land at Miller Quarry (Map 3).

An excavator would be used to excavate the pool, and place the river rock and boulder fill used to construct the riffle at the pool tail-out. A small rubber-tracked dump truck (8 cu yd capacity) would be used to bring in boulder or rock fill needed in addition to the materials available onsite from the excavated areas. Any river bed materials used in the construction of the riffle from offsite areas would be free of weed seed and be similar in appearance to Salmon River river rock. A contractor under RDG supervision would conduct the riffle-pool work (Appendix B – Drawing Number 2.0).

Restore Side Channel Flows

The restoration of the riffle habitat unit at the opening to side channel 1 would raise the bed elevation of the river 1.2 feet, increasing connectivity of the Salmon River to its floodplain and side channel 1 (Appendix B – Drawing Number 3.0). To restore year-round flows in side-channel 1, about 1,500 cubic yards of river bed sand, gravels, cobbles and soil would be removed at the entrance and first 800 feet of side channel 1 (Appendix B – Drawing Numbers 2.0 and 4.0). All topsoil and channel materials excavated from side-channel 1 would be hauled with a rubber-tracked dump truck to BLM land at Miller Quarry and stockpiled for future use in restoration projects (Map 3). This stockpile location (at the start of the renovated road) was previously used to store gravel from Miller Quarry.

To restore year-round flows to side channel 2, about 15 cubic yards of depositional materials would be removed from the side channel entrance and 2 log jams constructed at the side channel entrance to maintain scouring flows to prevent deposition at the channel entrance (Appendix B – Drawing Numbers 5.0 and 6.1). Excavated materials from side channel 2 would be side-cast on the uphill slope from the side channel.

Large Wood Placement

Large wood (LW) would be placed at 5 project sites on a 3,000 feet long section of the river located at and near side channels 1 and 2, and 1 site at side channel 9 (Map 2).

LW proposed to be added to Salmon River channel and floodplain areas as part of the 2010 habitat restoration projects includes: 102 large-sized logs with minimum diameter at breast height (DBH) of 20" (averaging about 24"), 25-30' long with attached roots, 130 medium-sized LW pieces (minimum 18" DBH, 25-30' long without roots), and 185 small-sized pieces (minimum 6" DBH and 10' long) that would be interwoven among the larger wood pieces in the engineered wood structures. If availability of 24" DBH LW is limited, additional LW pieces would be used over that shown in the plan drawings with at least 50% of the LW with 24" minimum DBH, 25% with a minimum 20" DBH, and 25% with an 18" minimum DBH. LW would be moved and placed by use of an excavator (see equipment specifications, Appendix B – Drawing Number 1.1).

For all main channel LW structures, RDG conducted buoyancy analyses, and hydraulic modeling of river velocities and sheer stresses to determine the number and size of LW pieces, and amount of ballasting with boulders needed for LW to stay in place during flows up to 100 year flood events (Appendix B – Drawing Number 2.0; Sean Welch, RDG; personal communication, 2010).

Individual LW pieces would be pinned together (see Appendix B – Drawing Number 6.1), but LW structures would not be cabled or bolted to the river bank or bed. LW structures would be built by a contractor under RDG supervision.

Main Channel Pool

A LW habitat structure would be added to the existing main channel pool near the lower end of side channel 2 (LW site, Map 2; Appendix B – Drawing Number 5.0). The structure would be constructed with 13 large logs with attached roots, and 15 small LW pieces (Appendix B – Drawing Number 6.2).

Log jam Construction at Restored Pool

Seven LW structures or log jams would be constructed on the margins of the river at the restored pool habitat unit (Appendix B – Drawing Number 3.0). Two log jams would be constructed on the right river bank, and 5 smaller log jams on the left river bank (Appendix B – Drawing Number 3.0). The log jams would constrict river flows at the pool, thereby maintaining river velocities needed to maintain pool scouring (i.e. prevent gravel and sediment deposition from filling in the pool). The log jams would be constructed with 43 large logs with attached roots and 60 small LW pieces (Appendix B – Drawing Numbers 6.3 and 6.4).

Entrances to Side-channels 1 and 2

Two LW structures would be placed at the opening to side channel 1 to prevent sediment and bedload deposition from blocking the channel opening (Appendix B – Drawing Number 3.0). The LW structures at side channel 1 would be constructed with 30 large logs with attached roots and 55 small LW pieces (Appendix B – Drawing Number 2.0). Similarly, two LW structures would be built at the opening to side channel 2 (Appendix B – Drawing Number 5.0) using 16 large logs with attached roots and 40 small LW pieces (Appendix B – Drawing Number 6.1). The LW would also dissipate stream energy, and increase habitat complexity, and cover for fish.

Side Channels 1 and 9

LW would be added to side channel 1 (100 medium-sized pieces and 30 small LW pieces) to increase habitat cover and complexity. Similarly, about 30 medium-sized pieces of LW would be added to side channel 9. Placement sites would be selected that have existing structural and geomorphic features determined most likely to retain the placed wood. LW added to side channels would not be artificially secured to the bed or banks of the stream.

Riparian Tree Planting

Seedlings of native riparian trees (primarily western red cedar) would be hand planted in fall to winter 2010 or early spring 2011 on the Salmon River floodplain adjacent to side channels 1, 2, and 9. Trees would primarily be planted on 'islands' located between the mainstem channel and side channels.

Temporary Access Roads

An existing old road, about 2600 ft long, would be renovated (trees and debris cleared with an excavator) and used as the access route to haul fill and excavation materials to and from project sites at side channels 1 and 2 (Map 3).

Road maintenance required to renovate the road includes: removal of about 30 small (<6" dbh) and about 10 larger (averaging 10" dbh) maple and alder trees, and replacement of cobble fill at an intermittent drainage crossing, and possibly grading steeper portions of the road surface.

Temporary access routes totaling about 1,000 feet in length would be established from the end of the renovated road to haul boulders and excavated river rock in and out from side channel 1 and side channel 2, and to haul boulders to the main channel pool located between side channel 1 and side channel 2 (Map 3). The number of new access paths would be minimized to limit impacts to riparian and forest vegetation, consistent with the aquatic restoration biological opinion (ARBO) covering restoration projects for threatened salmon and steelhead populations (NMFS 2008). About 20 small (<8" dbh) alder, maple, or hemlock trees and one large (20-22" dbh) hemlock, and several groups of vine maple shrubs would be removed when clearing the temporary access routes. Rubber-tracked dump trucks would be driven on the existing soil surface of the temporary access routes.

A staging area would be located where the existing old road reaches level ground in the flood plain, approximately 200 feet from the edge of the river channel (Map 3). Consistent with the ARBO, this area would be the minimum size required for safe handling and stockpiling of boulders for later placement in log jams and providing a safe turning radius for equipment. Up to ten red alder and/or bigleaf maple trees with <10 inches DBH would be cleared from the staging area.

All trees removed as part of road renovation, clearing of temporary access routes, and staging areas would be stockpiled for later use in the LW structures. About 800 feet of the upstream end of side channel 1 would be disturbed when excavating fill from the side channel and hauling the excavated soil and channel materials to Miller Quarry. The dump truck would be driven down the side channel, with the side-channel bed and banks shaped to remove any sign of hauling of the excavated materials upon completing the excavation of the side channel.

At completion of the project all temporary access routes would be obliterated and rehabilitated (see restoration plan section below). The renovated road would be decommissioned at the end of the project and a debris and earth berm barricade placed at the start of the road to prevent OHV and motorcycle use.

Large Wood Sources

Most trees needed for the large wood used in the 2010 project actions would be obtained from stands on BLM land located in T.2S, R.6E, Section 33 adjacent to the Alder Creek road (Map 4). Up to 70 live trees averaging 24-25" dbh (range of 20-29 inches), would taken from the stands, which are located about 2.5 miles from the project sites on the Salmon River (Map 4).

The trees would predominantly come from stands that were previously thinned and do not provide suitable nesting habitat for spotted owls. Some trees may be taken from unthinned stands, or stands in Riparian Reserves on intermittent stream channels, but tree removal and equipment use would be limited to >60 feet from stream channels. Trees removed from source area would be within approximately 100' of established rocked roads and would be pushed over using an excavator so that the roots remain attached. They would then be flown to the LW placement sites by use of a helicopter.

About 20 LW pieces used in the project would come from logs that are currently stored at the Zig Zag Ranger District Office of the Mt. Hood National Forest. The logs would be hauled by truck to Miller Quarry or other staging areas adjacent to project sites (Map 4). Another three would come from trees which blew down during winter 2010 on BLM land immediately adjacent to Miller Quarry, and 9 logs would be donated by Portland General Electric. These 32 logs would be flown from staging areas to project sites by use of a helicopter.

Pollution and Erosion Control Plan

Consistent with the ARBO (NMFS 2008), BLM will develop and implement a pollution and erosion control plan (PECP) to minimize erosion, sedimentation, and potential spills (fuel, hydraulic fluid, etc.) associated with the restoration project work. Key components of the PECP include: preparation and implementation of a spill control and containment plan, use of Oregon Department of Environmental Quality's (ODEQ) Best Management Practices (BMPs) for minimizing in-stream turbidity, minimizing site preparation and heavy equipment impacts, and a site restoration plan. Specific measures implemented to minimize impacts from turbidity, erosion, and potential spills are listed below in the turbidity monitoring, restoration plan, and project design features (*sections 2.2 and 2.2.1*).

Turbidity Monitoring

In-stream turbidity would be minimized by isolating individual work areas from river flows using a floating silt curtain that traps silt and sediment within the disturbed area (Appendix B – Drawing Number 8.0), and through the use of other BMPs outlined in Oregon Department of Environmental Quality's (ODEQ) 401 Water Quality Certification issued by ODEQ for all Nationwide Permits of in-water work. Turbidity levels and monitoring would comply with that identified in individual ACOE (Army Corps of Engineers)/DSL (Oregon Department of State Lands) in-water work permits obtained for the project by BLM, and with the 401 Water Quality Certification issued by ODEQ (see Appendix A).

Restoration Plan

Temporary access routes and other areas disturbed during construction would be rehabilitated to similar or better than pre-work conditions as outlined in ARBO (NMFS 2008) by: 1) decompacting and recontouring soil surfaces to the original topography of the site, and 2) planting sword fern, vine maple, and other native species so that plant species composition and densities in disturbed areas are similar to that pre-project (see *section 3.5*).

Additionally, vine maple, red-osier dogwood, nine bark, Indian plum, and other native plant species would be planted where access routes terminate near the river to speed vegetation growth to visually screen the river corridor.

Stockpiled materials (i.e. trees, vegetation, sand, topsoil, and other excavated material from restoration project areas) would also be used to rehabilitate areas disturbed by equipment to pre-work conditions. Short-term stabilization measures would be implemented until permanent erosion control measures (plant restoration) are effective, and may include use of native grass seeding, weed-free certified straw, jute matting, or other similar techniques.

Restoration planting would be completed no later than spring planting season of the year following completion of construction. The renovated road and the temporary access route to side channel 1 would be used again to access planned project sites adjacent to side channel 1 in 2011. The renovated road would be closed and barricaded to motorized vehicle use, and road surface roughened and water bars constructed to prevent soil erosion, both between the 2010 and 2011 project work, and following the completion of all restoration work in fall 2011. The temporary access route to side channel 1 would be restored following the completion of the 2011 restoration projects. The renovated road bed would not be rehabilitated-revegetated upon project completion; it is used by recreationists for hiking and mountain biking.

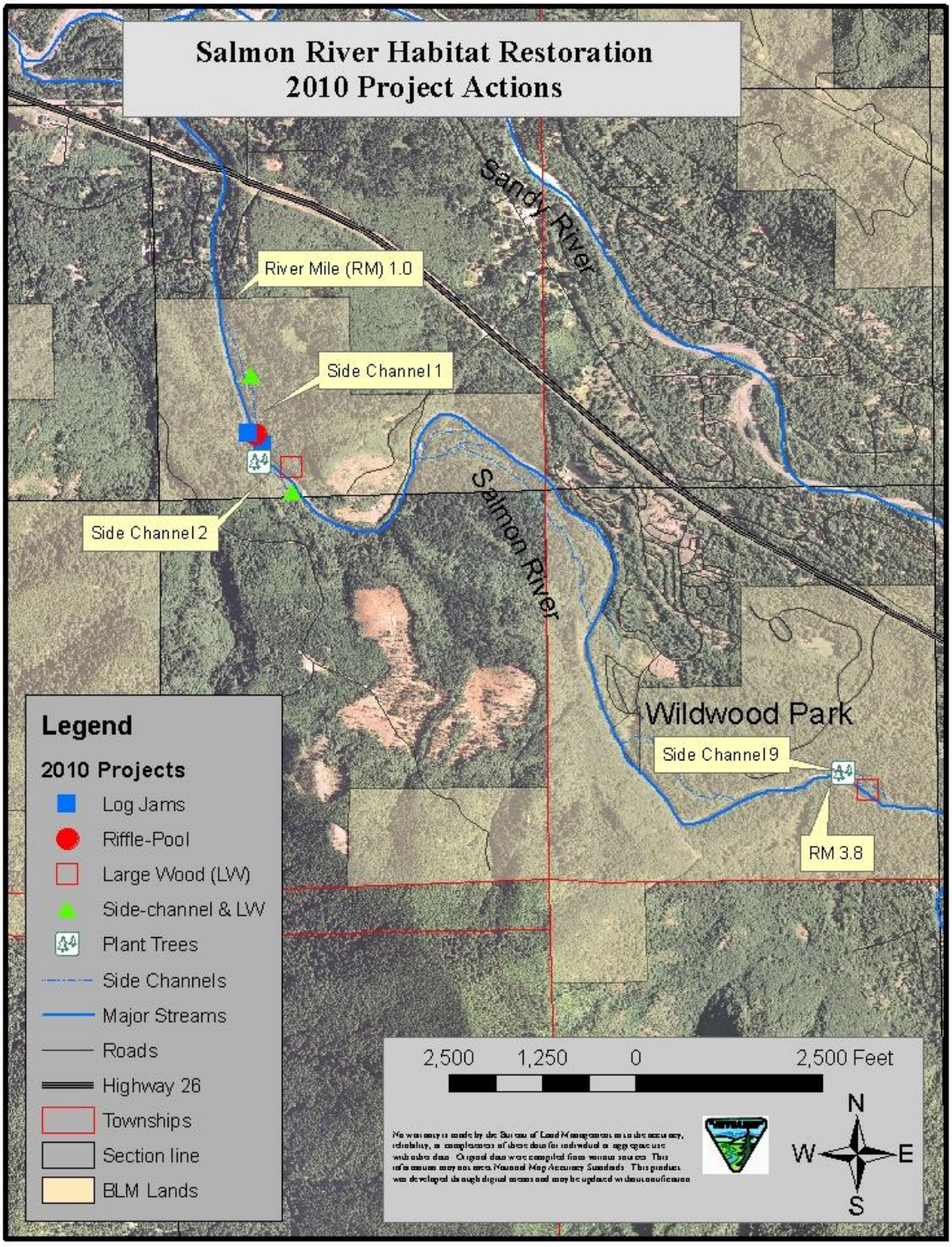
Contract Administration

The Project Design Features, turbidity monitoring, and restoration plan actions that constitute the pollution and erosion control plan would be incorporated into all construction contracts associated with the restoration project. BLM personnel (generally the project biologist and hydrologist) must regularly coordinate with the contracting officer's representative to ensure project design features and conservation and restoration measures are being followed. Authorized BLM personnel would have the authority to stop work if contract stipulations are not being met by the operator.

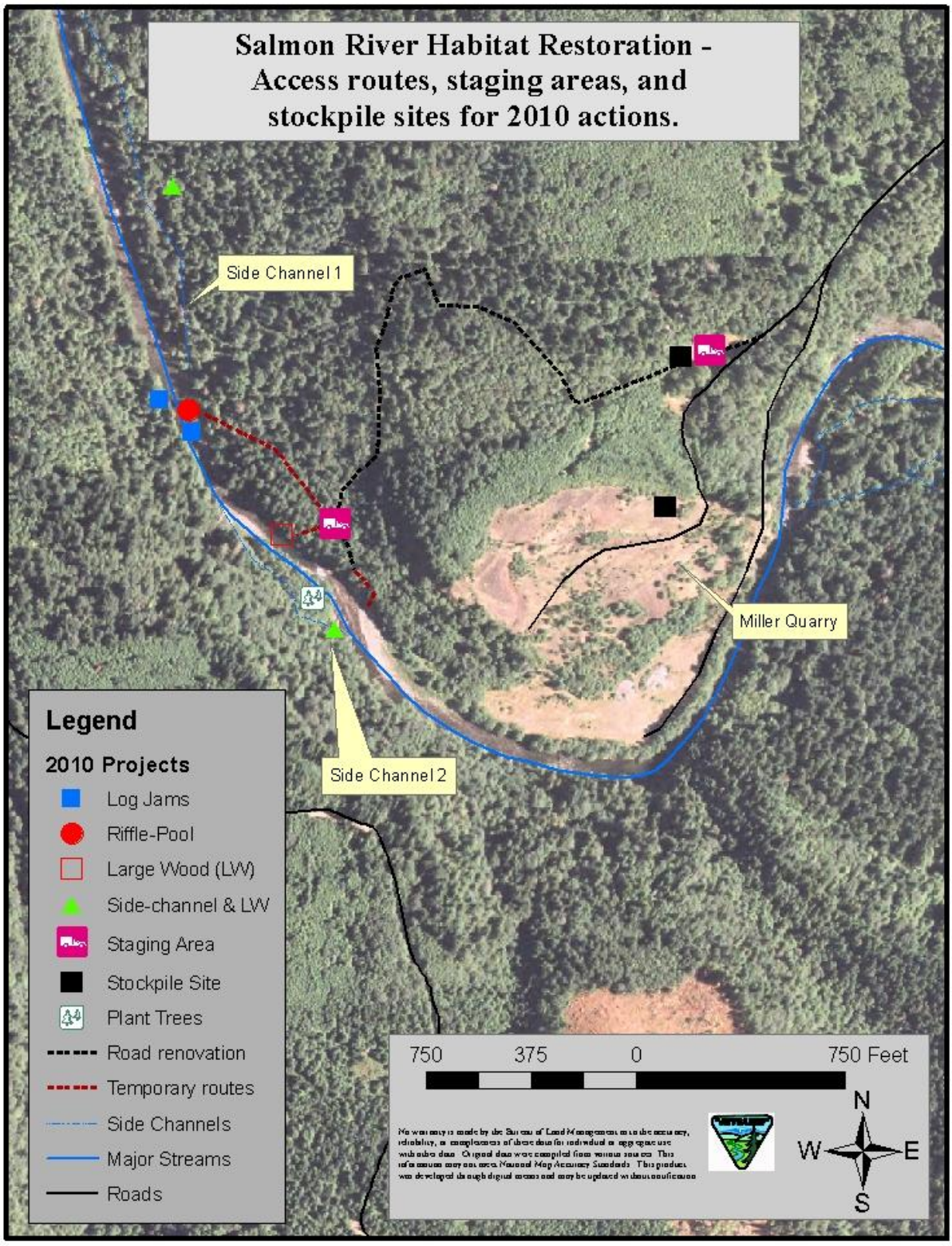
Project Timing For 2010 Project Actions

Project implementation would take place between July 2010 and August 2011. LW placement, riffle-pool restoration, and side-channel project work would be conducted during the in-stream work period (July 15 through August 31), and tree seedlings planted in late winter to early spring 2011.

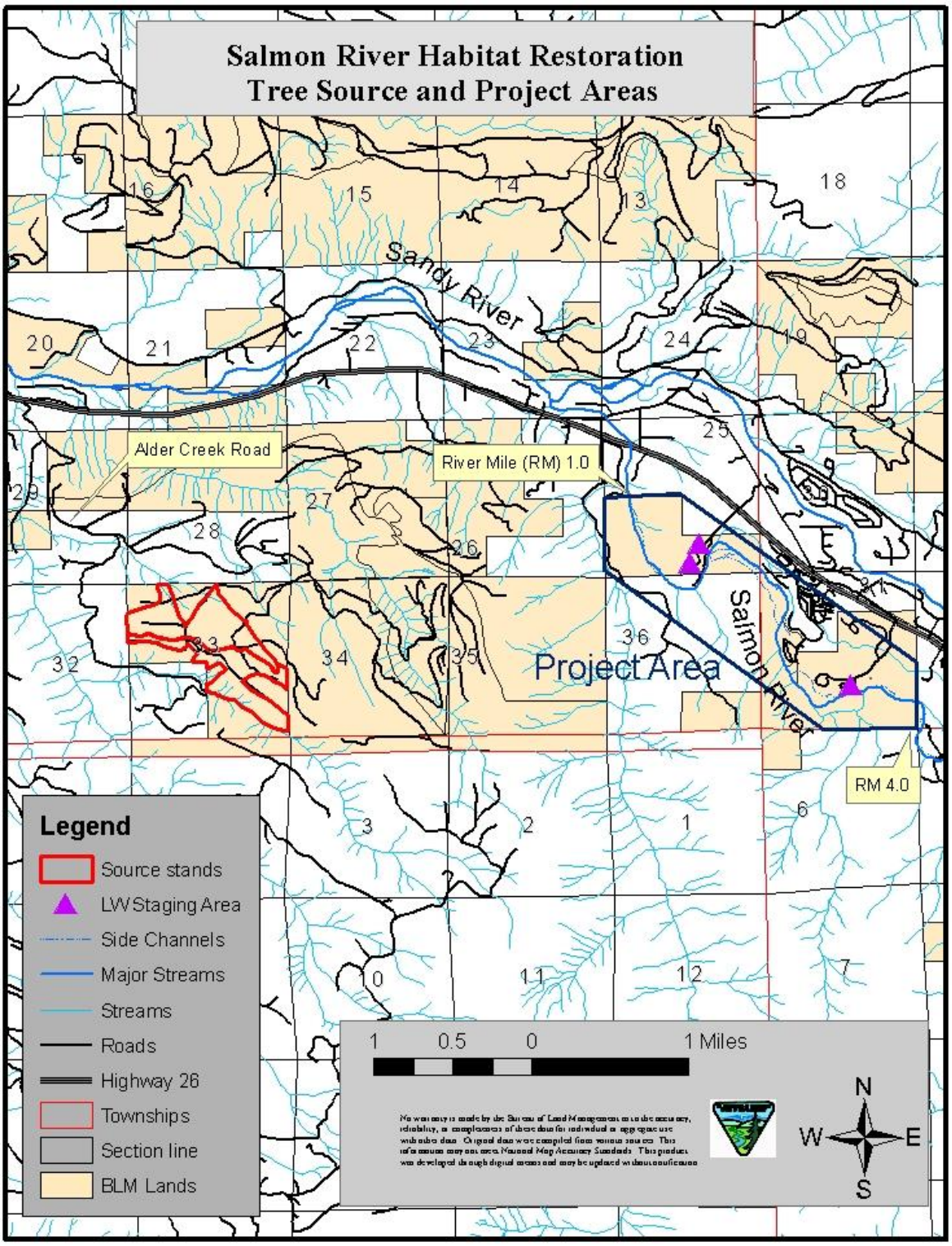
Map 2: Locations of 2010 Project Actions



Map 3: Access routes, staging areas, and stockpiles sites for 2010 project actions.



Map 4: Location of Tree Source Stands for the 2010 Project Actions



2.2.1 Project Design Features

The following is a summary of the design features in addition to the turbidity monitoring, restoration plan, and contract administration described above (*in Section 2.2*) that reduce the risk of effects to the affected elements of the environment described in *Section 3.0*, and includes the design features prescribed in the Aquatic Restoration Biological Opinion (ARBO) covering fish habitat restoration work (NMFS 2008). Unless otherwise specified, the following project design features apply to all 2010-2015 project actions.

In Source Stands and LW Placement Areas

- Equipment would be cleaned to prevent spread of noxious weeds, free of fluid leaks, and in good operating condition prior to unloading at the project site.
- Inspect equipment daily for leaks or accumulations of grease, and repair and clean any leaks before entering streams or areas that drain into streams or wetlands.
- Contractor would be required to have a Spill Containment Kit and a Spill Prevention, Control, and Countermeasure Plan in case equipment leaks fuel or oil. The plan shall contain a description of the hazardous materials that would be used, including inventory, storage, handling procedures; a description of quick response containment supplies that would be available on the site (e.g. a silt fence straw bales, and an oil-absorbing, floating boom whenever surface water is present).
- The excavator would push over trees, and move and place LW only when soils are at high strength and soil moisture levels are low during July through August; turning and rocking of the excavator would be limited as much as practical to avoid displacing and gouging the mineral soil.
- Excavator travel would be limited to a single pass and treads kept on top of organic material and slash as much as practical to avoid disturbing the mineral soil.
- Where appropriate, hazard tree removal would be incorporated into project design. Hazard trees would be felled within riparian areas when they pose a safety risk, and would be felled toward the stream or incorporated into LW structures. Felled trees would be kept on site when needed to meet coarse woody debris objectives.
- Breakage of trees and branches in the riparian zone and source tree stands would be minimized as much as practical.
- No helicopter use within 0.5 miles of a known spotted owl site center from March 1 to September 30.

In LW Placement Area

- Establish staging areas (used for construction equipment storage, vehicle storage, fueling, servicing, hazardous material storage, etc.) beyond the 100-year floodplain in a location and manner that would preclude erosion into or contamination of the stream or floodplain.
- Equipment used for in-stream or riparian work shall be fueled and serviced in a staging area outside of the riparian zone. When not in use, vehicles shall be stored in the staging area. (Map 3).

- Minimize clearing and grubbing activities when preparing staging, project, and or stockpile areas. Stockpile large wood, trees, vegetation, sand, topsoil and other excavated material that is removed when establishing areas for site restoration. Use stockpiled material to rehabilitate disturbed areas (see Restoration Plan).
- Prior to construction, flag critical riparian vegetation areas, wetlands, and other sensitive sites to prevent ground disturbance in theses areas.
- Place sediment barriers prior to construction around sites where significant levels of erosion may enter the river. Maintain barriers throughout construction.
- Minimize the number and length of stream crossings and access routes through riparian areas. Crossings and access routes should be at right angles. Stream crossings shall avoid potential listed fish spawning areas when possible.
- Existing roadways or travel paths would be used whenever reasonable. Minimize the number of new access paths to minimize impacts to riparian vegetation and functions.
- Project operation must cease under high flow conditions that inundate the project area, except for efforts to avoid or minimize resource damage.
- Minimize time in which heavy equipment is in stream channels, and riparian areas. Operate heavy equipment in streams only when project specialists believe that such actions are the only reasonable alternative for implementation, or would result in less sediment in the stream channel or damage (short- or long-term) to the overall aquatic and riparian ecosystem relative to other alternatives.
- Placement of LW would occur outside of the northern spotted owl critical nesting season (March 1 to July 15).
- No live trees larger than 8 inches diameter (DBH) would be removed from the primary shade zone of Salmon River.
- LW would be placed during the instream work period (July 15 through August 30).
- If capture, removal, or relocation of fish is required follow the conservation measures outlined in ARBO (NMFS 2008) for capture and release of fish.
- When necessary, compacted soil areas, such as access roads, stream crossings, staging, and stockpile areas, would be loosened.
- All riparian plantings shall follow BLM direction described in BLM Instruction Memorandum No. OR-2001-014, Policy on the Use of Native Species Plant Material.

In Source Stands (Applies only to 2010 Project Actions)

- A wildlife biologist and forester would be involved in tree selection in the source stand. No trees suitable for nesting spotted owls would be selected for removal.
- Trees selected to be removed would be spaced approximately 20-50 feet apart where feasible to prevent creating large gaps in the source stand, and would be <100' from established rocked roads.
- Trees selected would not remove, downgrade, or reduce the overall function of dispersal or suitable spotted owl habitat.
- Pushing over trees in suitable habitat would occur outside the critical nesting season for northern spotted owl (March 1 to July 15). For dispersal habitat, pushing over trees would occur after July 1.

- Disturbance of seedlings and understory vegetation would be minimized as much as possible. Where appropriate, disturbed sites would be rehabilitated and planted with Douglas-fir seedlings appropriate to the source stands' seed zone and elevation.
- Damage to residual trees (scraping of the boles of leave trees, removal of branches that are hit by falling trees) would be avoided as much as is feasible, and source trees would be directionally felled toward an existing rocked road where practical.
- If any residual trees are damaged extensively (more than 30% of either the circumference or length of the bole is scraped and bark removed, or more than 50% of the branches are removed) the damaged tree would be used as a replacement tree.
- Equipment travel would be limited to a single round-trip pass and treads kept on top of organic material and slash as much as practical to avoid disturbing the mineral soil and damaging residual seedlings and understory vegetation.
- Any damage (ruts, gouges) to existing rocked roads would be repaired where appropriate.

2.3 Action Alternative 1

2010 Project Actions

This alternative is the same as the proposed action except trees for the LW used in the project would be moved by log truck from source stands in T.2S, R.6E, Sec. 33 (Map 4) to the Miller Quarry log deck (staging area), and then from the log deck to specific project sites with rubber-tired or rubber-tracked vehicles, rather than by helicopter. Trees selected to push over in section 33 to supply logs for the LW structures would be located within 100 ft of existing gravel roads to minimize disturbance to the source stand when yarding the trees the road.

Once at the road, the trees would be cut to length and then loaded onto a self-loading log truck. After delivery to the log deck at Miller Quarry, the logs would then be moved to project sites via the same renovated and temporary access routes (Map 3) used to transport fill and excavation materials. Logs would be fully suspended (no dragging of any part of the log on the ground) when transported to project sites by use of a rubber tire or rubber-tracked vehicle. The area of ground disturbance associated with the ground-transport of logs would be slightly greater than that associated with transporting excavation and fill materials with a rubber-treaded dump truck (ie. Proposed Action) because one curve of the renovated road must be realigned to allow ground transport of 25-30 ft long logs around the curve.

2.3.1 Project Design Features

Project Design Features would be the same as that of the Proposed Action with the exception of deletion of design features relative to the use of helicopters to transport trees, and the addition of the following design features:

In LW Placement Area

- Logs would be fully suspended clear of the ground while being transported by a rubber tire or rubber-tracked vehicle. If necessary, the trailing end of the log may be suspended by a wheeled dolly to prevent the log from dragging a creating a furrow when the leading end of the log is suspended by the vehicle.

- Transport of logs would be limited to the renovated road bed, temporary access routes, and areas disturbed as part of hauling fill and river rock for the riffle-pool restoration portion of the project.

2.4 No Action Alternative

Under the No Action Alternative, no habitat restoration would be implemented in Salmon River. Existing LW amounts and the existing low habitat complexity in Salmon River would remain at current levels. No improvement in instream habitat quality of side channels for anadromous salmonid fishes would be likely to occur. Recruitment of red cedar and black cottonwood trees on floodplains needed to replace stands of old-aged alders would be substantially slower than under the proposed action and alternative 1.

3.0 AFFECTED ENVIRONMENT AND ENVIRONMENTAL EFFECTS

The elements of the environment affected by the proposed restoration project are Floodplains and Riparian Areas, Threatened / Endangered Fish Species and Critical Habitat, Essential Fish Habitat, Soils, Water Quality and Channel Function, Wild and Scenic Rivers, and Wildlife. *Sections 3.2-3.10* describe the current conditions and trends of those affected elements, and the environmental effects of the alternatives on those elements. Unless, otherwise specified, the affected environment and environmental effects apply to all 2010-2015 project actions.

3.1 Existing Watershed Condition

The project is located within Salmon River 5th field watershed, which is located approximately 24 miles east of the town of Sandy, Oregon. The Salmon River is a tributary to the Sandy River and flows into the Sandy River at about river mile (RM) 39. About 75% of the land in the Sandy River basin is federally managed (Table 1).

Table 1: Ownership in the Sandy River Watershed (Sandy Basin WQRP, p. 13)

Owner	% of Watershed
Forest Service	70
BLM	4
State	2
Private	22
City of Portland	2

Road densities are moderate (0.7 to 2.8 miles/mi^2) in the lower portion of the Salmon River basin adjacent to the project area (Salmon River Watershed Analysis, USDA 1995). Roads in close proximity to channels are thought to be one of the largest sources of stream sediment in the Salmon River sub-watershed (USDA 1995).

The lower to middle reaches of the Salmon River are characterized by channels with a "plane bed" form with low amounts of pool and glide habitat (RDG 2009, USDA 1995).

The channel and resulting fish habitat is degraded because of the combined effects of channelization and diking associated with flood control efforts, and the removal of large wood (LW) needed for the formation of complex aquatic habitats through channel scouring, pool formation, and gravel retention (RDG 2009, SRBP 2005, USDA 1995). LW amounts continue to be low in the lower Salmon River, and over 50 percent of adjacent riparian areas have low to moderate LW recruitment potential (USDA 1995). LW placement to improve aquatic habitat complexity in the lower Salmon River was recommended in the Watershed Analysis (USDA 1995), Water Quality Restoration Plan (USDI 2009a), and Salmon River Restoration Plan (RDG 2009).

Much of the lower Salmon River has simplified floodplains and reduced access to side channels due to historic diking and channel alteration in response to flood flows (RDG 2009, SBWG 2007, USDA 1995). Levels of stream shade from riparian trees are generally at site potential (USDI 2009a). However, portions of riparian areas adjacent to lower Salmon River are vegetated with old-aged stands of alder (*Alnus rubra*) with little conifer or black cottonwood (*Populus trichocarpa*) tree recruitment needed to maintain stream shade and floodplain function over the long term (USDI 2009a).

Lower Columbia River (LCR) steelhead trout (*Oncorhynchus mykiss*), LCR chinook salmon (*O. tshawytscha*), and LCR coho salmon (*O. kisutch*), all listed as threatened under the Endangered Species Act, inhabit the Salmon River. Non-listed fish inhabiting Salmon River include coastal cutthroat trout (*O. clarki clarki*), resident rainbow trout (*O. mykiss*), and sculpins (*Cottus* spp.).

The National Marine Fisheries Service (NMFS) has designated the Salmon River as critical habitat for both LCR spring chinook salmon and LCR steelhead trout (70 FR 52,630, September 2, 2005). Critical habitat has not yet been designated by NMFS for LCR coho salmon (www.nwr.noaa.gov/ESA-Salmon-Listings/Salmon-Populations/Coho/Index.cfm).

3.2 Floodplains and Riparian Areas

Affected Environment

Large wood (LW) levels are low in channels and floodplains of the lower Salmon River (RDG 2009, SRBWG 2007, USDA 1995). Side channel habitat complexity and connectivity to main channel flows are lower than that expected for the site because of both low amounts of LW, and the historic effects of stream channelization and diking (RDG 2009, SRBWG 2007). Most riparian areas adjacent to project sites are vegetated with conifer tree stands that meet shade targets for maintenance of stream temperature (USDI 2009a). Riparian areas adjacent to several side channels on the lower Salmon River are vegetated with older-aged stands of alder (Alnus rubra) with little conifer or black cottonwood tree recruitment needed to maintain stream shade and floodplain function over the long term.

Environmental Effects

3.2.1 Proposed Action

Restoration Projects

Addition of LW to the lower Salmon River and restoring flows to side channels would improve floodplain function by increasing connectivity of side channel and main channel flows (Abbe et al. 2003). A greater area of floodplain would be available for high flows to spread across thereby reducing erosive forces of the river.

The addition of LW would increase the stability of floodplain surfaces, and increase the retention of naturally delivered LW, thereby reducing rates of water and bedload transport (McHenry et al. 2007). Planting tree seedlings would improve stream shade and floodplain stability and supply LW to Salmon River over the long term (Beechie et al. 2000). Riparian tree composition and structural diversity would improve over the long term with planting red cedar and cottonwood seedlings. Short term impacts of LW delivery by helicopter would be limited to small amounts of branch breakage when logs are delivered through the canopy to project sites, and about 20 small (<8" dbh) maple, alder, and conifer trees per site along access routes in the Salmon River floodplain would be pushed over to enable the hauling of fill and removal materials to and from project sites on temporary access routes.

Large Wood Source Areas

2010 Project Actions only: Obtaining trees from BLM stands would have no effect on floodplains as trees removed would be located >60 feet from intermittent stream channels (outside of their floodplains). Potentially a few (<10) trees removed from the source stands for use as LW at project sites would come from upland vegetation areas associated with Riparian Reserves on two intermittent streams located in the northern portion of section 33 (Map 3).

3.2.2 Action Alternative 1

Effects would be similar to that of the Proposed Action, with the exception that a few more (<10 small trees and < 6" dbh) would be disturbed or pushed over per site to enable ground transport of logs. The riparian forest stand adjacent to project sites is relatively open, such that 30 feet long logs would be moved on the same access routes used to haul excavation and fill materials with only requiring a few more small trees to be cleared.

3.2.3 Cumulative Effects

No cumulative effects are expected for floodplain function because the project is small in scale and all effects are expected to be limited to the project area.

3.2.4 No Action Alternative

Connectivity to side channels and floodplain surfaces would be unchanged, with the river retaining predominantly a plane bed form with little habitat complexity (RDG 2009, SRBWG 2007, USDA 1995). High flows would be predominantly confined to a simplified main channel. LW levels would continue to be low relative to that expected for the site. Tree diversity and long term LW supplies of riparian stands would lower than that of the proposed action.

3.3 Threatened / Endangered Fish Species and Critical Habitat

Affected Environment

Federally threatened LCR steelhead trout and LCR Chinook and coho salmon spawn and rear in the lower Salmon River and NMFS has designated that the river provides Critical Habitat for Chinook salmon and steelhead trout (see Existing Watershed Condition). Habitat surveys conducted by USFS (1995) and SRBP (SRBWG 2007) documented low levels of LW on the lower Salmon River.

LW levels are inadequate to form complex stream habitats, and provide high quality spawning and rearing habitat for federally listed fish species (RDG 2009, SRBWG 2007, USDA 1995). Amount of and complexity of side channel habitat and connectivity to main channel flows are lower than that expected for the site both because of low amounts of LW, and the historic effects of stream channelization and diking (RDG 2009, SRBWG 2007). Coho salmon abundance is particularly dependent on the amount and quality of rearing habitat in side channels and floodplain habitats (Roni et al. 2006, Morley et al. 2005, Nickelson et al. 1992). Amount of gravel dominated areas for spawning is lower that expected for the site because of lack of LW and channel complexity (RDG 2009, SRBWG 2007, USDA 1995).

Several riparian areas adjacent to lower Salmon River are vegetated with old-aged stands of alder with little conifer or black cottonwood tree recruitment needed to supply LW to form and maintain complex stream habitats over the long term (Beechie et al. 2000).

Environmental Effects

3.3.1 Proposed Action

Restoration Projects

Placement of large wood (LW) in main and side channel habitats, and restoration of a main channel riffle-pool sequence would increase pool habitat, habitat complexity, and cover for salmon and steelhead in the main channel and side channels of the lower Salmon River (Keim et al. 2002, Beechie and Sibley 1997, Montgomery et al. 1995, Fausch and Northcote 1992, McMahon and Hartman 1989). Increased habitat availability and complexity would improve rearing conditions for steelhead, salmon, and resident cutthroat trout resulting in increased juvenile salmonid abundance (Pess et al. in review, 2003; Roni and Quinn 2001, Solazzi et al. 2000).

Increased structure from LW would result in localized reductions in the velocity of high flows (Beschta and Platts 1987), which would result in sorting and increased deposition of smaller bedload materials (McHenry et al. 2007, Bilby and Ward 1989). Retention of sand, gravel, and cobble would improve and create spawning areas for steelhead and salmon (McHenry et al. 2007). Increased LW in main channel pools would improve the distribution and amount of hiding cover for adult salmon (Pess et al. 2003). Restoring flows to side channels and addition of LW would increase the amount and quality of side channel habitat available, thereby increasing juvenile salmonid numbers, particularly those of coho salmon (Rosenfeld et al. 2008, Roni et al. 2006, Roni and Quinn 2001).

Habitat quality and quantity and juvenile fish abundance would improve in the short term with LW placement, restoration of main channel pool habitat, and reconnection of side channel habitats (Pess et al. in review, 2003; Roni et al. 2006, Roni and Quinn 2001). Habitat quality would also be maintained and improved over the long term as the result of increased LW production resulting from riparian tree plantings (Beechie et al. 2000). Condition of critical habitat for ESA listed fish would improve in the short and long term as the result of addition of LW, side channel and main channel pool restoration, and riparian tree plantings.

Short-term impacts of the habitat restoration projects on juvenile salmonids include active displacement from near shore habitats by the use of a floating silt curtain that traps silt and sediment, while excluding fish from a project area. An example can be found on 2010 Drawing Number 8.0 (Appendix B).

Additionally, juvenile salmonids and adult resident trout would also likely be displaced from side-channel and pool-riffle restoration project sites by elevated turbidity from in stream work (and have to compete with greater numbers of fish for food; Bjornn and Reiser 1991). Alternatively, their feeding could be disrupted (unable to see prey items) by the short term increases in turbidity (Bjornn and Reiser 1991). Risk of short-term soil erosion from access routes in adjacent riparian areas is minimal (see soils section) and thus short term sediment impacts to listed fish would primarily be from in-channel work.

No long-term adverse effects of the restoration projects on ESA listed fish or their habitat are expected because turbidity levels would return to background levels soon after cessation of in-water work. Additionally, no sediment is expected to move from access routes to the river long-term because soils are sandy and well-drained (see soils section) and the routes would be revegetated upon completion of the project (see Restoration Plan).

Large Wood Source Area
2010 Project Actions only: Obtaining trees from the BLM stands would have no effect on listed fish or their habitat. The source stands are more 2 miles upstream of the Salmon River, no ground disturbance would be allowed within 60 ft of intermittent stream channels.

3.3.2 Action Alternative 1

Impacts of this alternative to listed fish and their habitat would be similar to that of the Proposed Action. The same access routes and roads used to move fill and excavation materials would be used to transport logs. Amount of ground disturbed immediately adjacent to the river would be similar under both alternatives.

3.3.3 Cumulative Effects

Cumulatively this action in combination with other restoration actions planned in the Salmon River and Sandy River watershed (SRBWG 2007) would improve habitat conditions for listed fish, and the condition of Critical Habitat for ESA listed steelhead trout and Chinook salmon. No adverse cumulative impacts to listed fish and critical habitat are expected because increases in turbidity and displacement or disturbance of listed fish associated with in-water work would be both short-term (hours in duration) and limited in distribution.

3.3.4 No Action Alternative

Main channel habitat complexity and access to and quality of spawning and rearing habitat in side channels would continue to be low relative to that expected for the site (RDG 2009, SRBWG 2007, USDA 1995). The condition of Critical Habitat for ESA listed steelhead trout and Chinook salmon would continue to be low relative to the habitat quality expected for the site (SRBWG 2007, USDA 1995).

3.4 Essential Fish Habitat

Affected Environment

The Salmon River is designated as Essential Fish habitat under the Magnuson-Stevens Act because it is inhabited by Chinook and coho salmon. The condition of Essential Fish habitat is low relative to site potential because of the lack of gravel-dominated spawning areas and complex pool habitats for Chinook salmon, and lack of access to and reduced quality of side channel habitats for coho salmon spawning and rearing (RDG 2009, SRBWG 2007, USDA 1995). Currently LW levels are inadequate to form complex stream habitats, and provide high quality spawning and rearing habitat for federally listed salmon (RDG 2009, SRBWG 2007).

Amount of and complexity of side channel habitat and connectivity to main channel flows are lower than that expected for the site from comparisons with undisturbed reference reaches, both because of low amounts of LW, and the historic effects of stream channelization and diking (RDG 2009, SRBWG 2007).

Environmental Effects

3.4.1 Proposed Action

Restoration Projects

Placement of LW in main and side channel habitats, and restoration of a main channel riffle-pool sequence would increase pool habitat, habitat complexity, and cover for juvenile salmon in main channel and side channels of the lower Salmon River (Keim et al. 2002, Montgomery et al. 1995, Fausch and Northcote 1992, McMahon and Hartman 1989). Increased habitat availability and complexity would improve rearing conditions for juvenile salmon (Pess et al. in press, 2003; Roni and Quinn 2001, Solazzi et al. 2000). Increased structure from LW would result in localized reductions in the velocity of high flows (Beschta and Platts 1987), which would result in sorting and increased deposition of smaller bedload materials (McHenry et al. 2007, Bilby and Ward 1989). Retention of bedload materials composed of sand, gravel and cobble would improve and create spawning areas for Chinook and coho salmon (McHenry et al. 2007).

Increased LW in main channel pools would improve the distribution and amount of hiding cover for adult salmon (Pess et al. 2003). Restoring flows to side channels and addition of LW would increase the amount and quality of side channel habitat available, particularly for coho salmon (Rosenfeld et al. 2008, Roni et al. 2006, Roni and Quinn 2001).

Habitat quality and quantity would improve in the short term with LW placement, restoration of main channel pool habitat, and reconnection of side channel habitats (Pess et al. 2003, in review; Roni et al. 2006, Roni and Quinn 2001). Habitat quality would also be maintained and improved over the long term as the result of increased LW production resulting from riparian tree plantings (Beechie et al. 2000). Condition of Essential Fish Habitat would improve both in the short and long term as the result of LW placement, restoration of side channels and main channel pool habitat, and riparian tree plantings.

Large Wood Source Area
2010 Project Actions only: Obtaining trees from the BLM stand would have no effect on essential fish habitat. The source stand is 550 feet from any perennial stream and 2 miles upstream of essential fish habitat in the Salmon River.

3.4.2 Action Alternative 1

Impacts of this alternative to Essential Fish Habitat would be similar to that of the Proposed Action. The same access routes and roads used to move fill and excavation materials would be used to transport logs. Amount of ground disturbed immediately adjacent to the river would be similar under both alternatives.

3.4.3 Cumulative Effects

Cumulatively this action in combination with other restoration actions planned and recently implemented in the Salmon River and Sandy River watershed (SRBWG 2007) would improve Essential Fish Habitat in the Sandy River basin.

3.4.4 No Action Alternative

Stream habitat complexity and access to and quality of rearing habitat in side channels would continue to be low relative to that expected for the site. Main channel habitat quality would be unchanged, with the river retaining predominantly a plane bed form with little habitat complexity (RDG 2009, SRBWG 2007, USDA 1995).

3.5 Vegetation/Silviculture

Affected Environment

Forested Areas adjacent to Restoration Sites
The forested areas surrounding the proposed log placement and riffle-pool project areas on the Salmon River consist of Douglas-fir ***(Pseudotsuga menziesii)***, western redcedar ***(Thuja plicata)***, western hemlock ***(Tsuga heterophylla)*** stands with an understory of predominantly sword fern (***Polystichum munitum***) and vine maple (***Acer circinatum***). Additional shrubs present include red huckleberry (***Vaccinium parvifolium***) and California hazel (***Corylus cornuta***). Pre-project plant densities on the proposed access routes are: sword fern ($0.07/ft^2$), vine maple ($0.01/ft^2$), red huckleberry ($0.01/ft^2$), and California hazel ($0.01/ft^2$). A herb layer of Oregon oxalis (***Oxalis oregona***) is also present.

Approximate age of the overstory trees is listed at 80 years, although no recent stand data has been collected. There are a few remnant cedars and Douglas-firs that appear to be older than 80 years in the area. Several large black cottonwoods *(Populus trichocarpa)* are present in some parts of the stand, as well as a contingency of red alder *(Alnus rubra)* along stream channels, and where past disturbance has likely occurred. Large stumps in the area suggest it was logged several decades prior, although no recent treatments are currently on record.

Large Wood Source Area

2010 Project Actions only: Trees used in this project would be obtained from forested stands on BLM land in T2S, R6E, Section 33 (Map 4). Both stands are in the General Forest Management Area (GFMA) land use allocation (LUA) of the Cascades Resource Area. One stand is approximately 120 acres in size and was previously harvested in the late 1990's as the first stage of a two part Shelterwood treatment. In this area, approximately 50-55 trees per acre remain after the initial harvest. Overstory trees in the Shelterwood stand consist mainly of Douglas-fir, some western hemlock, with a natural understory of Douglas-fir, western redcedar and western hemlock. The overstory trees are approximately 110 years old, 140-170 feet in height and range from approximately 28-36 inches diameter at breast height (DBH). Understory shrubs consist of rhododendron, red-huckleberry, sword fern, and salal.

After harvest, the shelterwood area was understory burned, and replanted with western red-cedar, Douglas-fir, and western hemlock. All planted western redcedar were tubed to prevent browsing damage. Western hemlock seedlings have seeded in naturally and become established. Another stand in the same section proposed for a tree source is approximately 121 acres and directly adjacent to the shelterwood stand. This area is Douglas-fir dominated, with some overstory western hemlock and understory components of western hemlock and western redcedar. According to recent stand data, overstory trees are approximately 110 years in age, an average of approximately 120 feet tall, with DBH values at approximately 16-24 inches. This stand was commercially thinned in the late 1970's. Understory shrub species include rhododendron, salal and sword fern.

Environmental Effects

3.5.1 Proposed Action

Forested Areas adjacent to Restoration Sites

About 20 trees (<8 inches DBH) would be removed from temporary access routes per site. Trees removed for road renovation and on temporary access routes would be incorporated into the proposed log structures. Additionally, for the 2010 project actions only, one large western hemlock (20-22 inches DBH) would be removed on a temporary access route.

2010 Project Actions Only: Renovation of the road from Miller Quarry to the Salmon River (Map 3) would include: clearing trees and debris from the road surface with an excavator, possibly reblading steeper portions of the road surface; armoring one spot where an intermittent stream flows across the road; and opening up the road prism by cutting and removing approximately 40 small red alders and bigleaf maples (approximately 30 of which are less than 8 inches DBH and ten of which are 8-14 inches DBH).

A staging area would be cleared where the rocked (pit run rock) road reaches level ground in the flood plain, approximately 200 feet from edge of the river channel (Map 3). This area would be the minimum size required to provide a safe turning radius for equipment hauling fill and excavation materials. Clearing would consist of cutting up to ten red alder and/or bigleaf maple trees with diameters to 10 inches, and cutting or crushing small diameter vegetation. Roots and root collars would be retained to promote resprouting.

Large Wood Source Area
2010 Project Actions Only: Equipment used to dig up roots and push over large trees could disturb, crush or kill established seedlings, and potentially damage reserve trees. Damage to reserve trees can include removal of bark and scraping up the sides of residual trees as project trees are felled, as well as removal of branches as a tree is felled. Residual tree damage can be avoided by directional falling and care by the equipment operator, and any heavily damaged reserve trees should serve as replacements for designated project trees (see design features in ***section 2.2.1***).

Because the trees would be flown by helicopter to the staging area at Miller Quarry, this alternative would have slightly less ground disturbance and impacts to vegetation in the source stands than Action Alternative 1.

The tree source area is within the GFMA land use allocation, and thus is considered part of the Cascades Resource Area's timber base. Under the Salem District Resource Management Plan (RMP), the objectives listed for the GFMA LUA are to "provide a sustainable supply of timber and other forest products." as well as …"Manage developing stands on available lands to promote tree survival and growth and to achieve a balance between wood volume production, quality of wood and timber value at harvest" (USDI 1995, p. 46).

Additionally, an objective of GFMA LUA is to provide for important ecological functions such as dispersal of organisms, carryover of some species from one stand to the next, and maintenance of ecologically valuable structural components such as down logs, snags, and large trees (USDI 1995, p. 20).

The O&C Act states that O&C forest lands will be managed for "…permanent forest production" with timber to be "sold, cut and removed…"(O&C Act, 43 U.S.C. §1181a). Although the trees are remaining on BLM land, once extracted and placed in the stream, they are no longer available for timber harvest and their ability to be sold as a timber resource is no longer possible. The O&C Act also states that the lands shall be managed for "protecting watersheds, regulating stream flow,…"(O&C Act, 43 U.S.C. §1181a). Using the trees to restore floodplain and channel function of the Salmon River is consistent with the latter objective.

The land would continue to grow trees for future harvest. In the Shelterwood stand, some of the current understory conifers would be released for growth earlier than the remaining trees when the second entry (Shelterwood removal) is accomplished. In the other stand described, openings and disturbed soil would potentially provide opportunity for natural seedling establishment. Some of those trees would survive when this stand is logged in the future, but would contribute little to sustained timber production.

The estimated volume of the trees to be removed is approximately 66,000 board feet valued at a total of approximately $22,000 with April 2010 values1.

3.5.2 Action Alternative 1

Forested Areas adjacent to Restoration Sites
Impacts of temporary access routes to forest stands would be similar to that of the proposed action.

2010 Project Actions Only: Impacts from road renovation would be slightly greater than that of the proposed action as the alignment of one curve in the upland portion of the existing road would need to be changed slightly to facilitate ground transport of 30 ft long logs around the curve. A few more (about 5-10) red alder or maple trees would need be removed and a slightly large area of ground would be disturbed when realigning the road. Impacts to vegetation at the staging area that would be cleared where the rocked (pit run rock) road reaches level ground in the flood plain would be similar to that of the proposed action.

Large Wood Source Area
2010 Project Actions only: Impacts to vegetation of the source stand under this alternative would be slightly greater than that of the proposed action because trees tipped over would need to be moved to roads for transport by log truck to staging areas adjacent to the Salmon River. Pushing over trees, then skidding them to or placing them on roads could cause some damage to the road and ditch lines by causing ruts as trees are skidded and moved, and leaving slash or debris behind in the ditch lines and causing potential future road erosion. Additionally, skidding or moving the tipped trees from the source stands to the established road system could damage reserve trees and potentially crush established seedlings. Impacts of timber removal from the GFMA LUA would be similar to that of the proposed action.

3.5.3 Cumulative Effects

Cumulatively this action would have little effect on the overall health and vigor of any disturbed sites or forested areas if restoration actions are implemented where appropriate and care is used by the operator when trees are removed and transported.

3.5.4 No Action Alternative

Under the No Action Alternative no trees would be extracted from the source areas. No trees would be removed to renovate existing roads, and no seedlings or standing trees would be disturbed.

[1] Estimated log values calculated using April 2010 fair market values by BLM Staff; 70 trees, 24" DBH, 125' in height, Form Class: 78.

3.6 Soils

Affected Environment

Soils adjacent to Salmon River formed in alluvium associated with river deposition in flat areas or colluviums derived from the steep volcanic hillsides that constrain the stream. Soil maps and descriptions of project soil characteristics are available at the Natural Resource Conservation Service web site: http://websoilsurvey.nrcs.usda.gov/app/**.**

Soils on the floodplains adjacent to the Salmon river project area are mapped as Jimbo loam cool and Multopor very cobbly loamy sand; both are alluvial soils (i.e., deposited by river flooding). The Jimbo loam is a low strength soil susceptible to compaction, especially when wet. The Multopor is a well drained soil with high content of cobble. During field investigations of the project area the Cascades RA field hydrologist/soil scientist determined that the soil in the floodplain adjacent to the project area is primarily a well drained sandy soil, similar to the mapped Multopor. Soils in the source areas for trees are mapped as a Bull Run silt loam slopes of 3-30%, and an Aschoff cobbly loam, 5-30% slopes. The Bull Run is also susceptible to compaction when wet.

Environmental Effects

3.6.1 Proposed Action

Forested Areas adjacent to Restoration Sites

Transport of excavation and fill materials on temporary access routes on floodplains adjacent to the Salmon River would disturb and compact the soils within the proposed routes. Surface duff layers (approximately 0.5 foot in depth) would be mixed and pulverized into the subsoil (composed primarily of well graded, medium sands) by repeated vehicle traffic across the surface. This material is excessively drained and, especially during the operating season (July-August) is not highly susceptible to compaction. Truck traffic would result in a small increase in bulk density (already high at 1.2-1.4 gm/cc) of <10%, however, rutting and displacement of the surface organic layer would likely occur.

Due to the flat surfaces and rapid drainage, the risk of soil erosion is minimal. Light tillage of the surface following project implementation would help restore the soil's bulk density but the mixing of surface and subsurface layers would remain. Full recovery of pre-disturbance conditions would likely take several years although no permanent effect to the soil's physical and biological properties is expected.

2010 Project Actions only: The surface of the existing road that would be renovated to provide access to the project area is moderately to highly compacted and mostly free of vegetation. Reuse of this road would result in little additional disturbance to the surface soils since they are currently compacted and disturbed along this route. Utilization of this surface by haul trucks would have no effect on soil erosion or productivity outside of this existing road prism.

Large Wood Source Area

2010 Project Actions only: Use of a cable-yarder or an articulated excavator to pull or push over trees in upland stands would have a direct effect on soil in that area. Soil bound to the root system of the trees, would be pulled up, inverted and disturbed as the trees are pushed over. This effect is analogous to what occurs when trees are blown down during large wind storms, and thus is similar to the natural disturbance regime and part of the normal process of soil formation in these forests.

Removal of the pushed over trees or recently blown down trees that are on the forest floor is not part of the natural disturbance regime. Some of the soil that is attached to the tree roots would be removed and left on site while a portion would remain attached to the roots and would be carried away from the site along with the organic material and nutrients stored in the trees. Removal of 1-2 trees/acre is equivalent to less than 1% of the above ground biomass in the project area. Removal of this material is unlikely to have a long lasting effect on overall site productivity or the nutrient status of the remaining stand and would be quickly regenerated.

Helicopter yarding of the pushed over trees would have no effect on soils but excavator access to pushed trees would disturb the surface. The degree of disturbance and soil compaction would vary depending on site conditions (e.g., soil moisture and texture, topography, number of equipment passes and size of trees). By carefully following Project Design Features disturbance to soils would be minimized. Surface duff layers and vegetation would buffer and protect mineral soil.

Soil compaction would be limited by operating during periods of low soil moisture, allowing no more than one pass with the excavator along any individual route, and by operating the excavator on top of slash from the trees to help spread vehicular weight over a greater surface area. In addition, equipment would, to the extent practical, operate on previously compacted trails created during forest management. Light discontinuous compaction of the surface horizon of the mineral soil would be unlikely to result in reduction in soil productivity or disturb normal soil process. Soil bulk density and processes would likely recover to pre-disturbance condition within one year following the project.

3.6.2 Action Alternative 1

Restoration Project Area

Trees would be brought to the project work area under this alternative by ground based equipment along the same road system utilized to haul away river substrates and to access the project site. The affects to soils under this alternative would be essentially analogous to the proposed which entails multiple passes by vehicles across the same surface.

Tree Source Area

2010 Project Actions only: Under this alternative, trees that have been pushed over would be yarded to the adjacent forest road and loaded on trucks for hauling to the project site. Excavator travelling on soil surfaces would result in light compaction of the surface horizon of the soil (i.e., and increase in bulk density under 5%) in some locations. The surface compaction would be discontinuous and difficult to detect visually within one year of project completion. By carefully following Project Design Features (see ***section 2.2.1***) disturbance to soils would be minimized.

Surface duff layers and vegetation would buffer and protect mineral soil. For example, trees would be yarded while suspended from cables whenever possible. Soil compaction would be limited by allowing no more than one pass with the excavator along any individual route, and by operating the excavator on top of slash from the trees to help spread vehicular weight over a greater surface area.

3.6.3 Cumulative Effects

Because the effects of the proposed action on soils are expected to be short-term, (maximum 3-4 years), and localized (would not occur beyond the disturbed surfaces), no cumulative effects are expected.

3.6.4 No Action Alternative

No disturbance to soils would occur.

3.7 Water Quality and Channel Function

Affected Environment

The Salmon River is subject to the conditions of the Sandy River Basin TMDL completed by the Oregon Department of Environmental Quality (ODEQ) in 2005 (http://www.deq.state.or.us/wq/TMDLs/docs/sandybasin/tmdlwqmp.pdf). Essentially, the TMDL requires the recovery or maintenance of full potential shade along all perennial streams in the Sandy basin. The Water Quality Restoration Plan (WQRP) for the Sandy River Basin (USDI 2009a) identified the need to restore channel and riparian conditions on lower Salmon River to improve water quality and make progress towards TMDL targets for water temperature for the sub-basin. A rapid shade assessment indicated perennial stream channels on BLM managed lands in the basin all meet the shade target (USDI 2009a). Providing adequate amounts and distribution of large wood to maintain physical stream complexity and stability was identified in the Sandy River Water Quality Restoration Plan[2] as a high priority for restoration of water quality in the Salmon River.

Environmental Effects

3.7.1 Action Alternatives

Water Quality

The addition of large wood (LW; trees with roots attached) to lower Salmon River would increase flood access to floodplain surfaces. The riparian canopy currently provides near to full potential shade for this reach and would not be altered under the proposal. Over the short term, stream temperature would be largely unaffected by this proposal; although some reduction in stream temperature could result from shading of surface waters by the increase in pool cover, it would be difficult to detect. Sediment deposition may increase slightly in the short term as a result of LW locally reducing stream velocities. Over the long term, increased access to side channel habitat may help cool stream temperatures.

[2] Sandy Basin Water Quality Restoration Plan. March 30, 2009, Bureau of Land Management, Salem District, p. 30.

The construction of a riffle-pool complex could lead to pulses of highly turbid water during construction. RDG has provided a plan for the capture of fine sediments and for the maintenance of turbidity levels (For example, see drawing 8 of the 2010 project designs – Appendix B). Nevertheless, this proposal could produce short term (periods up to an hour during in-stream work) plumes of turbidity as a result of bed and bank disturbance.

Turbidity at the site of disturbance could exceed state standards during the period of activity and could measure as much as several hundred NTUs (nephelometric ***turbidity*** units) for short durations (seconds to minutes) in the vicinity of the disturbance and immediately downstream. The increased turbidity is unlikely to be visible or measurable beyond 800 meters below the site of the disturbance (see Foltz and Yanosek 2005). Turbidity levels would likely decrease as disturbed surfaces (and the channel bed) become "armored" (i.e., fines are removed). Any sediment yield increase would be difficult to measure and is unlikely to contribute more than 1% to the supply or transport of sediment in these watersheds.

Over the long term (years to decades) the proposed action is expected to help improve and maintain water quality by slowing the transport of sediment through the system and providing additional slow water velocity areas for the deposition of fine particles (silts, sand and clays). Restoring a stable vegetative community through LW placement and planting of riparian tree seedlings would help maintain cool temperatures in the springs that emerge in the source area of the project channel.

Channel Function

Placing LW into Salmon River would affect streamflow and channel morphology by altering channel roughness and geometry, reducing stream velocity, and redirecting flow around the obstructions. Site specific effects can be anticipated, but cannot be precisely predicted.

Effects include: reductions in stream gradient and flow velocity upstream of obstructions with consequent deposition of suspended materials and a fining of (i.e., reduction in the medium particle size) of channel substrates; bed scour and increased velocities in the vicinity of obstructions; increased bank erosion in areas where materials divert stream flow into the bank; reductions in bank erosion in areas where materials divert flows away from the banks.

Overall, the increase in roughness elements in the channel is expected to decrease transit time for organic and inorganic materials moving through the system (i.e., they would be held in place longer), increase hydraulic "complexity," increase the quantity of sediment transported in the channel but reduce its rate of transport, increase sediment storage, increase complexity and alter the ratio of bed forms (i.e, pools and riffles), and increase over bank flood flows (on a small scale adjacent to deposited materials).

All of these effects are anticipated to be highest immediately after LW placement with a gradual diminution until a form of dynamic equilibrium is reached.

Again, this can be anticipated, but not precisely predicted because timing of this process would be highly dependent upon the timing, quantity and size of winter peak flow events, which are stochastic in nature.

In addition, over time the LW added by the project is expected to trap wood entering the stream from upstream riparian areas; trees in riparian zones would continue to grow, age and eventually fall into the channel. This would result in increases in the quantity and complexity of wood in the channel over the next century. For the reasons described above, it is anticipated that these alterations to channel morphology and hydraulics would directly increase habitat diversity, aquatic community complexity and structure, and the diversity of aquatic organisms to the benefit of aquatic species in the watershed.

Large Wood Source Areas
2010 Project Actions only: Obtaining trees from BLM stands would have no effect on water quality or channel function as trees removed would be located >60 feet from intermittent stream channels (outside of their floodplains). Potentially a few (<10) trees removed from the source stands for use as LW at project sites would come from upland vegetation areas associated with Riparian Reserves on two intermittent streams located in the northern portion of section 33 (Map 3).

3.7.2 Cumulative Effects

Cumulatively this action would add to the recovery of aquatic habitat, sediment transport regime and functional stream channels in the Salmon River. This could contribute to a long term reduction in the turbidity and stream temperature.

3.7.3 No Action Alternative

Over the long term with delivery of LW from upstream reaches, water quality would improve due to increased floodplain stability and riparian tree colonization of areas with low tree shading. Improvement in water quality would be at a slower rate than that of the proposed action. Additionally, with natural recruitment of LW channel function would also improve over the long term, but at a slower rate than under the proposed action. Water quality would likely improve within 50 years as LW is delivered from upstream segments and trees colonize floodplain areas stabilized by the LW, compared to a similar level of improvement within 15-25 years under the proposed action.

3.8 Wild and Scenic Rivers/Recreation

Affected Environment

The Salmon River, from its headwaters on Mt. Hood to its confluence with the Sandy River was added to the National Wild and Scenic Rivers System with the passage of the Oregon Omnibus National Wild and Scenic Rivers Act in 1988. The BLM is responsible for the management of two segments of the Salmon River, totaling 8.3 miles. Segment four is a 3.5 mile segment from the Mt. Hood National Forest boundary to Lymp Creek and has a recreational classification. Segment five is 4.8 mile segment from Lymp Creek to its confluence with the Sandy River and has a scenic classification.

The intent of the Wild and Scenic River Act is to maintain the free-flowing character of the Salmon River corridor and to protect its values. Those values were termed by Congress as "outstandingly remarkable values." Outstandingly remarkable values are values or opportunities in a river corridor what are directly related to the river and which are rare, unique or exemplary from a regional or national perspective. The Salmon River provides for balanced protection and enhancement of all values found to be outstandingly remarkable: scenery, recreation, the anadromous fishery, both in terms of sport fishery as well as the presence of rare wild stocks, wildlife, hydrology, botany and ecology. The Outstandingly remarkable values for both segments include Botany, Ecology, Fisheries, Hydrology, Recreation, Scenery and Wildlife.

The Salmon River provides a wide variety of recreational opportunities along its length ranging from hiking, sport fishing and angling. The habitat enhancement projects outlined in this Environmental Assessment are planned within Segment five. The project area has a long history of providing dispersed, non designated recreational access to the public. Activities ranging from dispersed camping, hiking, target shooting and angling characterize use within the project area. Vehicular access is limited and the majority of public use occurs by walk in access via a turnout off of Highway 26, or through adjacent private property.

Environmental Effects

3.8.1 Proposed Action

Addition of LW to the lower Salmon River and restoring flows to side channels would improve floodplain function by increasing connectivity of side channel and main channel flows, and by increasing the stability of floodplain surfaces (Abbe et al. 2003). The addition of LW and restoring a riffle-pool complex would increase channel and floodplain diversity, increase the retention of naturally delivered LW, and improve aquatic habitat quality and complexity (Pess et al. in review, 2003; McHenry et al. 2007, Keim et al. 2002, Montgomery et al. 1995). Increased floodplain stability and aquatic habitat complexity would contribute to greater primitive appearance of the stream segment over the long term.

In the short term (for about one year) the primitive appearance of the reach would be slightly impacted by soil and vegetation disturbance resulting from transport of restoration materials on temporary access routes, and disturbance associated with the use of an excavator to construct ELJs and excavate side-channel openings. Temporary access routes would largely be located >100 ft from the river, and thus would be visually screened from the river corridor by existing riparian and floodplain vegetation. Additionally, access routes would terminate perpendicular to the river to minimize the amount of disturbance visible from the river. Upon project completion, vine maple, black cottonwood, western red cedar, and other native plant species would be planted where access routes terminate near the river to speed vegetation growth to visually screen the river corridor. Over the long term impacts to primitiveness would by negligible as logs weather and other LW accumulates from upstream reaches and access routes are revegetated (see Restoration Plan, *Section 2.2*). There would be no long term impacts to the Scenic Classification of the river, or the Outstandingly Remarkable Values of Scenery and Wildlife.

The proposed action would have no effect on recreational river users and their ability to navigate by watercraft through the project area. The high flow hydraulic effects that would result from project implementation will result in minor undulations in the water surface mimicking the natural water flow that currently exists.

Under low flow some of the larger boulders would be exposed from the water surface to the same extent as the current river condition. Placed boulders are not channel spanning and would provide multiple avenues to pass. Under both high and low flows, boaters would pass over the project area after project implementation with no effects to navigability or visitor experience.

Large Wood Source Areas
2010 Project Actions only: Dispersed recreation in the tree source stands in T.2S,R.6E, Section 33 (Map 4), consisting primarily of hiking and hunting, would not be impacted because trees proposed to be removed would be widely spaced so as not to create large gaps and would be removed near existing maintained roads. Recreation use levels are infrequent as the tree source location is behind a locked gate with public access being walk in only.

3.8.2 Action Alternative 1

Impacts of this alternative would be similar to that of the proposed action, with the exception that the primitive appearance of the reach would be slightly more impacted under this alternative. A few more (<10 small trees (< 6" dbh) would be disturbed or pushed over to enable ground transport of logs to restoration sites. The riparian forest stand adjacent to project sites is relatively open, such that 30 feet long logs would be moved on the same access routes used to haul excavation and fill materials with only requiring a few more small trees to be cleared.

3.8.3 Cumulative Effects

No cumulative effects to the Scenic Classification or the Outstandingly Remarkable Values of Salmon River are expected through the implementation of this project. This project is short term (less than one month) and small in scale with effects limited to the immediate project area.

3.8.4 No Action Alternative

Over the long term with delivery of LW from upstream reaches, channel stability and instream habitat conditions and would be expected to improve. With improvement in channel stability the primitive appearance of the segment would also improve over the long term, but at a slower rate than that of the proposed action. No impacts to primitiveness would be expected over the short term.

3.9 Wildlife

Affected Environment

The forest habitat in the vicinity of the project sites are late mid to early mature forest habitat, and riparian streamside habitat. The late mid/mature habitat is about 80 years of age and consists of Douglas-fir, Western hemlock, Western redcedar, with some red alder and big leaf maple.

The riparian habitat is similar in composition, with a significant component of big-leaf maple and red alder. Understory shrub layers and ground cover is fairly well developed with vine maple, huckleberries, salal, and sword fern predominating. There is some large coarse woody debris and snags present primarily in advanced decay classes.

2010 Project Actions only: The large wood source stands in T.2S., R.6E., Section 33 are two distinct forest types. Both are mature stands about 110 years of age. One stand consists of a low density (50-55 trees per acre) mature stands of Douglas-fir, Western hemlock with some Western redcedar. The other stand is a higher density stand (100+ trees per acre) which is similar in composition. There are few hardwoods, and large snags are lacking in these stands. There is coarse woody debris in the form of large down logs in advanced decay classes present.

The only threatened or endangered species which this project could affect would be the northern spotted owl. Habitat in the vicinity of the project sites is dispersal habitat with some elements of suitable habitat (few large trees, snags and coarse woody debris) for the spotted owl.

Existing disturbance factors are very high due to their proximity to human activity. There are rural residential areas, a major highway, and a recreation site resulting in high year round noise levels, reducing the suitability of the habitat for spotted owls. There are two distinct habitat types in the source stands. The low density (50-55 trees per acre) is dispersal habitat at best, because it is very open and lacks crown cover. The higher density (100+ trees per acre) is considered to be low quality suitable habitat, which lacks nesting structure (large trees/cull material and snags) for spotted owls. In addition, the presence of barred owls and great horned owls in the vicinity of both the project area sites and the source stands is highly likely. The closest known spotted owl sites are 1 to 2 miles from the source stand; and 1.5 to 2.5 miles from the project sites.

Oregon slender salamander, a Bureau Sensitive Species, is expected to occur both in the restoration project area and the 2010 project source stands. Habitat for the Oregon slender salamander is generally described as conifer stands with large Douglas-fir down logs in advanced stages of decay.

Harlequin ducks (Bureau Sensitive) have been observed during their spring migration from their wintering grounds on the coast, up the Sandy and Salmon Rivers upstream to their breeding grounds in headwater tributaries. They have been observed as late as April in the vicinity of the restoration project sites.

A number of migratory birds which are associated with late successional forest are expected to breed in the project area and source stands.

Environmental Effects

3.9.1 Proposed Action

Due to the location, nature, timing, and short duration of the activities at the project sites and the 2010 source stands, there would be no adverse effects to spotted owl. No suitable or dispersal habitat would be removed or downgraded, and the project would not reduce the overall function of any habitat for the spotted owl. There would be a seasonal restriction on all activities in the source stands during the critical nesting period for suitable habitat (March 1 to July 15); and dispersal habitat (March 1 to July 1). There are two spotted owl site centers 0.5+ to 1 mile from the planned helicopter flight path, which outside of the disruption distance for spotted owls.

The project is expected to have effects on Oregon slender salamander due to disturbance of down CWD and the forest floor. Effects are expected to be minimal because the project would be of short duration and would occur during the summer when salamander activity is low. Any down logs proposed for use in the project are harder material in the early stages of decay. Primary habitat for the Oregon slender salamander is large soft material in the more advanced stages of decay which would remain on site. Disturbance of this material is expected to be low.

Due to the timing of activities at the projects sites on the Salmon River, the project is expected to have no adverse effects to harlequin ducks. The project would occur outside the migration period, and is not located in any known nesting or brood rearing habitat.

Effects to migratory birds and habitat are expected to be low due to the nature, duration and timing of this project. The project would not be implemented until later in the summer when the majority of bird species have finished nesting.

3.9.2 Action Alternative 1

Impacts to wildlife of this alternative are similar to that of the Proposed Action, with the exception that impacts of 2010 project actions are slightly greater under this alternative. Yarding of trees to roads would disturb slightly more ground in the 2010 source stands, and slightly more ground would also be disturbed when renovating the access road from Miller Quarry to the restoration sites. Therefore, impacts to coarse woody debris and Oregon slender salamander habitat would be slightly greater than that of the proposed action.

3.9.3 Cumulative Effects

Due to the nature, duration and timing of this project, cumulative effects to wildlife species, including special status species and migratory birds, would be minimal. No habitat types would be changed, degraded or downgraded as a result of this project. The project area would remain late successional forest, and snag and CWD levels would remain well above Northwest Forest Plan requirements (USDI 1995; p.21).

3.9.4 No Action Alternative

Late Successional habitat in the project area would remain unchanged and undisturbed due to human activity. Due to the nature, duration and timing of this project, there few differences between the action and the no action alternatives from a wildlife perspective.

3.10 Other Elements of the Environment Based On Authorities and Management Direction

Table 2: Elements of the Environment to be analyzed based on Authorities and Management Direction

Table 2: Element of the Environment /Authority	*Remarks/Effects*
Aquatic Conservation Strategy	In compliance with PCFFA IV (Civ. No. 04-1299RSM), this project complies with the Aquatic Conservation Strategy described in the Northwest Forest Plan and RMP. This project also complies with the PCFFA II (265 F.3d 1028 (9th Cir. 2001)) by analyzing the site scale effects on the Aquatic Conservation Strategy. EA sections 3.2, 3.3, 3.4, 3.7, and 5.2.1 show how this project meets the Aquatic Conservation Strategy in the context of the PCFFA cases.
Air Quality (Clean Air Act as amended (42 USC 7401 et seq.)	This project would have no affect on air quality because the project does not include any prescribed burn actions.
Cultural Resources (National Historic Preservation Act, as amended (16 USC 470) [40 CFR 1508.27(b)(3)], [40 CFR 1508.27(b)(8)]	Inventories were completed prior to project implementation resulting in compliance with this direction. The project would have no effect on this element because no cultural resources were determined to be present in the proposed project areas.
Ecologically critical areas [40 CFR 1508.27(b)(3)]	The project would take place outside of areas of critical environmental concern (ACEC).
Energy Policy (Executive Order 13212)	This project is in compliance with this direction because this project would not interfere with the Energy Policy (Executive Order 13212).
Environmental Justice (E.O. 12898, "Environmental Justice" February 11, 1994)	This project is in compliance with this direction because project would have no effect on low income populations.
Fish Habitat, Essential (Magnuson-Stevens Act Provision: Essential Fish Habitat (EFH): Final Rule (50 CFR Part 600; 67 FR 2376, January 17, 2002)	This project is in compliance with this direction because NOAA's Biological Opinion (2008) determined habitat restoration actions would not result in adverse modification of EFH. Addressed in text (*Section 3.4*)
Farm Lands, Prime [40 CFR 1508.27(b)(3)]	The project would have no effect on this element because no prime farm lands are present on BLM land within the Cascades RA.
Floodplains (E.O. 11988, as amended, Floodplain Management, 5/24/77)	This project is in compliance with this direction. Addressed in text (*Section 3.2*)
Hazardous or Solid Wastes (Resource Conservation and Recovery Act of 1976 (43 USC 6901 et seq.) Comprehensive Environmental Repose Compensation, and Liability Act of 1980, as amended (43 USC 9615)	The project is in compliance with this direction because the Contractor is required to have a Spill Containment Kit and a Spill Prevention, Control, and Countermeasure Plan (SPCC) in case the excavator or other equipment leaks fuel or oil during the large wood work. The SPCC Plan will be reviewed and accepted by the Contracting Officer prior to initiating project work (*Section 2.2.1*).
Healthy Forests Restoration Act (Healthy Forests Restoration Act of 2003 (P.L. 108-148)	This project is in compliance with this direction because the project would have no adverse effect on the Healthy forests restoration act.
Migratory Birds (Migratory Bird Act of 1918, as amended (16 USC 703 et seq)	This project is in compliance with the Migratory Bird Treaty Act – Interim Management Guidance (BLM WO-2008-050). Addressed in text (*Section 3.9*)

Table 2: Element of the Environment /Authority	*Remarks/Effects*
Native American Religious Concerns (American Indian Religious Freedom Act of 1978 (42 USC 1996)	This project is in compliance with the AIRFA because there no known Native American religious sites are in the project area and no concerns from any Tribes were received during the scoping period. Addressed in text (*Section 5.2*).
Noxious weed or non-Invasive, Species (Federal Noxious Weed Control Act and Executive Order 13112)	This project is in compliance with this direction because due to the manner in which material would be transported to, and moved on site, no adverse effect from invasive species is anticipated. Excavator, self-loader, and other equipment would be washed and inspected prior to entering public lands to insure that no invasive weeds would be transported to the project site (USDI 2003). (*Section 2.2.1)*
Park lands [40 CFR 1508.27(b)(3)]	No Parklands are present within the project area.
Public Health and Safety [40 CFR 1508.27(b)(2)]	The project would have no adverse concern on public health and safety because all actions would follow established safety procedures for operating equipment, minimizing emissions, and avoiding fuel spills. (*Section 2.2.1)*
Other Special Status Species (BLM Manual 6840)	*Fish* - No other special status fish species are present in the Salmon River. *Plants* - Although suitable habitat for some Special Status Species (SSS) is present, no SSS are known from or expected to occur in the proposed project area or close proximity, and the project would not contribute to the need to list any SSS as threatened or endangered under the Endangered Species Act. Due to the nature of the project, identified suitable habitat would not be compromised. *Wildlife* - The proposal would not contribute to the need to list any special status wildlife species due to the location, nature, duration and timing of the project. Addressed in text (*Section 3.9*).
Threatened or Endangered Species (Endangered Species Act of 1983, as amended (16 USC 1531)	This project is in compliance with this direction because there would be no adverse effects to habitats of Threatened or Endangered Species. *Fish* - Addressed in text (*Sections 3.3, 3.4, and 5.2.1.2*) *Plants* - No T&E plant species or habitat are known or suspected to exist in the project area. *Wildlife* - The proposed action would have no adverse effects to T&E wildlife or habitat due to the location, nature, duration and timing of the project. Addressed in text (*Sections 3.9 and 5.2.1.1*)
Water Quality –Drinking, Ground (Safe Drinking Water Act, as amended (43 USC 300f et seq.) Clean Water Act of 1977 (33 USC 1251 et seq.)	This project is in compliance with this direction. Addressed in text (*Section 3.7*)
Wetlands (E.O. 11990 Protection of Wetlands 5/24/77) [40 CFR 1508.27(b)(3)]	This project is in compliance with this direction because no jurisdictional wetlands are in the project area. Addressed in text (*Section 3.2*)
Wild and Scenic Rivers (Wild and Scenic Rivers Act, as amended (16 USC 1271) [40 CFR 1508.27(b)(3)]	This project is in compliance with this direction because the project follows direction for management within W&S rivers Addressed in text (*Section 3.8*)

Table 2: Element of the Environment /Authority	*Remarks/Effects*
Wilderness (Federal Land Policy and Management Act of 1976 (43 USC 1701 et seq.); Wilderness Act of 1964 (16 USC 1131 et seq.)	This project is in compliance with this direction because the project does not take place within Wilderness.

3.11 Compliance with the Aquatic Conservation Strategy

3.11.1 Compliance with the Aquatic Conservation Strategy

Table 3 shows compliance with the four components of the Aquatic Conservation Strategy for all Action alternatives (1/ Riparian Reserves, 2/ Key Watersheds, 3/ Watershed Analysis and 4/ Watershed Restoration).

Table 3: Compliance of Components of the Aquatic Conservation Strategy

ACS Component	*Project Consistency*
Component 1 - Riparian Reserves	The proposed project would not negatively affect the integrity of Riparian Reserves. Placement of LW and planting tree seedlings would improve riparian and floodplain functioning.
Component 2 - Key Watershed	The Salmon River basin is a Tier 1 key watershed. The proposed project has been designed to meet the Tier 1 objective of conserving anadromous and resident fish species.
Component 3 - Watershed Analysis	The Salmon River Watershed Analysis (WA) was conducted by USFS in 1995. The WA recommended placement of LW on lower Salmon River to improve side channel connectivity, floodplain function, and aquatic habitat complexity.
Component 4 - Watershed Restoration	The proposed project is a restoration project. The restoration objectives of the project are described in section 1.3.

3.11.2 Documentation of Consistency with the Nine Aquatic Conservation Strategy Objectives for all Action Alternatives

This project was reviewed against the ACS objectives at the project scale (IM-OR-2007-60). *Table 4* describes the project's consistency with the nine Aquatic Conservation Strategy Objectives.

Table 4: Consistency with the Nine Aquatic Conservation Strategy Objectives

Consistency with ACS Objectives	*Reasoning*
1. Maintain and restore the distribution, diversity, and complexity of watershed and landscape-scale features to ensure protection of the aquatic systems to which species, populations and communities are uniquely adapted. *Both the No Action and the Proposed Action Alternatives do not retard or prevent the attainment of*	**No Action Alternative:** The No Action alternative would maintain the simplified aquatic habitat that currently exists. The current distribution, diversity and complexity of watershed and landscape-scale features would also be maintained. **Proposed Action:** The diversity and complexity of aquatic habitat would be enhanced. The aquatic system would be

Consistency with ACS Objectives	*Reasoning*
ACS objective 1.	restored to more closely resemble that to which the species, communities and populations are adapted. (Section 3.3)
2. Maintain and restore spatial and temporal connectivity within and between watersheds. *Both the No Action and the Proposed Action Alternatives do not retard or prevent the attainment of ACS objective 2.*	**No Action Alternative:** Current connectivity within and between watersheds would be maintained. **Proposed Action:** Connectivity within the watershed may be improved through improvement of habitat complexity. (Section 3.3)
3. Maintain and restore the physical integrity of the aquatic system, including shorelines, banks, and bottom configurations. *The No Action Alternative may retard the attainment of ACS objective 3. The Proposed Action does not retard or prevent the attainment of ACS objective 3.*	**No Action Alternative:** The current condition of physical integrity would be maintained or improve slightly over the long term **Proposed Action:** The physical integrity of shorelines, banks and bottom configurations would be restored by means of reintroduction of large structural elements and the retention of bedload that currently is routed rapidly through the system. (Section 3.2, 3.3, and 3.7)
4. Maintain and restore water quality necessary to support healthy riparian, aquatic, and wetland ecosystems. *Both the No Action and the Proposed Action Alternatives do not retard or prevent the attainment of ACS objective 4.*	**No Action Alternative:** The current condition of the water quality would be maintained. **Proposed Action:** Placement of LW and planting tree seedlings would improve water quality over the long term by increasing stream shade. Water quality would also be improved by increasing sediment deposition by placing LW to create areas of decreased stream velocities. (Section 3.7)
5. Maintain and restore the sediment regime under which aquatic ecosystems evolved. *The No Action Alternative may retard the attainment of ACS objective 5. The Proposed Action does not retard or prevent the attainment of ACS objective 5.*	**No Action Alternative:** Sediment currently in Salmon River would be expected to route quickly through the system into the Sandy River. Bedload transport would continue at a rapid pace with little instream structure to retain it. **Proposed Action:** The addition of large wood (LW) structure would be expected to retain some of the bedload in Salmon River. Throughout the project area the sediment regime would be restored to one more closely resembling that under which the aquatic ecosystems evolved. (Sections 3.3 and 3.7)
6. Maintain and restore in-stream flows sufficient to create and sustain riparian, aquatic, and wetland habitats and to retain patterns of sediment, nutrient, and wood routing. *Both the No Action and the Proposed Action Alternatives do not retard or prevent the attainment of ACS objective 6.*	**No Action Alternative:** No change in in-streams flows would be anticipated. **Proposed Action:** The project is not expected to change instream flows, however, it would result in localized reductions in the velocities of high flows, and would restore patterns of sediment, nutrient and wood routing. (Sections 3.3 and 3.7)

Consistency with ACS Objectives	*Reasoning*
7. Maintain and restore the timing, variability, and duration of floodplain inundation and water table elevation in meadows and wetlands. *Both the No Action and the Proposed Action Alternatives do not retard or prevent the attainment of ACS objective 7.*	**No Action Alternative:** The current condition of flood plains and their likelihood of inundation, as well as the water table elevations in meadows and wetlands is expected to be maintained. **Proposed Action:** The Salmon River channel has limited floodplain habitat due to its confinement by canyon walls, however, the addition of large structure is likely to restore floodplain inundation and water table elevation to the extent that the channel allows. No meadows and wetlands are near the project area. (Section 3.2)
8. Maintain and restore the species composition and structural diversity of plant communities in riparian areas and wetlands to provide adequate summer and winter thermal regulation, nutrient filtering, appropriate rates of surface erosion, bank erosion, and channel migration and to supply amounts and distributions of coarse woody debris sufficient to sustain physical complexity and stability. *Both the No Action and the Proposed Action Alternatives do not retard or prevent the attainment of ACS objective 8.*	**No Action Alternative:** Development of physical complexity and stability would occur over the long term as LW is delivered to the project site from upstream reaches. **Proposed Action:** Riparian tree plantings would improve the species composition and structural diversity of riparian plant communities and improve supplies of LW over the long term. Restoration of plant composition would occur faster than under the no action alternative. (Section 3.2)
9. Maintain and restore habitat to support well-distributed populations of native plant, invertebrate and vertebrate riparian-dependent species. *The No Action Alternative may retard the attainment of ACS objective 9. The Proposed Action does not retard or prevent the attainment of ACS objective 9.*	**No Action Alternative:** The aquatic habitat would remain in a simplified state and less capable of supporting well-distributed populations of native invertebrate and vertebrate populations. **Proposed Action:** Aquatic habitat in Salmon River would be more capable of supporting well-distributed populations of native invertebrate and vertebrate populations due to increased habitat complexity and diversity. (Section 3.3)

4.0 LIST OF PREPARERS

Resource	***Name***
Botany TES and Special Attention Plant Species	Terry Fennell
Cultural Resources	Heather Ulrich
Fisheries	Bruce Zoellick
Hydrology/ Water Quality	Patrick Hawe
NEPA	Carolyn Sands
Recreation Sites and Visual Resources Management and Rural Interface	Zach Jarrett
Roads/Engineering	Dan Nevin
Soils	Patrick Hawe
Vegetation/Silviculture	Alisa Tanner
Wildlife TES and Special Attention Animal Species	Jim England

5.0 CONTACTS AND CONSULTATION

5.1 Coordination with other Agencies and Organizations

Oregon Department of Fish and Wildlife (ODFW) biologists were consulted with regarding project impacts to salmon and steelhead habitats.

5.2 Consultation (ESA Section 7 and Section 106 with SHPO)

5.2.1 ESA Section 7 Consultation

5.2.1.1 US Fish and Wildlife Service

Consultation for proposed fish habitat restoration projects such as this one are included in the *Programmatic Biological Assessment for Aquatic Habitat Restoration Activities in Oregon and Washington, CY 2007 – CY 2012. A Programmatic Biological Opinion and Letter of Concurrence for Aquatic Restoration Activities (ARBO)* was issued on June 14, 2007 (FWS Reference # 13420-2007-F-0055). The only threatened or endangered species which this project could affect would be the northern spotted owl. Due to the location, nature, duration and timing of this project, no adverse effects to northern spotted owls or their habitat are anticipated (no effect from habitat modification or disturbance). No suitable or dispersal habitat would be removed or downgraded, and the project would not reduce the overall function of any habitat for the spotted owl.

The project would have no disturbance effects to the spotted owl because the project would occur mostly outside of the critical nesting season for spotted owls (after July 1), and is not located within disturbance distance of any known spotted owl sites. The project would have no effects on Critical Habitat because the project sites and source stand are not located in Critical Habitat.

5.2.1.2 National Marine Fisheries Service (NMFS)

NMFS (2008) concluded that restoration projects similar to this one may affect, but are not likely to jeopardize the continued existence of Lower Columbia River (LCR) steelhead trout, LCR coho salmon, and LCR Chinook salmon, nor are they likely to adversely modify their designated critical habitat. Short-term adverse impacts of the habitat restoration projects include displacement of juvenile salmonids from near shore habitats and main channel project sites during project construction, and disruption of feeding (unable to see prey items) during short term increases in turbidity (see *section 3.3.1*). No long-term adverse effects of the restoration projects on ESA listed fish or their habitat are expected because turbidity levels would return to background levels soon after cessation of in-water work (*section 3.7*).

Additionally, no sediment is expected to move from access routes to the river because soils are sandy and well-drained (see *section 3.6*) and the routes would be revegetated upon completion of the project (see Restoration Plan). Adult ESA listed fish would not be impacted because restoration work would be conducted during the in-water work period when adult fish are absent from the project reach. Habitat quantity and quality for ESA listed fish would improve over the short to long term as a result of the restoration actions (see *sections 3.3.1 and 3.4.1*). Consultation for aquatic restoration projects such as this are included in the Programmatic Consultation Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation for Fish Habitat Restoration Activities in Oregon and Washington, CY2007-CY2012 issued by NMFS on June 27, 2008.

5.2.2 Cultural Resources - Sec. 106 Consultation with State Historical Preservation Office:

Cultural surveys were conducted in compliance with section 106 of the National Historic Preservation Act for the areas to be impacted by stream restoration and log removal for restoration purposes.

In 2008, the Forest Service conducted research and field surveys of of the stream channel project locations and the adjacent 100 yards. Report # C08-05 stated that no cultural resources were located. Reports C84-9, C90-5 and, C96-3 summarize field inventories conducted in Township 2 south, Range 6 east, section 33, the location of log removal for use in the stream restoration projects. These cultural resource inventories resulted in no cultural resources being located.

In summary, all areas of the Salmon River Restoration project have been previously inventoried for cultural resources and none have been located, therefore consultation with SHPO is not required. If at any time during the project any cultural resources are observed, all activities must cease until a professional archaeologist can assess the significance of the discovery.

5.3 Public Scoping and Notification

A scoping letter was sent on February 11, 2010 to federal, tribal, state and municipal government agencies, nearby landowners, and interested parties on the Cascades Resource Area mailing list. A second scoping letter was sent to 10 additional nearby landowners on April 13, 2010. Responses are described in *section 1.4* of this EA.

5.3.1 EA public comment period

The EA and FONSI will be made available for public review May 19, 2010 to June 4, 2010. The notice for public comment will be published in a legal notice by the ***Sandy Post*** newspaper. Comments received by the Cascades Resource Area of the Salem District Office, 1717 Fabry Road SE, Salem, Oregon 97306, on or before June 4, 2010 will be considered in making the final decisions for this project.

6.0 MAJOR SOURCES

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7.0 Appendices

7.1 Appendix A: Turbidity and Erosion Control Conditions applicable to Salmon River Restoration Project Work as part of the 401 Water Quality Certification issued by ODEQ

1) Turbidity: All practical Best Management Practices (BMPs) on disturbed bank and within the stream shall be implemented to minimize turbidity during in-water work. OAR 340-041-0036 states that turbidity shall not exceed 10% above natural stream turbidities, except where allowed by the rule. This rule also states that limited duration activities necessary to accommodate essential dredging, construction or other legitimate activities and which cause the turbidity standard to be exceeded may be authorized provided all practical turbidity control techniques have been applied and a section 401 water quality certificate has been granted.
    a. Monitoring: Turbidity monitoring shall be conducted and recorded as described below. Monitoring shall occur each day during daylight hours when in-water work is being conducted. A properly and regularly calibrated turbidimeter is recommended, however, visual gauging is acceptable.
        i. Representative Background Point: a sample or observation must be taken every four hours at a relatively undisturbed area approximately 100 feet upcurrent from in-water disturbance to establish background turbidity levels for each monitoring cycle. Background turbidity, location, and time must be recorded prior to monitoring downcurrent.

ii. Compliance Point: Monitoring shall occur every four hours approximately 100 feet down current from the point of discharge and be compared against the background measurement or observation. The turbidity, location, and time must be recorded for each sample.

b. Compliance: Results from the compliance points should be compared to the background levels taken during each monitoring interval. Exceedances are allowed as follows:

Monitoring with a Turbidimeter		
Allowable Exceedance Turbidity Level	***Action Required at 1st Monitoring Interval***	***Action Required at 2nd Monitoring Interval***
0 to 5 NTU above background		
5 to 29 NTU above background	Modify BMPs & continue to monitor every 4 hours	Stop work after 8 hours at 5-29 NTU above background
30 to 49 NTU above background	Modify BMPs & continue to monitor every 2 hours	Stop work after 2 hours at 30-49 NTU above background
50 NTU or more above background	Stop work	Stop work
Visual Monitoring		
No plume observed	Continue to monitor every 4 hours	Continue to monitor every 4 hours
Plume observed	Modify BMPs & continue to monitor every 4 hours	Stop work after 8 hours with an observed plume

When monitoring visually, turbidity that is visible over background is considered an exceedance of the standard. If an exceedance over the background level occurs, the applicant must modify the activity and continue to monitor every four hours or as appropriate (above). If an exceedance over the background levels continues after the second monitoring interval, the activity must stop until the turbidity levels return to background. If, however, turbidity levels return to background at second monitoring level due to implementation of BMPs or natural attenuation, work may continue with appropriate monitoring as above. If an exceedance occurs at: 50 NTU or more over background; 30 NTU over background for 2 hours; or 5-29 NTU over background for 8 hours, the activity must stop immediately for the remainder of that 24-hour period.

c. Reporting: Copies of daily logs for turbidity monitoring shall be available to DEQ, USACE, NMFS, USFWS, and ODFW upon request. The log must include: background NTUs, compliance point NTUs, comparison of the points in NTUs, and location, time, and tidal stage (if applicable) for each reading. Additionally, a narrative must be prepared discussing all exceedances with subsequent monitoring, actions take, and the effectiveness of the actions.

d. BMPs to Minimize In-stream Turbidity:
   i. Sequence/Phasing of work – the applicant will schedule work activities so as to minimize in-water disturbance and duration of in-water disturbances;
   ii. Bucket control – All in-stream digging passes by excavation machinery and placement of fill in-stream using a bucket shall be completed so as to minimize turbidity. All practicable techniques such as employing an experienced equipment operator, not dumping partial or full buckets of material back into the wetted stream, adjusting the volume, speed, or both of the load, or by using a closed-lipped environmental bucket shall be implemented;

iii. Limit the number and location of stream crossing events. Establish temporary crossing sites as necessary at the least impacting areas and supplement with clean gravel or other temporary methods as appropriate;
iv. Machinery will not drive into the flowing channel;
v. Excavated material will be placed so that it is isolated from the water edge or wetlands and not placed where it could re-enter waters of the state uncontrolled; and,
vi. Use of containment measure such as silt curtains, geotextile fabric, and silt fence will be implemented and properly maintained in order to minimize in-stream sediment suspension and resulting turbidity.

2) Erosion Control: The applicant is referred to DEQ's *Oregon Sediment and Erosion Control Manual*, April 2005. The following erosion control measures (and others as appropriate) or comparable measures as specified in a NPDES 1200-C permit (if required) shall be implemented during construction/project activities:
   a. Filter bags, sediment traps or catch basin, vegetative strips, berms, Jersey barriers, fiber blankets, bonded fiber matrices, geotextiles, mulches, wattles, sediment fences, or other measures used in combination shall be used to prevent movement of soil from uplands into waterways or wetlands;
   b. Stop work after 8 hours at 5-29 NTU above background An adequate supply of material needed to control erosion must be maintained at the project site;
   c. To prevent stockpile erosion, use compost berms, impervious materials or other equally effective methods, during rain events or when the stock pile site is not moved or reshaped for more than 48 hours;
   d. Erosion control measures shall be inspected and maintained daily, or more frequently as necessary, to ensure their continued effectiveness and shall remain in place until all exposed soil is stabilized;
      i. If monitoring or inspection shows that the erosion and sediment controls are ineffective, mobilize work crews immediately to make repairs, install replacements, or install additional controls as necessary.
      ii. Remove sediment from erosion and sediment controls once it has reached 1/3 of the exposed height of the control.
   e. Unless part of the authorized permanent fill, all construction access points through, and staging areas in, riparian or wetland areas shall use removable pads, mats, or other methods as necessary to prevent soil compaction, unless doing so would be more impactful to these or surrounding resources.
   f. Flag or fence off avoided wetlands and newly planted areas to protect from disturbance and/or erosion.
   g. Dredged or other excavated material shall be placed on upland areas with stable slopes to prevent materials from eroding back into waterways or wetlands;
   h. Sediment from disturbed areas or in any way able to be tracked by vehicles onto pavement shall not be allowed to leave the site in amounts that would reasonably be expected to enter waters of the state and impair water quality. Placement of clean aggregate at all construction entrances, and other BMPs such as truck or wheel washes if needed, will be used when earth moving equipment will be leaving the site and traveling on paved surfaces; and,
   i. Projects which disturb one acre or more require an NPDES 1200C Storm Water Discharge Permit. Contact the appropriate DEQ regional office for more information (Contact information can be found at: http://www.deq.state.or.us/wq/).

7.2 Appendix B: River Design Group, Inc. (RDG) Salmon River Restoration Project Design Drawings

The following pages show the Salmon River Restoration Project Design Drawings prepared by River Design Group, Inc. (RDG).

Salmon River at Miller Quarry

Restoration Demonstration Project for Salmonid Habitat Improvement

PROJECT DESIGNED IN ACCORDANCE WITH AQUATIC RESTORATION BIOLOGICAL OPINION (ARBO)

PROJECT PARTNERS

The Freshwater Trust — Changing the course of conservation.

Oregon Watershed Enhancement Board — OWEB

Forest Service — U.S. Department of Agriculture

U.S. Department of the Interior — Bureau of Land Management

Portland Water Bureau — From Forest to Faucet

Sandy River Basin Partners

FishAmerica Foundation

National Oceanic and Atmospheric Administration — NOAA — U.S. Department of Commerce

PROJECT DESCRIPTION

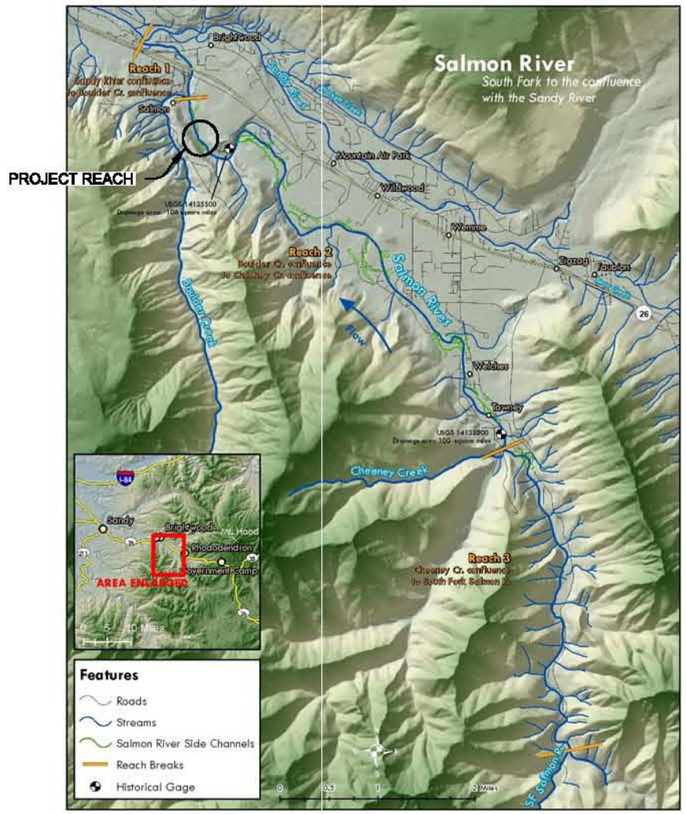
THIS PROJECT CONSISTS OF THE PLACEMENT OF ELEVEN ENGINEERED LARGE WOOD STRUCTURES, THE AUGMENTATION OF A NATURALLY OCCURRING BAR APEX LOG JAM, THE CONSTRUCTION OF AN ENGINEERED RIFFLE AND THE RE-CONNECTION OF THE SALMON RIVER TO SIDE-CHANNELS. THE LARGE WOOD PLACEMENT IS DESIGNED TO PROMOTE AND MAINTAIN POOL SCOUR AND IMPROVE ADULT SALMONID POOL HABITAT. THE LARGE WOOD PLACEMENT WILL ALSO INCREASE HABITAT DIVERSITY, HYDRAULIC COMPLEXITY, SIDE CHANNEL CONNECTION MAINTENANCE AND PROVIDE STRUCTURAL ELEMENTS TO INCREASE POOL FREQUENCY IN A PLANE-BED REACH OF THE SALMON RIVER. THE LARGE WOOD PLACEMENT WITHIN THE SIDE CHANNEL WILL PROMOTE THE DEVELOPMENT OF OFF CHANNEL HABITAT. THE ENGINEERED RIFFLE IS A LOW HEAD STRUCTURE THAT UTILIZES A DESIGN MATRIX COUPLED WITH LARGE BOULDER - ROUGHNESS ELEMENTS THAT WILL BACKWATER AN EXISTING POOL THAT IS TO BE DEEPENED. THE STRUCTURE WILL PROVIDE ADDITIONAL HEAD TO CONTRIBUTE FLOW DOWN A HISTORIC SIDE-CHANNEL THAT IS TO BE RE-CONNECTED AS A COMPONENT OF THIS PROJECT. THE COMBINATION OF ENGINEERED LARGE WOOD STRUCTURES AND AN ENGINEERED RIFFLE WILL SIGNIFICANTLY INCREASE THE AVAILABLE POOL HABITAT IN THIS REACH IN ADDITION TO SUPPORTING THE REACTIVATION AND MAINTENANCE OF TWO SIDE CHANNELS.

BENCHMARK

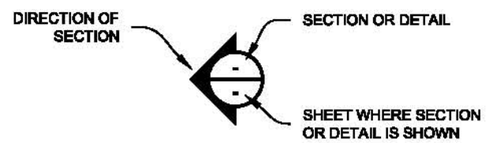
SURVEY CONTROL USED FOR THE PROJECT IS PROVIDED ON DRAWING 2.0. THE HORIZONTAL DATUM IS NAD 83, STATE PLANE COORDINATES, OREGON ZONE NORTH, US SURVEY FEET, AND THE VERTICAL DATUM IS NAVD 88. THE BENCHMARK COORDINATES CORRESPOND TO THE TOP CENTER OF CONTROL MARKERS LISTED ON DRAWING.

DRAWING INDEX

PROJECT VICINITY MAP



T2S-R6E SECTION 25
USGS QUADRANGLE: SALMON



CROSS-SECTION SHEET REFERENCE

NEPA REVIEW

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311 SW Jefferson Avenue
Corvallis, OR 97333
541.758.3790
3098 Hwy 93 South
Whitefish, MT 59937
406.862.4927

COVER PAGE AND NOTES

SALMON RIVER, MILLER QUARRY REACH SALMONID HABITAT IMPROVEMENT

SALMON RIVER, CLACKAMAS COUNTY, OREGON

NO.	DATE	BY	DESCRIPTION	CHK
-	01/28/10	SW	ISSUED FOR NEPA REVIEW	SW

PROJECT NUMBER
RDG-09-042

DRAWING NUMBER
1.0

GENERAL NOTES TO CONTRACTOR

1. THE CONSTRUCTION SPECIFICATIONS AND MATERIAL SPECIFICATIONS DESCRIBE MINIMUM ACCEPTABLE QUALITY OF WORK AND MATERIALS FOR THE PROJECT. IF A CONFLICT ARISES BETWEEN THE DRAWINGS AND SPECIFICATIONS, THE SPECIFICATION GOVERNS THE WORK AND/OR MATERIAL. THE DRAWINGS ARE A VISUAL REPRESENTATION TO COMPLEMENT CONSTRUCTION AND MATERIAL SPECIFICATIONS. THE DRAWINGS INCLUDE LOCATION, PROFILES, SECTIONS, DETAILS AND NOTES NECESSARY TO DESCRIBE THE WORK. IF SITE CONDITIONS WARRANT CHANGES TO THE PLANS, THE PROJECT INSPECTOR RESERVES THE RIGHT TO DIRECT THE CONTRACTOR TO MAKE THESE MODIFICATIONS. NO CHANGES SHALL BE MADE TO THE DRAWINGS OR SPECIFICATIONS WITHOUT PRIOR WRITTEN APPROVAL OF THE PROJECT INSPECTOR.

2. IN THE EVENT THAT A PERMIT CONDITION CONFLICTS WITH THE DRAWINGS AND SPECIFICATIONS, THE ISSUE SHALL BE BROUGHT TO THE ATTENTION OF THE PROJECT INSPECTOR FOR CLARIFICATION PRIOR TO PROCEEDING WITH WORK.

3. THE PROJECT SHALL BE CONSTRUCTED ACCORDING TO THE PLAN SET. THE CONTRACTOR SHALL NOTIFY THE PROJECT INSPECTOR OF ANY CHANGES PRIOR TO IMPLEMENTATION. THE PROJECT INSPECTOR FOR THIS PROJECT SHALL BE RIVER DESIGN GROUP, INC.

4. RIVER DESIGN GROUP MAKES NO REPRESENTATION OF THE EXISTENCE OR NONEXISTENCE OF UTILITIES. CONTRACTOR IS RESPONSIBLE FOR CALLING THE OREGON UTILITY NOTIFICATION CENTER (800-332-2344) AT LEAST TWO BUSINESS DAYS PRIOR TO DIGGING.

5. COSTS INCURRED DUE TO PROJECT DELAYS RESULTING FROM FAILURE OF THE CONTRACTOR TO MEET THE REQUIREMENTS OF THE GENERAL NOTES TO CONTRACTOR, SAFETY, CONTRACTOR QUALIFICATIONS, MATERIAL SPECIFICATIONS, EQUIPMENT SPECIFICATIONS, CONSTRUCTION SPECIFICATIONS, AND PLAN SET SHALL BE THE EXPENSE OF THE CONTRACTOR.

SAFETY

1. THE CONTRACTOR IS RESPONSIBLE FOR COMPLIANCE WITH ALL STATE AND LOCAL LAWS, ORDINANCES, CODES, AND/OR REGULATIONS APPLICABLE FOR THE PROJECT INSTALLATION. THE PROJECT INSPECTOR WILL DOCUMENT ANY SAFETY VIOLATIONS WITNESSED.

CONTRACTOR QUALIFICATIONS

1. THE CONTRACTOR SHALL HAVE AT LEAST TWO (2) YEARS OF RIVER RESTORATION CONSTRUCTION EXPERIENCE AND SHALL HAVE COMPLETED AT LEAST FIVE (5) RIVER RESTORATION PROJECTS. SIMILAR EXPERIENCE WILL BE EVALUATED ON A CASE BY CASE SCENARIO.

2. IF THE CONTRACTOR CHOOSES TO DESIGNATE AN EMPLOYEE WITHOUT QUALIFIED STREAM RESTORATION EXPERIENCE, THE CONTRACTOR SHALL BE ON-SITE AT ALL TIMES WHEN THE EMPLOYEE IS PERFORMING RIVER RESTORATION WORK. FAILURE TO ABIDE BY THIS CONDITION WITHOUT PREVIOUS AGREEMENT WITH THE PROJECT INSPECTOR WOULD BE GROUNDS FOR TERMINATION.

3. THE CONTRACTOR SHALL MAINTAIN AT LEAST $2,000,000 IN LIABILITY INSURANCE AND HAVE PROOF OF LIABILITY INSURANCE ON-SITE DURING THE ENTIRETY OF PROJECT CONSTRUCTION.

4. THE CONTRACTOR SHALL HAVE PROOF OF WORKER'S COMPENSATION INSURANCE ON-SITE DURING THE ENTIRETY OF PROJECT CONSTRUCTION.

5. COPIES OF ALL PROJECT PERMITS SHALL BE POSTED ON-SITE IN A VISIBLE LOCATION. THE CONTRACTOR SHALL COMPLY WITH THE PROVISIONS OF THE PERMITS. THE CONTRACTOR SHALL NOTIFY THE CONSTRUCTION MANAGER OF ANY KNOWN CHANGES OR ACTIVITIES THAT COULD VIOLATE PERMIT REQUIREMENTS PRIOR TO IMPLEMENTATION.

MATERIALS SPECIFICATIONS

1. THE CONTRACTOR SHALL FURNISH ALL MATERIALS NECESSARY TO CONSTRUCT THE PROJECT UNLESS OTHER PROVISIONS HAVE BEEN AGREED UPON PRIOR TO CONSTRUCTION. THE CONTRACTOR SHALL DELIVER ALL MATERIALS TO THE DESIGNATED STOCKPILE LOCATIONS LABELED ON THE PLAN SET OR TO A LOCATION SPECIFIED BY THE PROJECT INSPECTOR. IF A MATERIAL SOURCE HAS BEEN PRE-DETERMINED, THE PROJECT INSPECTOR SHALL PROVIDE DIRECTIONS TO THE CONTRACTOR.

2. MATERIAL QUANTITIES, DIMENSIONS AND SIZES SHALL CONFORM TO THE NOTES AND SPECIFICATIONS PROVIDED ON THE PLAN SET OR ON THE MATERIALS LIST.

3. THE PROJECT INSPECTOR SHALL INSPECT AND APPROVE ALL MATERIALS PRIOR TO CONSTRUCTION. IF MATERIALS DO NOT MEET THE MINIMUM REQUIREMENTS SPECIFIED IN THE PLAN SET OR MATERIAL LIST, THE PROJECT INSPECTOR SHALL REJECT THE MATERIALS.

EQUIPMENT SPECIFICATIONS

1. THE CONTRACTOR SHALL FURNISH ALL EQUIPMENT NECESSARY TO CONSTRUCT THE PROJECT. AT A MINIMUM, THE CONTRACTOR SHALL PROVIDE THE FOLLOWING EQUIPMENT FOR THIS PROJECT:

EXCAVATOR - AT A MINIMUM, ONE EXCAVATOR(S) SHALL BE REQUIRED. THE EQUIPMENT SHALL BE CAPABLE OF MOVING LARGE WOOD (30 FOOT STEMS, WITH A 6 FOOT ATTACHED ROOTWAD WITH A MINIMUM TRUNK DIAMETER OF 2 FEET). THE EQUIPMENT MUST ALSO BE ABLE TO RAISE AND PLACE A 5.5 FOOT DIAMETER ROCK AT A WEIGHT OF 16,000 LBS. MINIMUM BUCKET VOLUME SHALL BE ONE (1) CUBIC YARD(S). THE BUCKET SHALL BE EQUIPPED WITH A HYDRAULIC THUMB FOR GRASPING LOGS, ROCKS, AND OTHER MATERIALS. THE EQUIPMENT MUST BE CAPABLE OF CROSSING WATER AND WORKING ON OR ADJACENT TO STEEP SLOPES. A CHAIN SHALL BE AVAILABLE FOR ATTACHING CULVERTS, PUMPS AND OTHER EQUIPMENT OR MATERIALS TO THE BUCKET FOR TRANSPORT ON-SITE.

OFF-ROAD DUMP TRUCK - TWO (2) DUMP TRUCK(S) SHALL BE REQUIRED FOR THIS PROJECT. TRUCK(S) SHALL HAVE A MINIMUM BED VOLUME OF EIGHT (8) CUBIC YARDS. THE TRUCK(S) SHALL BE CAPABLE OF DRIVING ON NON-ASPHALT SURFACES AND OFF-ROAD SURFACES.

TRASH PUMP - ONE (1) TRASH PUMP SHALL BE REQUIRED. DISCHARGE CAPACITY SHALL BE AT LEAST 450 GPM (1 CFS). TOTAL HEAD LIFT SHALL BE AT LEAST 95 FT. PUMPS SHALL BE EQUIPPED WITH AT LEAST 100 FEET OF 4" DIAMETER OUTLET HOSE. A PIPE WRENCH SHALL BE AVAILABLE FOR ATTACHING HOSES. FUEL AND OIL SHALL BE SUPPLIED FOR THE TRASH PUMPS.

CHAINSAW - ONE (1) CHAINSAW SHALL BE REQUIRED. THE CHAINSAW MUST BE CAPABLE OF COMPLETELY SAWING LOGS OF THE DIAMETER SPECIFIED IN THE MATERIAL SPECIFICATIONS. ALSO, THE CHAINSAW MUST BE CAPABLE OF SAWING HDPE OR PVC CULVERTS OR PIPES AS NOTED IN THE MATERIAL SPECIFICATIONS.

3. ALL EQUIPMENT SHALL BE WASHED PRIOR TO MOBILIZATION TO THE SITE TO MINIMIZE THE INTRODUCTION OF FOREIGN MATERIALS AND FLUIDS TO THE PROJECT SITE. ALL EQUIPMENT SHALL BE FREE OF OIL, HYDRAULIC FLUID, AND DIESEL FUEL LEAKS. TO PREVENT INVASION OF NOXIOUS WEEDS OR THE SPREAD OF WHIRLING DISEASE SPORES, ALL EQUIPMENT SHALL BE POWER WASHED OR CLEANED TO REMOVE MUD AND SOIL PRIOR TO MOBILIZATION INTO THE PROJECT AREA. IT WILL BE THE CONTRACTOR'S RESPONSIBILITY TO INSURE THAT ADEQUATE MEASURES HAVE BEEN TAKEN.

4. EQUIPMENT SHALL BE IN A WELL-MAINTAINED CONDITION TO MINIMIZE THE LIKELIHOOD OF A FLUID LEAK. IF A FLUID LEAK DOES OCCUR, THE PROJECT INSPECTOR SHALL BE NOTIFIED IMMEDIATELY, AND ALL WORK CEASED UNTIL THE LEAK HAS BEEN RECTIFIED. AT ALL TIMES DURING THE CONSTRUCTION PHASE, FLUID SPILL CONTAINMENT EQUIPMENT SHALL BE PRESENT ON-SITE AND READY FOR DEPLOYMENT SHOULD AN ACCIDENTAL SPILL OCCUR. PROJECT INSPECTOR RESERVES THE RIGHT TO REFUSE EQUIPMENT THAT DOES NOT MEET THE PREVIOUS CRITERIA.

5. THE CONTRACTOR SHALL MAINTAIN A COMPLETE TOOL SET WITH COMMONLY REPLACED PARTS (E.G. O-RINGS) TO MINIMIZE DOWNTIME IN THE EVENT OF EQUIPMENT MALFUNCTION. THE CONTRACTOR SHALL HAVE AN EMERGENCY SPILL KIT ON SITE DURING THE PROJECT.

MOBILIZATION SPECIFICATIONS

1. ALL MOBILIZATION AND DEMOBILIZATION WILL BE PERFORMED IN A SAFE AND ORDERLY MANNER WITH PARTICULAR CARE NOT TO DAMAGE EXISTING VEGETATION OR UNDUE DISTURBANCE TO THE INGRESS-EGRESS ROUTE.

2. THE CONTRACTOR IS RESPONSIBLE FOR DAMAGE INCURRED TO PROPERTY RESOURCES DURING MOBILIZATION AND DE-MOBILIZATION. VEGETATION THAT MAY BE CAUSE FOR CONCERN DURING MOBILIZATION SHALL BE IDENTIFIED BY THE CONTRACTOR AND FLAGGED BY THE PROJECT INSPECTOR AT THE TIME OF THE PROJECT "WALK THROUGH".

3. INGRESS AND EGRESS ROUTES TO THE PROJECT SITE WILL BE IDENTIFIED DURING THE PROJECT "WALK THROUGH".

4. UPON COMPLETION OF CONSTRUCTION AND DEMOBILIZATION ACTIVITIES THE CONTRACTOR SHALL PERFORM SITE RESTORATION. ALL COMPACTED SURFACES ARE TO BE RIPPED TO A MINIMUM DEPTH OF 4 INCHES FOR SEEDING PREPARATION. ORGANIC CONSTRUCTION DEBRIS SHALL BE PLACED AT THE DIRECTION OF THE PROJECT INSPECTOR ON SURFACES EXPOSED DURING CONSTRUCTION. SITE RESTORATION SHALL BE CERTIFIED COMPLETE IN WRITING BY THE PROJECT INSPECTOR UPON COMPLETION OF CONSTRUCTION ACTIVITIES.

CONSTRUCTION SPECIFICATIONS

1. CONSTRUCTION SHALL OCCUR IN ACCORDANCE WITH THE PLAN SET, CONSTRUCTION SPECIFICATIONS, EQUIPMENT SPECIFICATIONS, MATERIAL SPECIFICATIONS, REVEGETATION SPECIFICATIONS AND GENERAL SPECIFICATIONS.

2. PRIOR TO CONSTRUCTION, CONSTRUCTION AREAS WILL BE STAKED OUT USING A SURVEY GRADE GLOBAL POSITIONING SYSTEM (GPS), TOTAL STATION, OR SURVEY LASER. THE PROJECT INSPECTOR SHALL STAKE THE LOCATIONS OF THE CONSTRUCTION ACCESS, STOCKPILE LOCATIONS, LIMITS OF DISTURBANCE, TEMPORARY DIVERSION CHANNELS, TEMPORARY CULVERTS, PROPOSED CHANNEL CENTERLINE, PROPOSED CHANNEL MARGINS, CHANNEL BED FEATURES, FLOODPLAIN EXTENTS, WETLANDS AND ALL STRUCTURES ACCORDING TO THE PLAN SET. AT A MINIMUM, STAKING OF FEATURES SHALL OCCUR EVERY 25 FEET ALONG THE ALIGNMENT. THE CONTRACTOR SHALL MINIMIZE DISTURBANCE TO GRADE STAKES. IF EXCESSIVE DISTURBANCE TO GRADE STAKES BY THE CONTRACTOR OCCURS, IT SHALL BE THE CONTRACTOR'S EXPENSE TO RE-STAKE THE PROJECT.

3. CONSTRUCTION ACCESS SHALL BE DETERMINED BY THE PROJECT INSPECTOR. CONSTRUCTION EQUIPMENT SHALL NOT CROSS PRIVATE LAND UNLESS PERMISSION IS OBTAINED FROM THE LANDOWNER. THE CONTRACTOR SHALL LEAVE ALL GATES, WHETHER OPEN OR CLOSED, AS FOUND.

4. STREAM CROSSINGS SHALL BE MINIMIZED DURING CONSTRUCTION. IF MULTIPLE CROSSINGS (10 OR MORE) ARE EXPECTED, THE CONTRACTOR SHALL PROVIDE AND INSTALL TEMPORARY CULVERTS SO THAT EQUIPMENT CAN CROSS THE STREAM WITHOUT GENERATING EXCESS TURBIDITY. TEMPORARY CULVERT SIZES SHALL ACCOMMODATE 150% OF EXPECTED BASE FLOW DURING CONSTRUCTION. THE PROJECT INSPECTOR SHALL SPECIFY THE SIZES AND LOCATIONS OF THE TEMPORARY CULVERTS.

5. PRIOR TO CONSTRUCTION, TEMPORARY DIVERSION CHANNELS SHALL BE CONSTRUCTED TO DIVERT WATER AWAY FROM CONSTRUCTION AREAS. TEMPORARY DIVERSION CHANNELS SHALL BE LOCATED AND CONSTRUCTED ACCORDING TO THE DESIGN REPORT OR PLAN SET. TEMPORARY DIVERSION CHANNELS CONSTRUCTED IN FINE SOILS SUCH AS SAND, SILT, OR ORGANIC MATERIAL SHALL BE COMPLETELY LINED WITH FABRIC TO PREVENT EROSION. THE CONTRACTOR SHALL USE "ECO BLOCKS", OR AN APPROVED EQUAL, FOR CONSTRUCTING COFFERDAMS FOR TEMPORARY DIVERSION CHANNELS. THE CONTRACTOR SHALL DIVERT WATER INCREMENTALLY INTO THE TEMPORARY DIVERSION CHANNEL TO MINIMIZE TURBIDITY AND PERMIT FISH TO MOVE OUT OF THE DEWATERED CHANNEL SEGMENTS. THE CONTRACTOR SHALL NOTIFY THE CONSTRUCTION MANAGER PRIOR TO DEWATERING CHANNEL SEGMENTS. THE PROJECT INSPECTOR SHALL NOTIFY A QUALIFIED FISH BIOLOGIST OF POSSIBLE FISH RESCUE NEEDS.

6. STRAW BALES AND SILT FENCING SHALL BE AVAILABLE AND INSTALLED BY THE CONTRACTOR IF DEEMED NECESSARY BY THE PROJECT INSPECTOR. CONSTRUCTION FENCING (LIMITS OF DISTURBANCE) SHALL BE INSTALLED BY THE CONTRACTOR IF DEEMED NECESSARY BY THE PROJECT INSPECTOR.

7. THE CONTRACTOR SHALL EXCAVATE THE CHANNEL TO APPROXIMATE DESIGN DIMENSIONS USING THE EXCAVATOR. EXCAVATION SHALL COMPLY WITH CONSTRUCTION STAKES AND THE PLAN SET. EXCAVATION SHALL ESTABLISH CHANNEL ELEVATIONS WITHIN ONE-HALF FOOT OF FINAL ELEVATIONS. THE PROJECT INSPECTOR SHALL INSPECT THE CHANNEL EXCAVATION FOR COMPLIANCE WITH THE PLAN SET. ALL EXCAVATED MATERIALS SHALL BE STOCKPILED ON-SITE, ABOVE THE BANKFULL CHANNEL UNTIL HAULED OFF-SITE OR USED ON-SITE. DISTURBANCE TO RIPARIAN VEGETATION, CHANNEL BANKS AND SOD SHALL BE MINIMIZED. EXCAVATED SOD AND RIPARIAN SHRUB TRANSPLANTS SHALL BE CAREFULLY STOCKPILED AND REUSED FOR PLANTING FLOODPLAINS OR STREAM BANKS.

8. AFTER EXCAVATING THE CHANNEL, THE CONTRACTOR SHALL INSTALL THE GRADE CONTROL, BANK STABILIZATION AND HABITAT STRUCTURES USING THE EXCAVATOR. EACH STRUCTURE SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE LOCATIONS AND SPECIFICATIONS PROVIDED IN THE PLAN SET. THE PROJECT INSPECTOR SHALL INSPECT AND APPROVE ALL STRUCTURES PRIOR TO BACKFILLING.

9. AFTER ALL STRUCTURES ARE INSTALLED, THE CHANNEL WILL BE SHAPED TO WITHIN 0.2 FEET OF THE FINAL ELEVATIONS SPECIFIED ON THE PLAN SET. THE PROJECT INSPECTOR SHALL CHECK THE FINAL ELEVATIONS FOR COMPLIANCE WITH THE PLAN SET. ALL EXCAVATED MATERIALS SHALL BE STOCKPILED AT A LOCATION IDENTIFIED BY THE PROJECT INSPECTOR. DISTURBANCE TO RIPARIAN VEGETATION, CHANNEL BANKS AND SOD SHALL BE MINIMIZED.

10. UPON NOTIFICATION FROM THE PROJECT INSPECTOR, THE CONTRACTOR SHALL DIVERT WATER INCREMENTALLY INTO THE NEW CHANNEL. EFFORTS SHALL BE MADE TO MINIMIZE TURBIDITY AND PERMIT FISH TO MOVE OUT OF THE DEWATERED CHANNEL SEGMENTS.

11. THE CONTRACTOR SHALL REMOVE EXCESS MATERIALS, TEMPORARY CULVERTS AND EQUIPMENT FROM THE SITE. THE CONTRACTOR SHALL REGRADE DISTURBED AREAS AND CONSTRUCTION ACCESS ROADS TO THEIR ORIGINAL GRADES. THE CONTRACTOR SHALL TREAT COMPACTED SOIL AREAS INCLUDING ACCESS ROADS AND MATERIAL STOCKPILE AREAS. THE CONTRACTOR SHALL REMOVE SOIL FROM THE PROJECT SITE IF THE SOIL IS TAINTED WITH PETROLEUM-BASED FLUIDS.

RIVER DESIGN GROUP, INC.
8098 Hwy 93 South
Whitefish, MT 59937
406.862.4927
311 SW Jefferson Avenue
Corvallis, OR 97333
541.758.2920

PROJECT SPECIFICATIONS

SALMON RIVER, MILLER QUARRY REACH SALMONID HABITAT IMPROVEMENT

SALMON RIVER, CLACKAMAS COUNTY, OREGON

NEPA REVIEW

NO.	DATE	BY	DESCRIPTION	CHK
-	01/28/10	SW	ISSUED FOR NEPA REVIEW	SW

PROJECT NUMBER
RDG-09-042

DRAWING NUMBER
1.1

PROJECT QUANTITIES

SITE 1

ELWS A

LARGE WOOD MEMBERS	8 LOGS W/6' EFFECTIVE ROOTWAD, 2' MIN DIA., 25 - 30' STEM LENGTH
SLASH	15 TOPS OR LARGE BRANCHES, 6" STEM DIA., 10 FOOT LENGTH
BOULDER BALLAST	2, 5' MEAN DIA. BOULDERS 4, 4' MEAN DIA. BOULDERS 10, 4' LONG, 1" DIA. REBAR PINS

ELWS B

LARGE WOOD MEMBERS	10 LOGS W/6' EFFECTIVE ROOTWAD, 2' MIN DIA., 25 - 30' STEM LENGTH
SLASH	25 TOPS OR LARGE BRANCHES, 6" STEAM DIA., 10 FOOT LENGTH
BOULDER BALLAST	6, 5' MEAN DIA. BOULDERS 15, 4' LONG, 1" DIA. REBAR PINS

SIDE CHANNEL 2

EXCAVATION AND DEBRIS	15 CUBIC YARDS REMOVAL

SITE 2

ELWS

LARGE WOOD MEMBERS	13 LOGS W/6' EFFECTIVE ROOTWAD, 2' MIN DIA., 25 - 30' STEM LENGTH
SLASH	15 TOPS OR LARGE BRANCHES, 6" STEM DIA., 10 FOOT LENGTH
BOULDER BALLAST	4, 5' MEAN DIA. BOULDERS 5, 3.5' MEAN DIA. BOULDERS 20, 4' LONG, 1" DIA. REBAR PINS

SITE 3

ELWS A (x3)

LARGE WOOD MEMBERS	9 LOGS W/6' EFFECTIVE ROOTWAD, 2' MIN DIA., 25 - 30' STEM LENGTH
SLASH	15 TOPS OR LARGE BRANCHES, 6" STEAM DIA., 10 FOOT LENGTH
BOULDER BALLAST	2, 4' MEAN DIA. BOULDERS 4, 5' MEAN DIA. BOULDERS 12, 4' LONG, 1" DIA. REBAR PINS

ELWS B (x5)

LARGE WOOD MEMBERS	5 LOGS W/6' EFFECTIVE ROOTWAD, 2' MIN DIA., 25 - 30' STEM LENGTH
SLASH	6 TOPS OR LARGE BRANCHES, 6" STEAM DIA., 10 FOOT LENGTH
BOULDER BALLAST	4, 4' MEAN DIA. BOULDERS 6, 4' LONG, 1" DIA. REBAR PINS

RIFFLE

MATRIX GRADATION	100 CU. YDS. MATRIX GRADATION 10, 5' DIA. BOULDERS 12, 4.5' DIA. BOULDERS 20, 3.5' DIA. BOULDERS
LARGE WOOD MEMBERS	21 LOGS W/6' EFFECTIVE ROOTWAD, 2' MIN DIA., 25 - 30' STEM LENGTH
SLASH	40 TOPS OR LARGE BRANCHES, 6" STEAM DIA., 10 FOOT LENGTH
BOULDER BALLAST	10, 3' MEAN DIA. BOULDERS 6, 4' MEAN DIA. BOULDERS 15, 4' LONG, 1" DIA. REBAR PINS

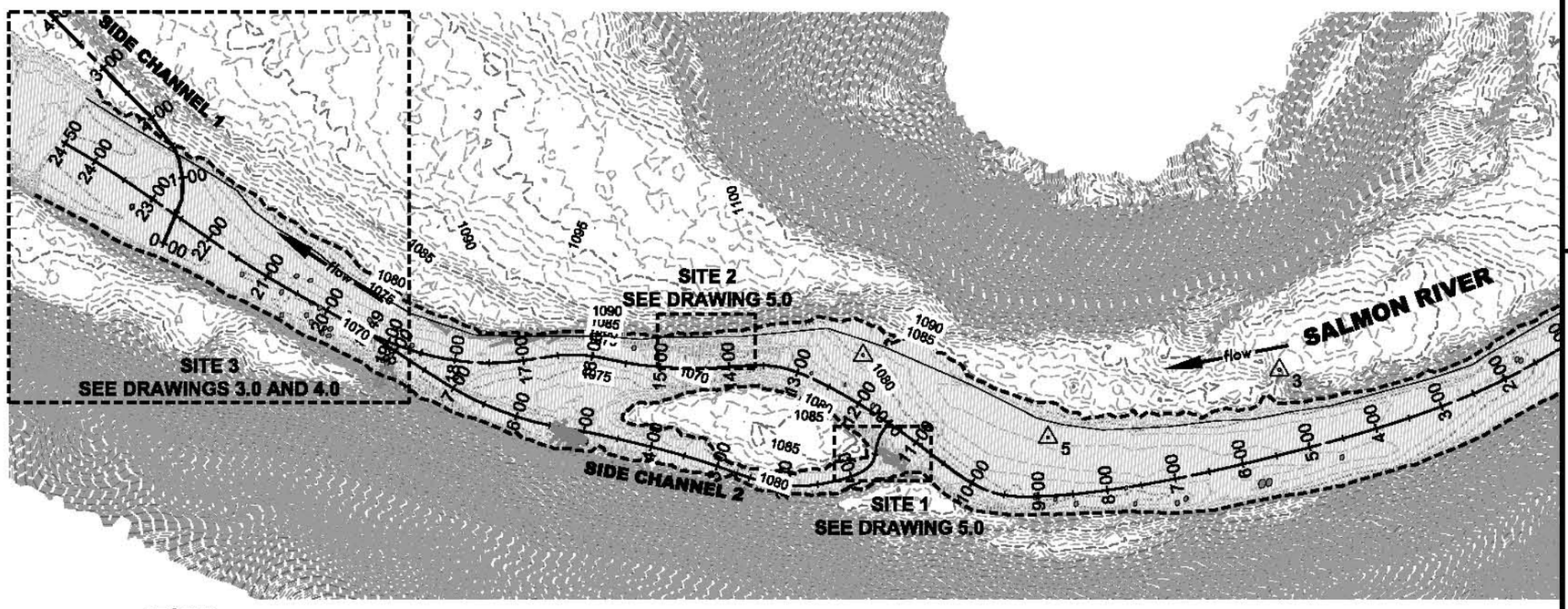
POOL

EXCAVATION	700 CU. YDS.

SIDE CHANNEL 1

EXCAVATION	1500 CU. YDS.
LARGE WOOD MEMBERS	50 LOGS W/3' EFFECTIVE ROOTWAD, 1.5' MAX DIA., 15-20' STEM LENGTH 60 LOGS, 1' MIN DIA., 15-20' MEMBER LENGTH
SLASH	30 TOPS OR LARGE BRANCHES, 6" STEAM DIA., 10 FOOT LENGTH

CONTRACTOR SHALL VERIFY PROJECT QUANTITIES BY INSPECTING THE PROJECT PLAN SET PRIOR TO SUBMITTING BID



LEGEND

- ORDINARY HIGH WATER
- TOP OF BANK
- BOTTOM OF BANK
- EXISTING BOULDER
- EXISTING LARGE WOOD
- EXISTING CONTOURS (5FT)

1 PROJECT LAYOUT
1" = 200'

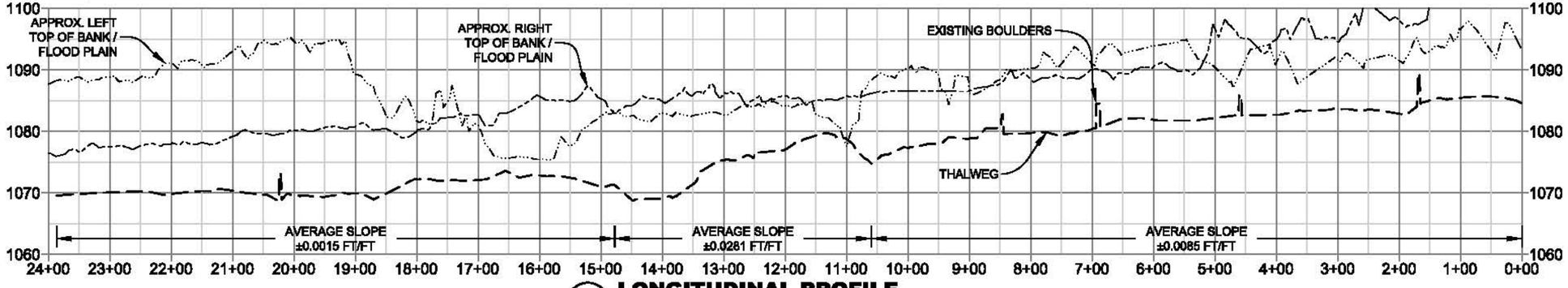
STREAM REACH CHARACTERISTICS

DRAINAGE AREA	106 SQ. MILES
AVERAGE REACH SLOPE	0.007 FT/FT
ACTIVE CHANNEL WIDTH	142 FT
EST. BANKFULL	2,500 cfs
2-YEAR FLOW	3,620 cfs
10-YEAR FLOW	7,380 cfs
25-YEAR FLOW	9,510 cfs
100-YEAR FLOW	13,000 cfs
DESIGN STABILITY FLOW	100-YEAR FLOW
IN WATER WORK PERIOD	JULY 15th - AUGUST 31st

SITE BENCHMARKS

POINT #	NORTHING	EASTING	ELEV (FT)	DESCRIPTION
1	624920.14	7812961.48	1196.14	set rdg
2	620917.74	7813183.32	1108.15	set rdg
3	620986.34	7812660.16	1090.55	set rdg
4	621390.16	7812212.06	1080.86	set rdg
5	621126.80	7812340.62	1083.33	set rdg
8	622069.27	7811676.09	1073.64	set rdg

COORDINATE SYSTEM: OREGON STATE PLANE NORTH
HORIZONTAL DATUM: NAD83
VERTICAL DATUM: NAVD88 (GEOID 03)
UNITS: U.S. SURVEY FEET



2 LONGITUDINAL PROFILE
HORIZ 1" = 200'
VERT 1" = 20'

NEPA REVIEW

RIVER DESIGN GROUP, INC.
311 SW Jefferson Avenue
Corvallis, OR 97333
541.758.3790
5098 Hwy 93 South
Whitefish, MT 59937
406.862.4927

EXISTING CONDITIONS

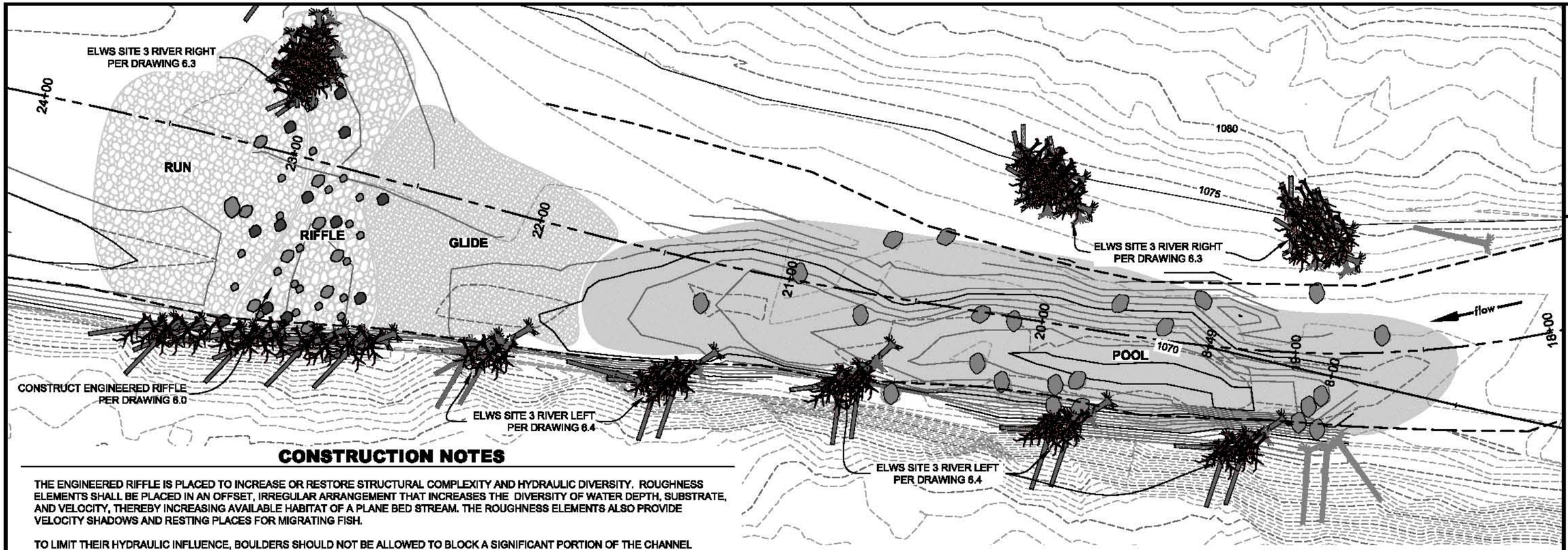
SALMON RIVER, MILLER QUARRY REACH SALMONID HABITAT IMPROVEMENT

SALMON RIVER, CLACKAMAS COUNTY, OREGON

NO.	DATE	BY	DESCRIPTION	CHK
-	01/15/10	SW	ISSUED FOR NEPA REVIEW	SW

PROJECT NUMBER
RDG-09-042

DRAWING NUMBER
2.0



CONSTRUCTION NOTES

THE ENGINEERED RIFFLE IS PLACED TO INCREASE OR RESTORE STRUCTURAL COMPLEXITY AND HYDRAULIC DIVERSITY. ROUGHNESS ELEMENTS SHALL BE PLACED IN AN OFFSET, IRREGULAR ARRANGEMENT THAT INCREASES THE DIVERSITY OF WATER DEPTH, SUBSTRATE, AND VELOCITY, THEREBY INCREASING AVAILABLE HABITAT OF A PLANE BED STREAM. THE ROUGHNESS ELEMENTS ALSO PROVIDE VELOCITY SHADOWS AND RESTING PLACES FOR MIGRATING FISH.

TO LIMIT THEIR HYDRAULIC INFLUENCE, BOULDERS SHOULD NOT BE ALLOWED TO BLOCK A SIGNIFICANT PORTION OF THE CHANNEL CROSS-SECTION AND SHOULD BE KEPT RELATIVELY LOW IN THE CHANNEL PROFILE

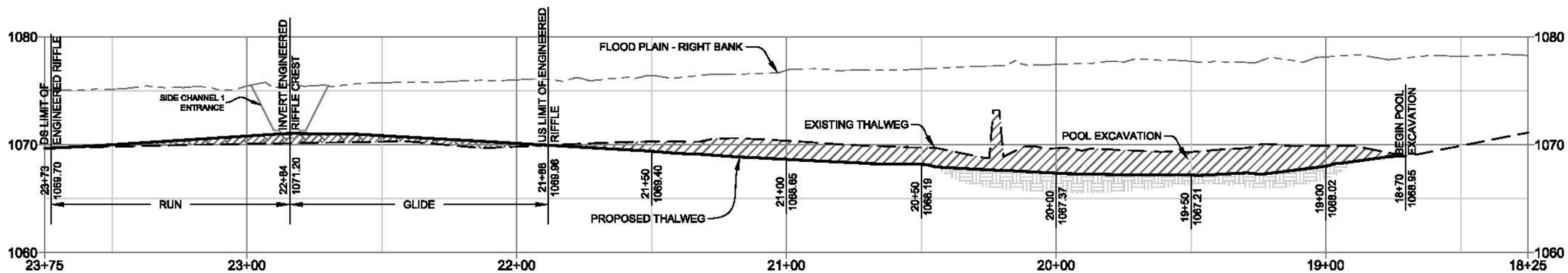
ROCK FOR MATRIX AND ROUGHNESS ELEMENTS SHOULD BE SOUND, DENSE, AND FREE FROM CRACKS, SEAMS AND OTHER DEFECTS THAT WOULD TEND TO INCREASE DETERIORATION FROM WEATHERING, FREEZING AND THAWING, OR OTHER NATURAL CAUSES.

AMBIENT SUBSTRATE MATERIAL DEVELOPED FROM EXCAVATION OF HABITAT ROCK AND CONSTRUCTION RIFFLE FOUNDATION PREPARATION SHALL BE INCORPORATED INTO GRADATION MIX SPECIFIED ON DETAIL 6.0. THIS MIX SHALL BE WELL-GRADED AND REPRESENTATIVE OF IN-SITU SUBSTRATE AND BED MATERIAL. CONSTRUCTED RIFFLE MATERIAL SHALL BE MIXED AND WASHED TO ENSURE THE FILLING OF INTERSTITIAL VOIDS AND A GOOD SEAL WITHIN THE CONSTRUCTED FEATURE PER ODF&W FISH PASSAGE CRITERIA.

ALL ROCK SHALL BE PLACED SO THAT LARGER ROCKS ARE UNIFORMLY DISTRIBUTED AND IN CONTACT WITH ONE ANOTHER WITH SMALLER ROCKS FILLING IN VOIDS. NO END DUMPING OF ROCK WILL BE ALLOWED.

1 SITE 3 LAYOUT
1" = 40'

LEGEND
- ORDINARY HIGH WATER
- TOP OF BANK
- BOTTOM OF BANK
- EXISTING BOULDER
- EXISTING LARGE WOOD
- EXISTING CONTOURS (1 FT)
- DESIGN CONTOURS (0.5 FT)
- CUT
- FILL



2 LONGITUDINAL PROFILE
HORIZ 1" = 40'
VERT 1" = 10'

NEPA REVIEW

RIFFLE AND POOL LAYOUT

SALMON RIVER, MILLER QUARRY REACH SALMONID HABITAT IMPROVEMENT
SALMON RIVER, CLACKAMAS COUNTY, OREGON

RIVER DESIGN GROUP, INC.
311 SW Jefferson Avenue
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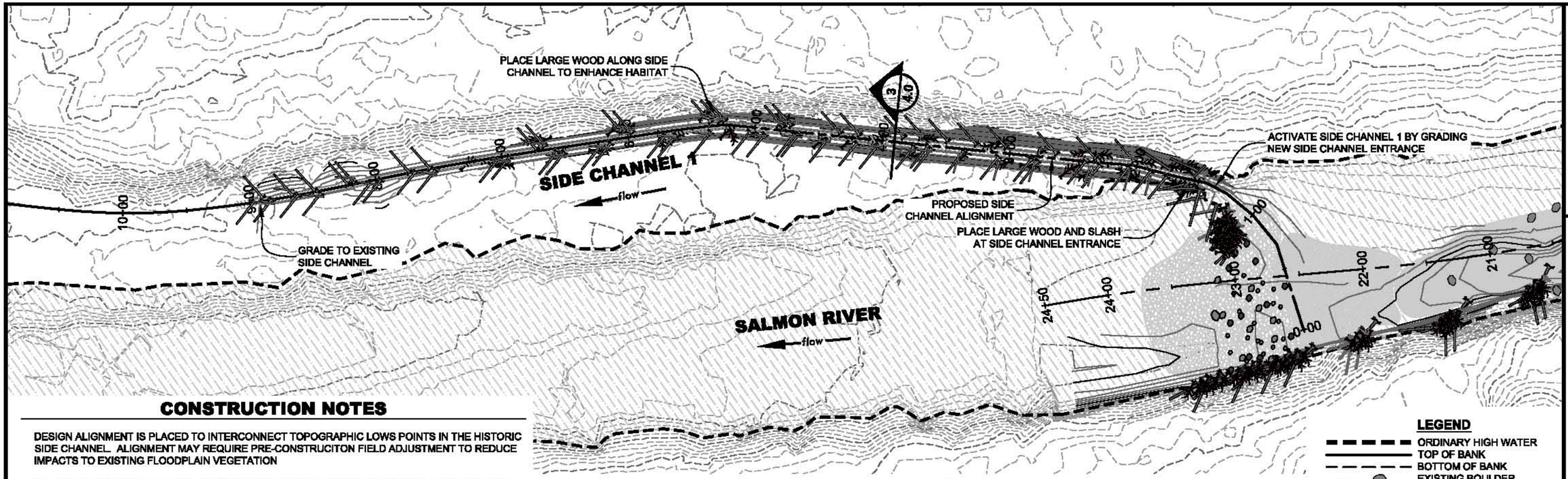
PROJECT NUMBER
RDG-09-042

DRAWING NUMBER
3.0



CONSTRUCTION NOTES

DESIGN ALIGNMENT IS PLACED TO INTERCONNECT TOPOGRAPHIC LOWS POINTS IN THE HISTORIC SIDE CHANNEL. ALIGNMENT MAY REQUIRE PRE-CONSTRUCITON FIELD ADJUSTMENT TO REDUCE IMPACTS TO EXISTING FLOODPLAIN VEGETATION

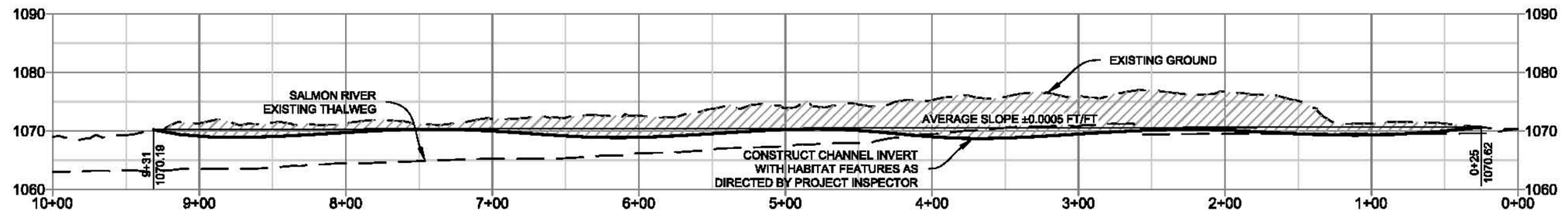
STRIP ORGANIC MATERIALS AND SALVAGE VEGETATION ALONG SIDE CHANNEL ALIGNMENT AND STOCKPLIE AT A LOCATION IDENTIFIED BY THE PROJECT INSPECTOR.

STOCKPILED MATERIAL AND SALVAGED VEGETATION TO BE PLACED ALONG CONSTRUCTED SIDE CHANNEL AT DIRECTION OF PROJECT INSPECTOR.

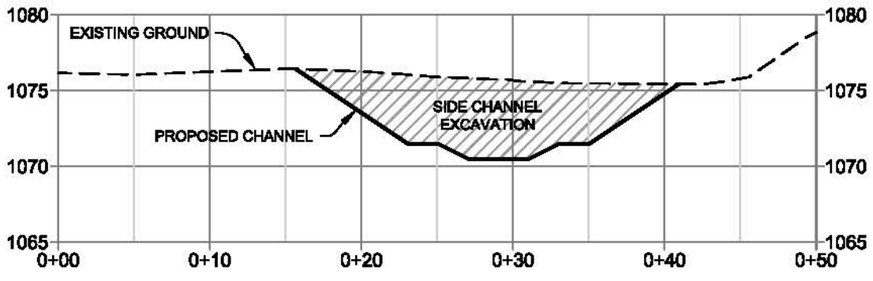
LEGEND

- ORDINARY HIGH WATER
- TOP OF BANK
- BOTTOM OF BANK
- EXISTING BOULDER
- EXISTING LARGE WOOD
- EXISTING CONTOURS (1 FT)
- DESIGN CONTOURS (0.5 FT)
- CUT
- FILL

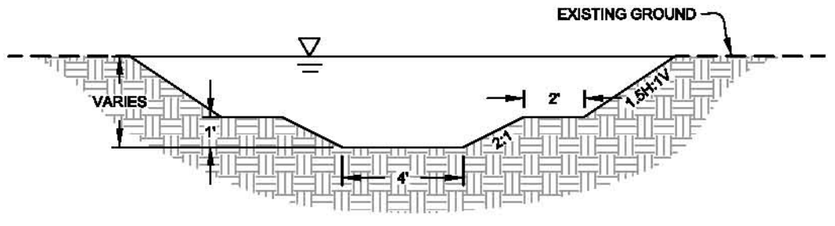
1 LAYOUT
1" = 80'



2 LONGITUDINAL PROFILE
HORIZ 1" = 80'
VERT 1" = 20'



3 SIDE CHANNEL 1 SECTION
HORIZ 1" = 10'
VERT 1" = 10'



4 SIDE CHANNEL 1 DETAIL
HORIZ 1" = 5'
VERT 1" = 5'

SIDE CHANNEL

STATION	℄ GRADE
1+00	1069.31
2+00	1070.13
3+00	1069.47
4+00	1069.00
5+00	1070.22
6+00	1068.90
7+00	1069.98
8+00	1069.73
9+00	1069.12

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SIDE CHANNEL 1 ACTIVATION

SALMON RIVER, MILLER QUARRY REACH SALMONID HABITAT IMPROVEMENT

SALMON RIVER, CLACKAMAS COUNTY, OREGON

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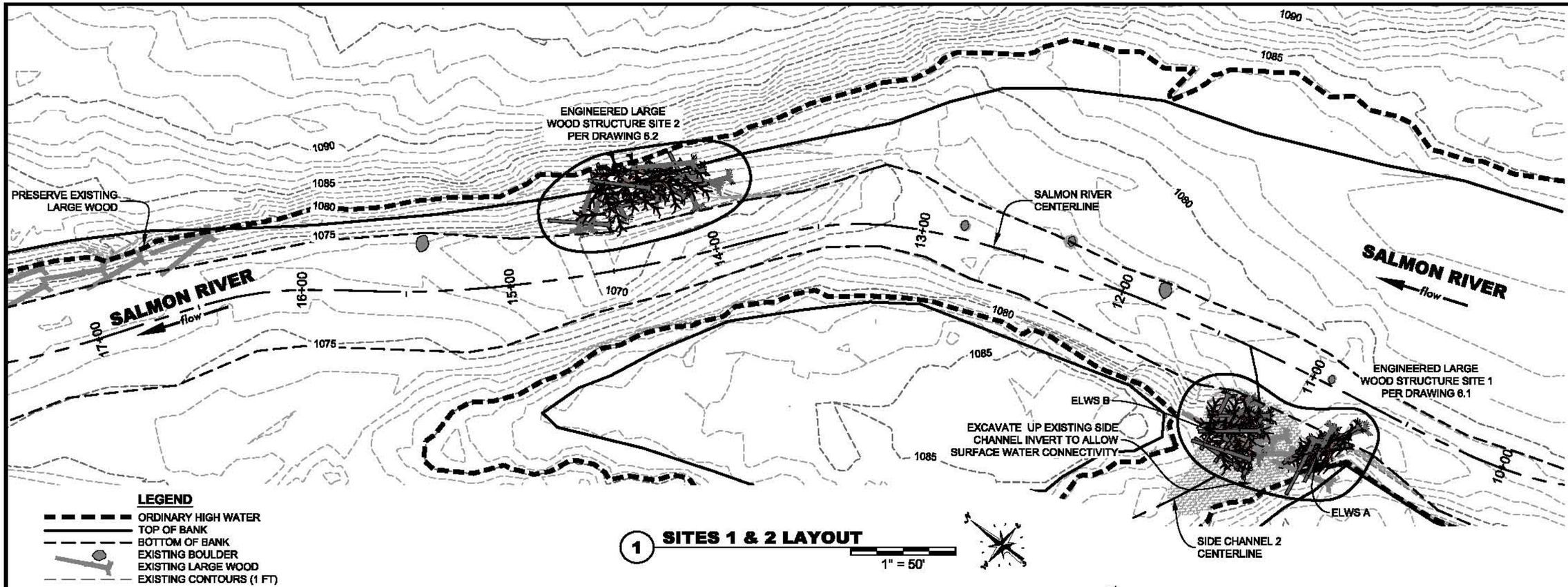
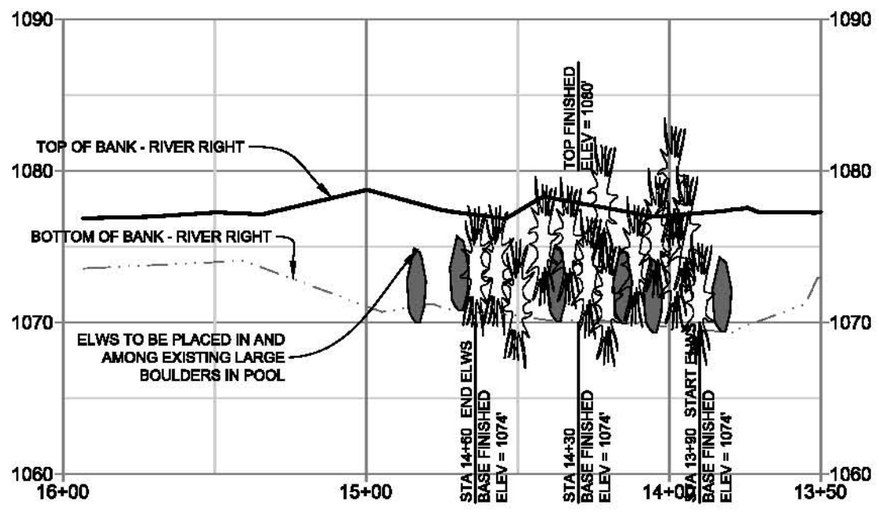


LEGEND

- ORDINARY HIGH WATER
- TOP OF BANK
- BOTTOM OF BANK
- EXISTING BOULDER
- EXISTING LARGE WOOD
- EXISTING CONTOURS (1 FT)

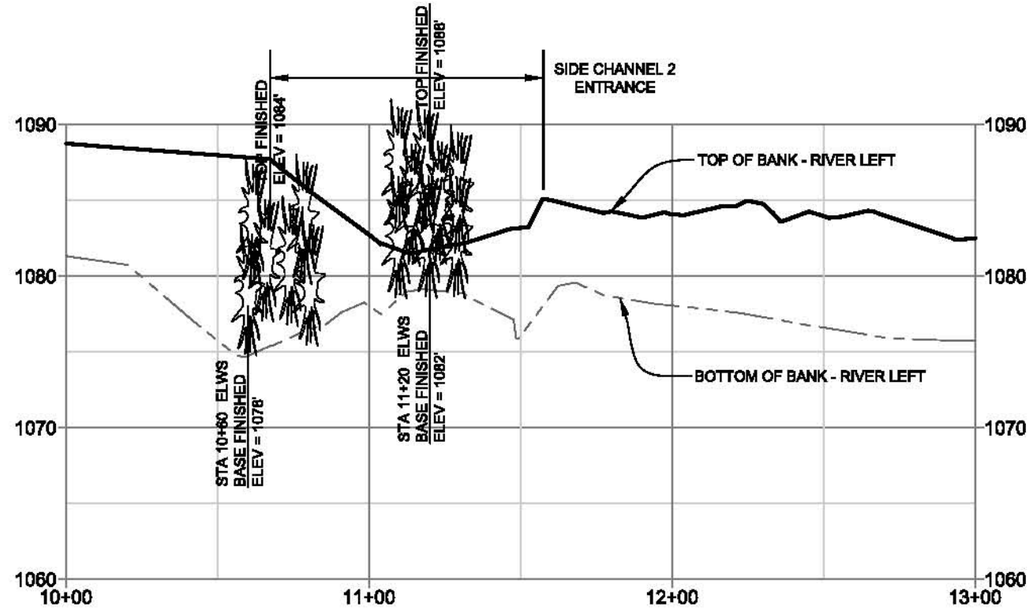
1 SITES 1 & 2 LAYOUT

1" = 50'



2 SITE 2 PROFILE

HORIZ 1" = 50'
VERT 1" = 10'



3 SITE 1 PROFILE

HORIZ 1" = 50'
VERT 1" = 10'

NEPA REVIEW

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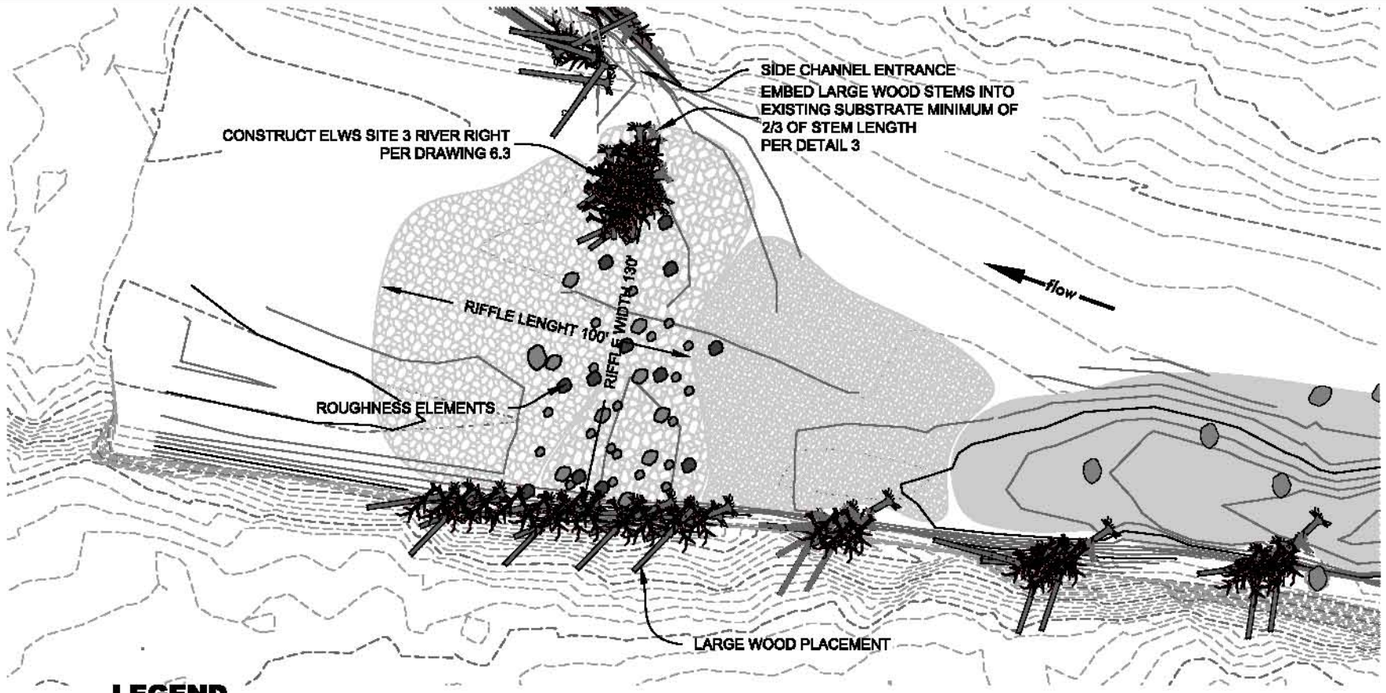
CHANNEL LAYOUT STA 11+00 TO 18+00

SALMON RIVER, MILLER QUARRY REACH SALMONID HABITAT IMPROVEMENT

SALMON RIVER, CLACKAMAS COUNTY, OREGON

PROJECT NUMBER
RDG-09-042

DRAWING NUMBER
5.0

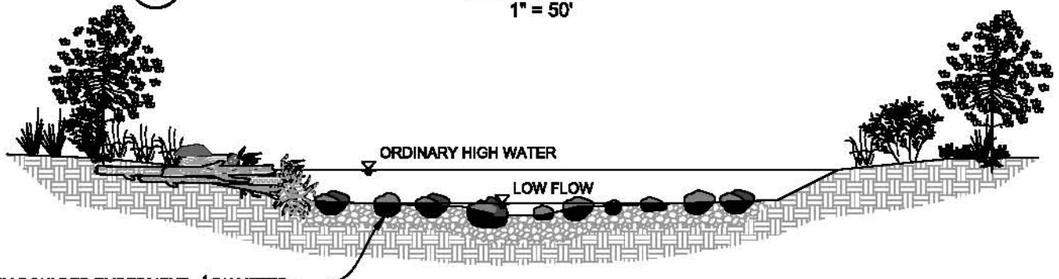


LEGEND

- ROUGHNESS ELEMENT
- RIFFLE MATRIX
- GLIDE MATRIX

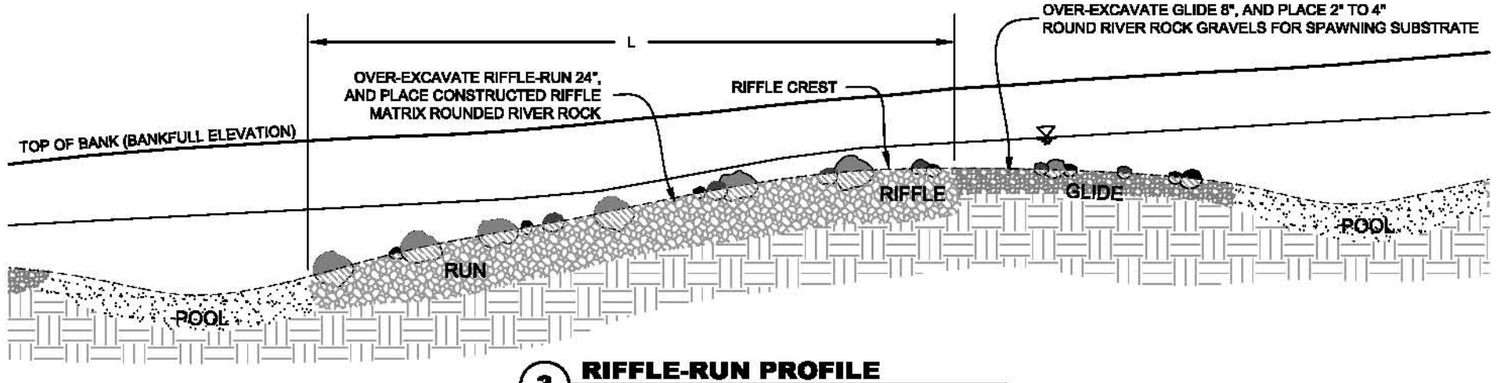
1 PLAN VIEW

1" = 50'



2 RIFFLE SECTION

NOT TO SCALE



3 RIFFLE-RUN PROFILE

NOT TO SCALE

GENERAL NOTES

CONSTRUCTION ACTIVITY TO BE SUPERVISED BY THE PROJECT INSPECTOR. CENTERLINE, OFFSET AND GRADING LIMIT STAKES WILL BE PROVIDED. SPECIAL ATTENTION SHALL BE TAKEN TO OPERATE EQUIPMENT IN A SAFE AND EFFICIENT MANNER WITH MINIMAL DISTURBANCE OUTSIDE OF GRADING LIMITS UNLESS OTHERWISE SPECIFIED. UTMOST CARE SHALL BE EMPLOYED TO ENSURE EXCAVATED MATERIALS FROM BANK SHAPING AND LOG JAM CONSTRUCTION DO NOT ENTER RIVER OR INCREASE AMBIENT TURBIDITY LEVELS.

CONSTRUCTION NOTES

BOULDER PLACEMENT PROVIDES LARGE SCALE ROUGHNESS DURING HIGH FLOW AND HYDRAULIC VARIABILITY UNDER LOW FLOW CONDITIONS. HYDRAULIC EFFECT INCLUDES SPAWNING MATERIAL RETENTION AND DEPOSITION ALONG GLIDE FACE. BOULDERS PLACED ALONG THE RIFFLE AND RUN PROVIDE DISRUPTION OF AVERAGE VELOCITY GRADIENTS AND SERVE A GRADE CONTROL FUNCTION FOR THE OVERALL GEOMORPHIC UNIT.

BOULDERS SHOULD BE PLACED IN RANDOM PATTERNS THAT REPLICATE NATURAL STREAM CONDITIONS AS DIRECTED BY THE PROJECT INSPECTOR.

SEE GRADATION SCHEDULES ON THIS SHEET FOR CONSTRUCTED RIFFLE MATRIX GRADATION AND HABITAT BOULDER REQUIREMENTS. SUFFICIENT FINES (SAND FRACTION OR FINER) SHALL BE DEVELOPED FROM ON-SITE EXCAVATIONS AND PRESSURE WASHED INTO THE PLACED RIFFLE MATRIX BOULDER FEATURE.

ENGINEERED RIFFLE TO BE CONSTRUCTED IN ONE HALF FOOT VERTICAL LIFTS WITH FINES ADDED AND WASHED. SUCCESSFUL WASHING WILL BE DETERMINED BY MINIMIZATION OF VOIDS WITHIN PLACED MATRIX SUCH THAT PONDING OCCURS ON TOP OF LIFT WITH LITTLE TO NO PERCOLATION LOSSES OCCURRING THROUGH THE ENGINEERED RIFFLE.

EXCAVATE AMBIENT SUBSTRATE MATERIAL DEVELOPED FROM EXCAVATION OF HABITAT ROCK AND CONSTRUCTION RIFFLE FOUNDATION PREPARATION SHALL BE INCORPORATED INTO GRADATION MIX SPECIFIED ABOVE. THIS MIX SHALL BE WELL-GRADED AND REPRESENTATIVE OF IN-SITU SUBSTRATE AND BED MATERIAL. CONSTRUCTED RIFFLE MATERIAL SHALL BE MIXED AND WASHED TO ENSURE THE FILLING OF INTERSTITIAL VOIDS AND A GOOD SEAL WITHIN THE CONSTRUCTED FEATURE PER ODF&W FISH PASSAGE CRITERIA.

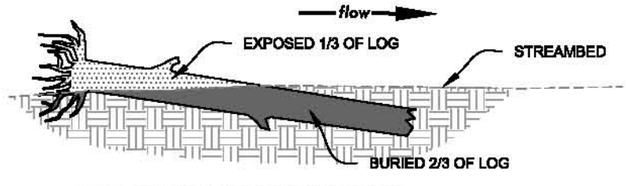
ENGINEERED RIFFLE ROUGHNESS ELEMENTS

BOULDER ELEMENT SIZE (FT.)	RIFFLE LENGTH = 50'
5	10
4.5	12
3.5	20

ENGINEERED RIFFLE MATRIX GRADATION

PERCENT PASSING	LOWER LIMIT (INCHES)	UPPER LIMIT (INCHES)
100	15.19	20.25
85	13.16	18.23
50	10.13	15.19
30	6.08	9.4
15	3.04	5.06

MATRIX THICKNESS (T) = 34 INCHES



3 ELWS EMBEDMENT

NOT TO SCALE

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311 SW Jefferson Avenue
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5098 Hwy 93 South
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ENGINEERED RIFFLE

SALMON RIVER, MILLER QUARRY REACH SALMONID HABITAT IMPROVEMENT

SALMON RIVER, CLACKAMAS COUNTY, OREGON

NEPA REVIEW

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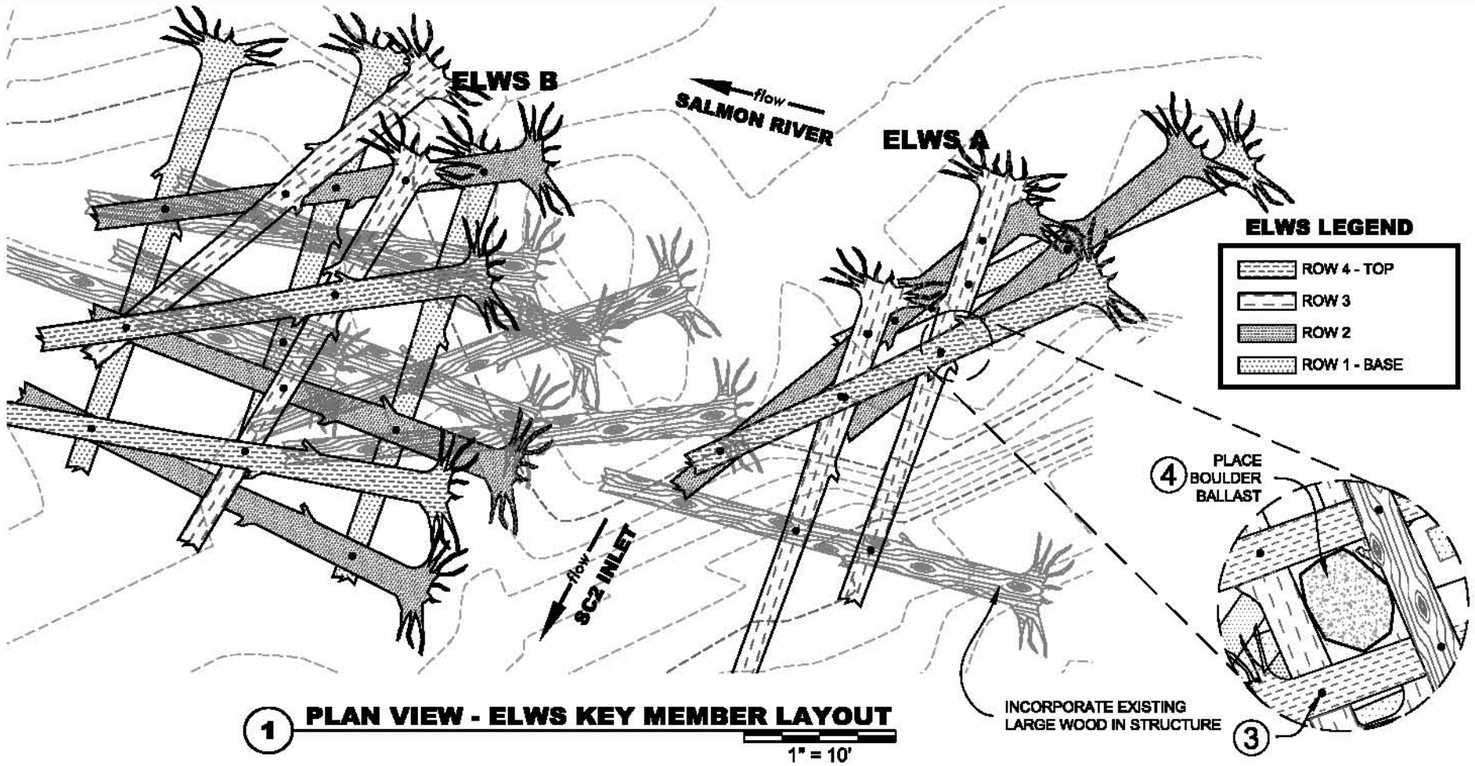
PROJECT NUMBER RDG-09-042

DRAWING NUMBER 6.0



1 PLAN VIEW - ELWS KEY MEMBER LAYOUT

1" = 10'

GENERAL NOTES

CONSTRUCTION ACTIVITY TO BE SUPERVISED BY THE PROJECT INSPECTOR. CENTERLINE, OFFSET AND GRADING LIMIT STAKES WILL BE PROVIDED. SPECIAL ATTENTION SHALL BE TAKEN TO OPERATE EQUIPMENT IN A SAFE AND EFFICIENT MANNER WITH MINIMAL DISTURBANCE OUTSIDE OF GRADING LIMITS UNLESS OTHERWISE SPECIFIED. UTMOST CARE SHALL BE EMPLOYED TO ENSURE EXCAVATED MATERIALS FROM BANK SHAPING AND LOG JAM CONSTRUCTION DO NOT ENTER RIVER OR INCREASE AMBIENT TURBIDITY LEVELS.

CONSTRUCTION NOTES

1. CONSTRUCT ELWS FOR NEAR-BANK ENERGY DISSIPATION AND FISH HABITAT ENHANCEMENT. LOGS FOR THE ELWS SHALL BE CEDAR, SPRUCE, PINE OR FIR. LIMBS AND BRANCHES SHALL BE INTACT TO THE FULLEST EXTENT POSSIBLE. STRUCTURE MEMBERS ARE TO BE A MINIMUM OF 2' STEM DIAMETER, 6' EFFECTIVE DIAMETER ROOTWAD, AN 25' - 30' STEM LENGTH.

② EXCAVATE BASE MEMBER OF ELWS INTO THE STREAMBED SO TOP OF THE LOG IS AT GRADE WITH THE CHANNEL. USE EXCAVATED GRAVEL COBBLES TO BACKFILL AROUND BASE MEMBERS. COMPACT GRAVEL COBBLE BACKFILL AND WASH IN FINES TO MINIMIZE VOIDS AND FACILITATE COMPACTION.

③ ANCHOR ALL LARGE WOOD MEMBERS TOGETHER AS SHOWN IN ANCHOR DETAIL. EACH MEMBER SHALL BE CONNECTED AT A MINIMUM OF 2 LOCATIONS AS SHOWN IN THE PLAN VIEW.

④ BALLAST STRUCTURE A WITH (2) 5.0' DIAMETER BOULDERS AND (4) 4.0' DIAMETER BOULDERS. BALLAST STRUCTURE B WITH (6) 5.0' DIAMETER BOULDERS. BOULDER BALLAST SHALL BE PLACED WITHIN AND ON TOP OF ELWS IN A STABLE POSITION. BALLAST NOT SHOWN ON PLAN VIEW FOR CLARITY, PLACE LARGEST BALLAST IN FRAMED ELWS CHAMBER AS SHOWN IN DETAIL. BALLAST PLACEMENT TO BE SUPERVISED BY PROJECT INSPECTOR.

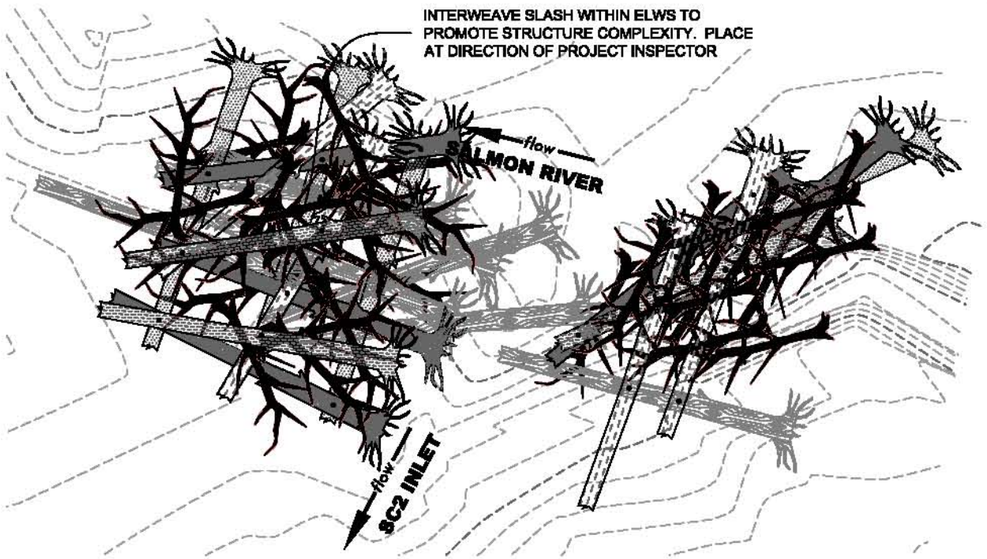
5. ELWS - BANKLINE INTERFACE AND PLACED BACKFILL AND SURROUNDING AREA TO BE PLANTED WITH SALVAGED VEGETATION INCLUDING WILLOW AND ALDER CLUMP PLANTINGS AND OTHER VEGETATIVE SPECIFICATIONS OUTLINED WITHIN THE PLANS.

6. EXPOSED BUTT ENDS OF ALL LARGE WOOD SHALL BE ROUGHENED AND BROKEN. EXPOSED SAWED BUTT ENDS ARE NOT ACCEPTED.

7. SLASH SHALL BE A MINIMUM OF 6" STEM DIAMETER, WITH INTACT BRANCHES OR TREE TOPS AT LEAST 10' IN LENGTH. SLASH TO BE WOVEN IN ELWS AS SHOWN IN SLASH DETAIL AND AT DIRECTION OF THE PROJECT INSPECTOR.

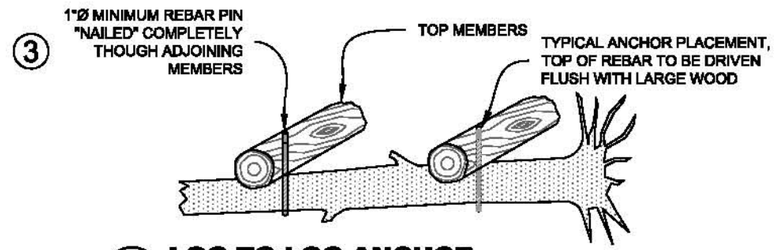
LEGEND

EXISTING CONTOURS (1 FT)



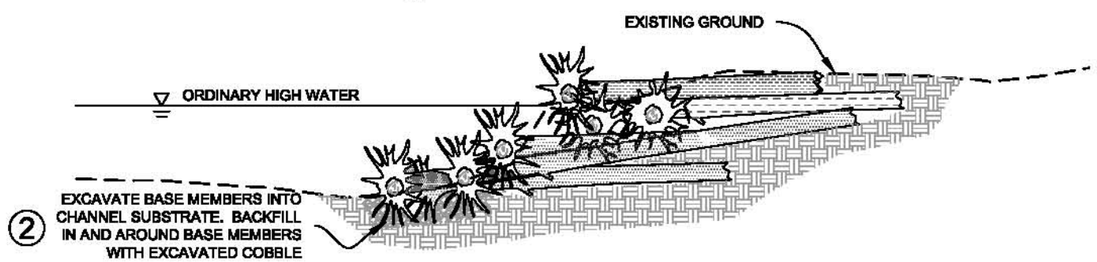
2 PLAN VIEW - ELWS SLASHING DETAIL

1" = 15'



4 LOG TO LOG ANCHOR

NOT TO SCALE



3 SECTION

HORIZ 1" = 15'
VERT 1" = 15'

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311 SW Jefferson Avenue
Corvallis, OR 97333
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ENGINEERED LARGE WOOD SITE 1

SALMON RIVER, MILLER QUARRY REACH SALMONID HABITAT IMPROVEMENT

SALMON RIVER, CLACKAMAS COUNTY, OREGON

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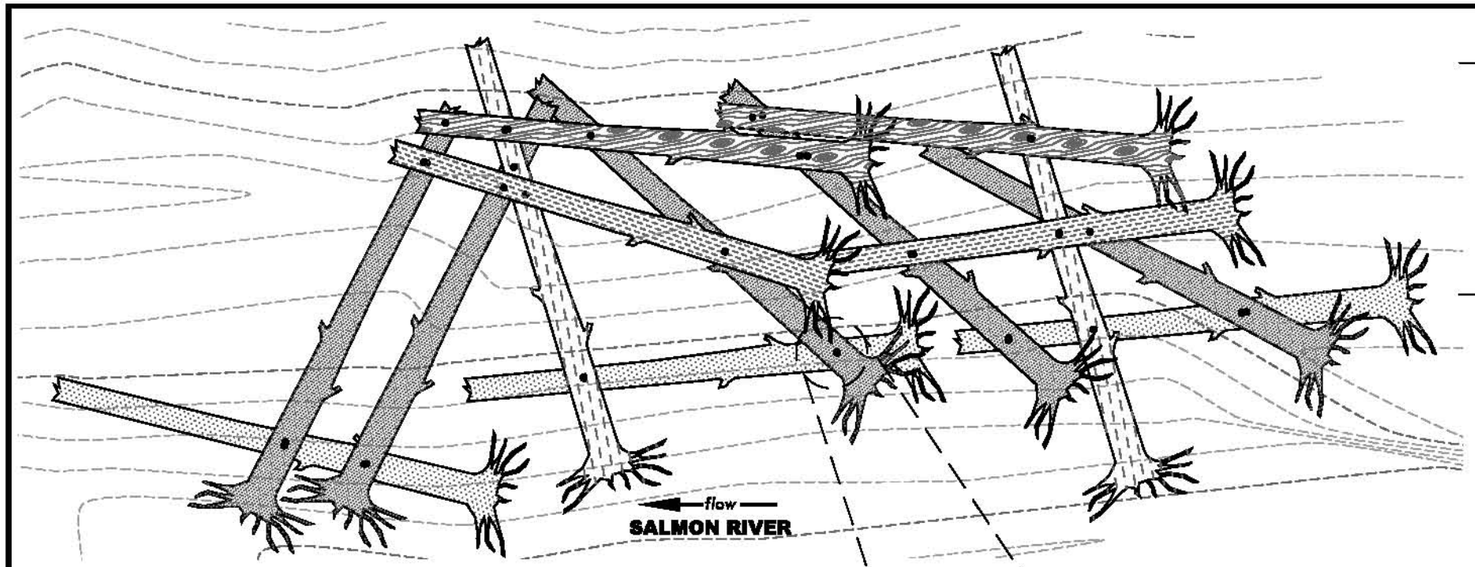
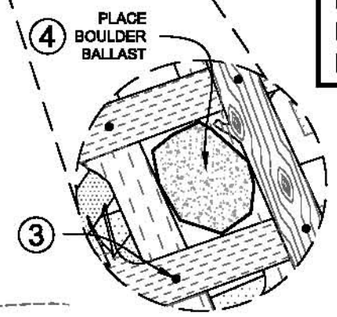


1 PLAN VIEW - ELWS KEY MEMBER LAYOUT

1" = 10'

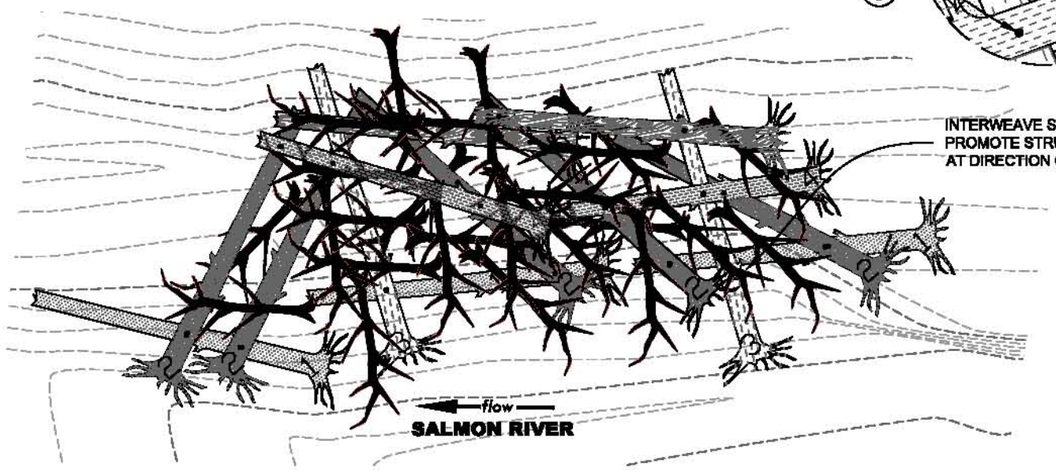


ELWS LEGEND

- ROW 5 - TOP
- ROW 4
- ROW 3
- ROW 2
- ROW 1 - BASE

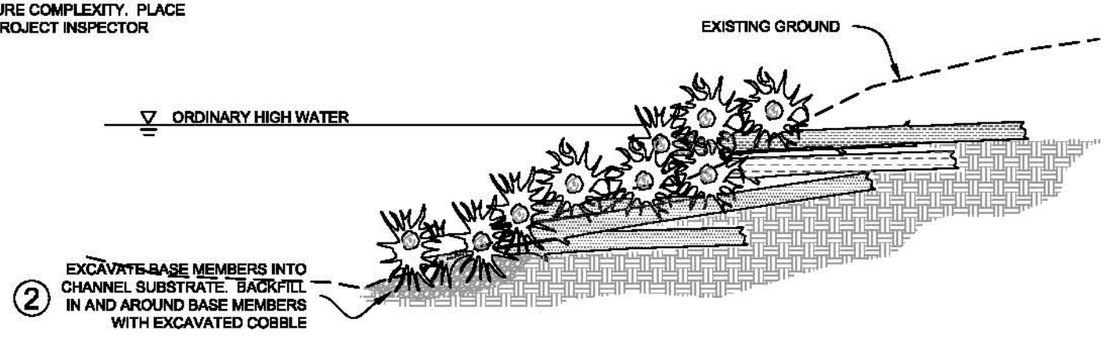
LEGEND

EXISTING CONTOURS (1 FT)



2 PLAN VIEW - ELWS SLASHING DETAIL

1" = 15'



3 SECTION

HORIZ 1" = 15'
VERT 1" = 15'

GENERAL NOTES

CONSTRUCTION ACTIVITY TO BE SUPERVISED BY THE PROJECT INSPECTOR. CENTERLINE, OFFSET AND GRADING LIMIT STAKES WILL BE PROVIDED. SPECIAL ATTENTION SHALL BE TAKEN TO OPERATE EQUIPMENT IN A SAFE AND EFFICIENT MANNER WITH MINIMAL DISTURBANCE OUTSIDE OF GRADING LIMITS UNLESS OTHERWISE SPECIFIED. UTMOST CARE SHALL BE EMPLOYED TO ENSURE EXCAVATED MATERIALS FROM BANK SHAPING AND LOG JAM CONSTRUCTION DO NOT ENTER RIVER OR INCREASE AMBIENT TURBIDITY LEVELS.

CONSTRUCTION NOTES

1. CONSTRUCT ELWS FOR NEAR-BANK ENERGY DISSIPATION AND FISH HABITAT ENHANCEMENT. LOGS FOR THE ELWS SHALL BE CEDAR, SPRUCE, PINE OR FIR. LIMBS AND BRANCHES SHALL BE INTACT TO THE FULLEST EXTENT POSSIBLE. STRUCTURE MEMBERS ARE TO BE A MINIMUM OF 2' STEM DIAMETER, 6' EFFECTIVE DIAMETER ROOTWAD, AN 25' - 30' STEM LENGTH.

2. EXCAVATE BASE MEMBER OF ELWS INTO THE STREAMBED SO TOP OF THE LOG IS AT GRADE WITH THE CHANNEL. USE EXCAVATED GRAVELS TO BACKFILL AROUND BASE MEMBERS.

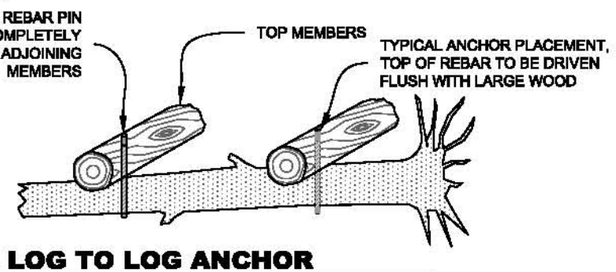
3. ANCHOR ALL LARGE WOOD MEMBERS TOGETHER AS SHOWN IN ANCHOR DETAIL. EACH MEMBER SHALL BE CONNECTED AT A MINIMUM OF 2 LOCATIONS AS SHOWN IN THE PLAN VIEW.

4. BALLAST STRUCTURE A WITH (4) 5.0' DIAMETER BOULDERS AND (5) 3.5' DIAMETER BOULDERS. BOULDER BALLAST SHALL BE PLACED WITHIN AND ON TOP OF ELWS IN A STABLE POSITION. BALLAST NOT SHOWN ON PLAN VIEW FOR CLARITY, PLACE LARGEST BALLAST IN FRAMED ELWS CHAMBER AS SHOWN IN DETAIL. BALLAST PLACEMENT TO BE SUPERVISED BY PROJECT INSPECTOR.

5. ELWS - BANKLINE INTERFACE AND PLACED BACKFILL AND SURROUNDING AREA TO BE PLANTED WITH SALVAGED VEGETATION INCLUDING WILLOW AND ALDER CLUMP PLANTINGS AND OTHER VEGETATIVE SPECIFICATIONS OUTLINED WITHIN THE PLANS.

6. EXPOSED BUTT ENDS OF ALL LARGE WOOD SHALL BE ROUGHENED AND BROKEN. EXPOSED SAWED BUTT ENDS ARE NOT ACCEPTED.

7. SLASH SHALL BE A MINIMUM OF 6" STEM DIAMETER, WITH INTACT BRANCHES OR TREE TOPS AT LEAST 10' IN LENGTH. SLASH TO BE WOVEN IN ELWS AS SHOWN IN SLASH DETAIL AND AT DIRECTION OF THE PROJECT INSPECTOR.



4 LOG TO LOG ANCHOR

NOT TO SCALE

NEPA REVIEW

RIVER DESIGN GROUP, INC.
311 SW Jefferson Avenue
Corvallis, OR 97333
541.758.2720
5098 Hwy 93 South
Whitefish, MT 59937
406.862.4927

ENGINEERED LARGE WOOD SITE 2

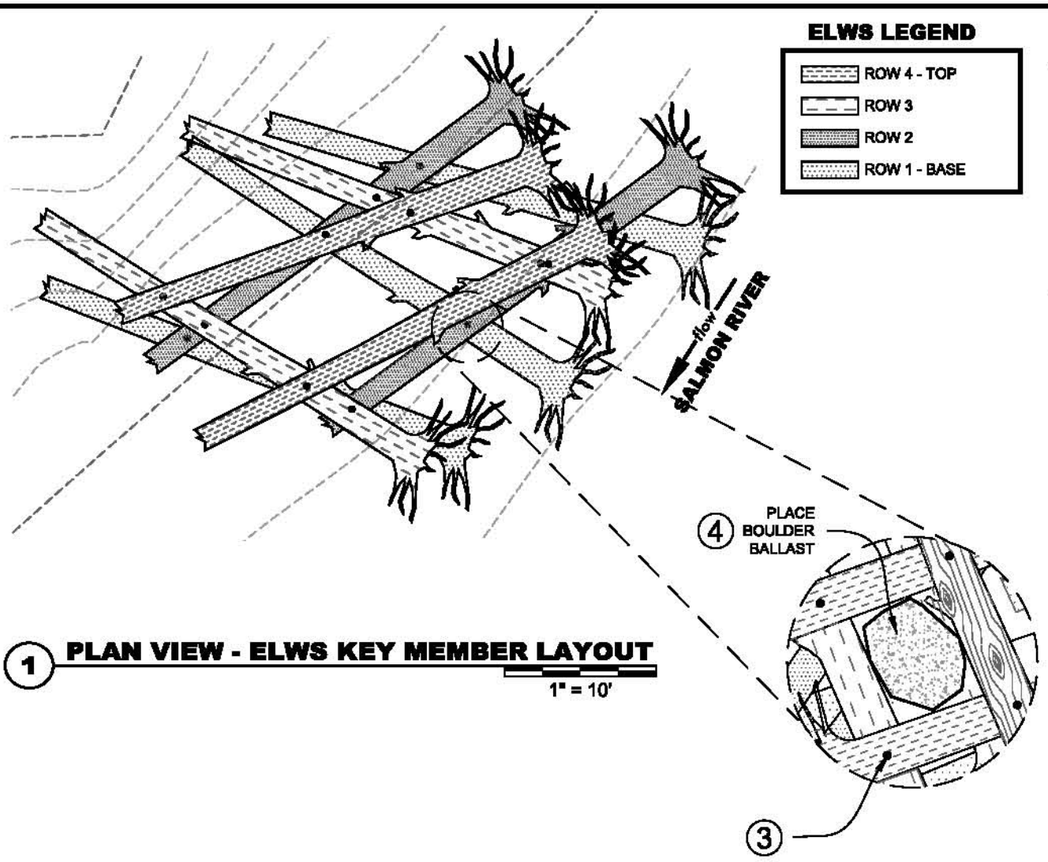
SALMON RIVER, MILLER QUARRY REACH SALMONID HABITAT IMPROVEMENT

SALMON RIVER, CLACKAMAS COUNTY, OREGON

NO.	DATE	BY	DESCRIPTION	CHK
-	01/28/10	SW	ISSUED FOR NEPA REVIEW	SW

PROJECT NUMBER
RDG-09-042

DRAWING NUMBER
6.2



ELWS LEGEND

- ROW 4 - TOP
- ROW 3
- ROW 2
- ROW 1 - BASE

1 PLAN VIEW - ELWS KEY MEMBER LAYOUT

1" = 10'

GENERAL NOTES

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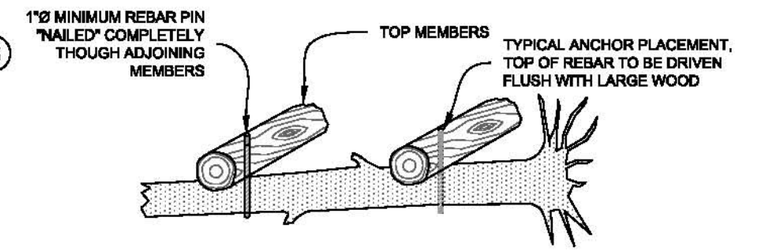
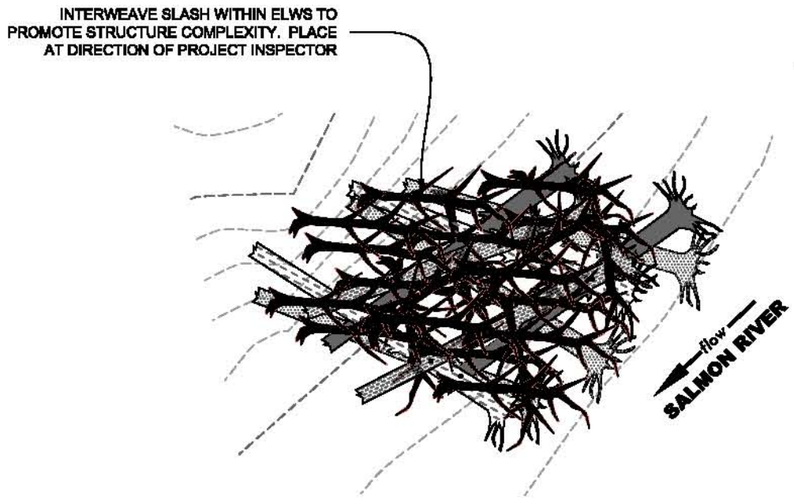


4 LOG TO LOG ANCHOR

NOT TO SCALE

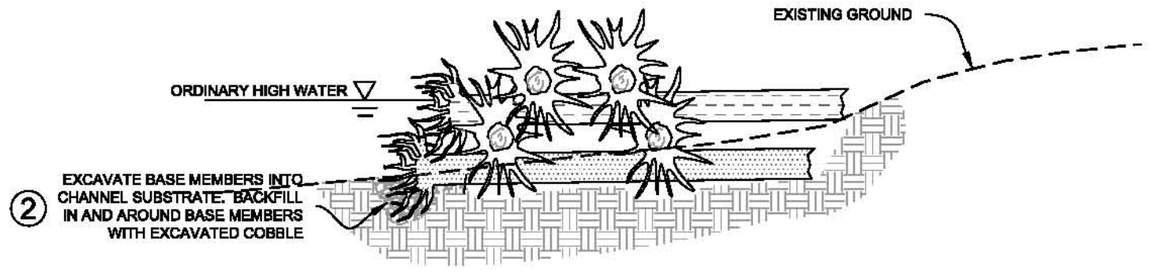


LEGEND

EXISTING CONTOURS (1 FT)

2 PLAN VIEW - ELWS SLASHING DETAIL

1" = 15'



3 SECTION

HORIZ 1" = 15'
VERT 1" = 15'

RIVER DESIGN GROUP, INC.
311 SW Jefferson Avenue
Corvallis, OR 97333
541.758.2920
5098 Hwy 93 South
Whitefish, MT 59937
406.862.4927

ELWS SITE 3 RIVER RIGHT

SALMON RIVER, MILLER QUARRY REACH SALMONID HABITAT IMPROVEMENT

SALMON RIVER, CLACKAMAS COUNTY, OREGON

NEPA REVIEW

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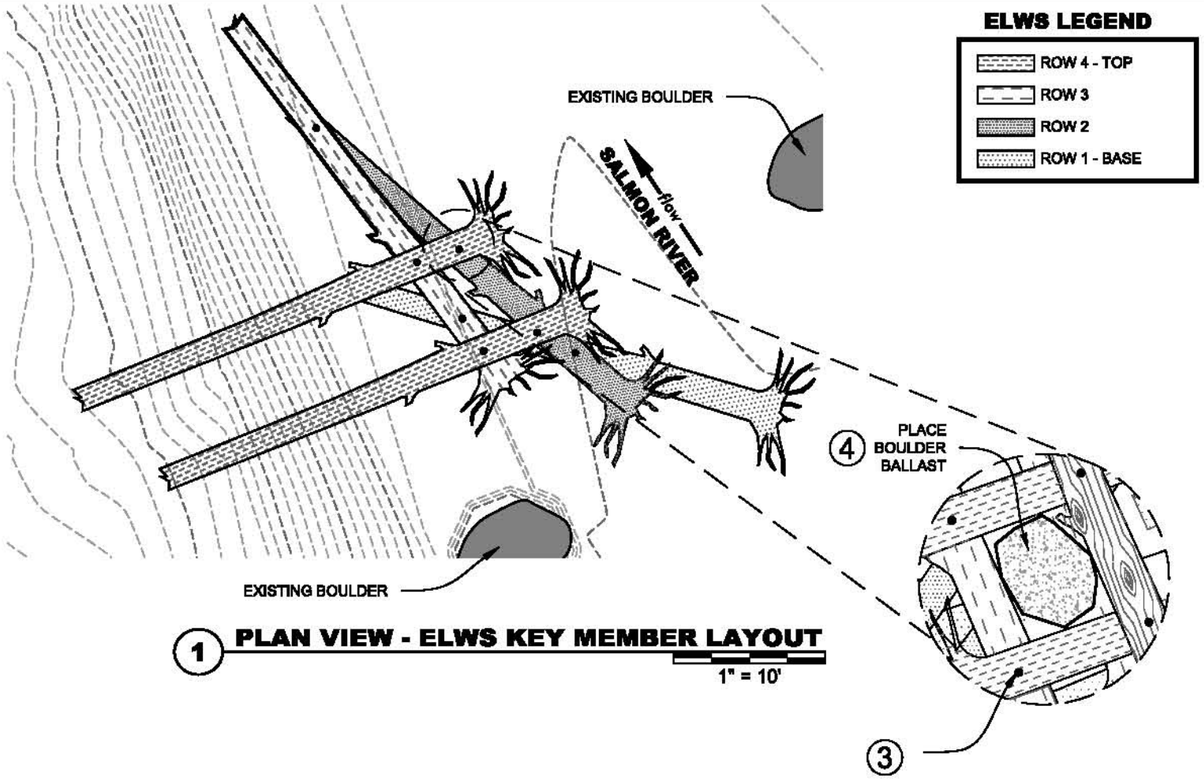
PROJECT NUMBER
RDG-09-042

DRAWING NUMBER
6.3



1 PLAN VIEW - ELWS KEY MEMBER LAYOUT

1" = 10'

ELWS LEGEND

- ROW 4 - TOP
- ROW 3
- ROW 2
- ROW 1 - BASE

GENERAL NOTES

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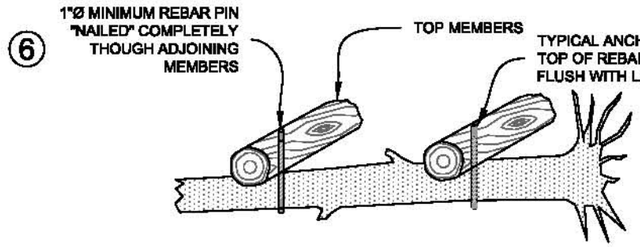
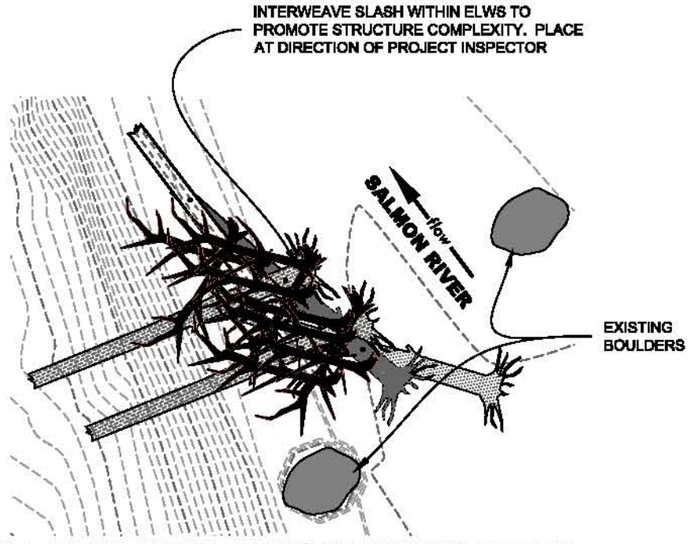


4 LOG TO LOG ANCHOR

NOT TO SCALE

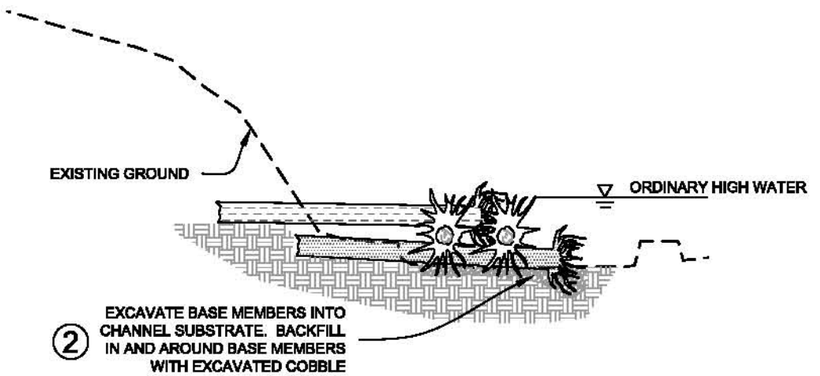


LEGEND

- TOP OF BANK
- BOTTOM OF BANK
- EXISTING CONTOURS (1 FT)

2 PLAN VIEW - ELWS SLASHING DETAIL

1" = 15'



3 SECTION

HORIZ 1" = 15'
VERT 1" = 15'

RIVER DESIGN GROUP, INC.
311 SW Jefferson Avenue
Corvallis, OR 97333
541.758.2720
5098 Hwy 93 South
Whitefish, MT 59937
406.862.4927

ELWS SITE 3 RIVER LEFT

SALMON RIVER, MILLER QUARRY REACH SALMONID HABITAT IMPROVEMENT

SALMON RIVER, CLACKAMAS COUNTY, OREGON

NO.	DATE	BY	DESCRIPTION	CHK
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NEPA REVIEW

PROJECT NUMBER
RDG-09-042

DRAWING NUMBER
6.4

Drawing 11 of 13

EROSION CONTROL NOTES

CONTRACTOR SHALL PREPARE AND HAVE ON-SITE A SPILL CONTAINMENT AND CONTROL PLAN WITH NOTIFICATION PROCEDURES, EQUIPMENT, SPECIFIC CLEANUP AND DISPOSAL INSTRUCTIONS FOR ALL PRODUCTS USED ON SITE.

AT A MINIMUM, EROSION CONTROL MEASURES SHOWN ON THIS PLAN SHALL BE IN PLACE PRIOR TO COMMENCING CONSTRUCTION AND SHALL BE INSPECTED WEEKLY. BASED ON INSPECTIONS, WORK CREWS SHALL MOBILIZE IMMEDIATELY TO MAKE REPAIRS OR INSTALL ADDITIONAL MEASURES, IF NECESSARY.

CONTRACTOR SHALL HAVE AN EMERGENCY SUPPLY OF SEDIMENT CONTROL MATERIALS ON HAND (SILT FENCE, STRAW BALES, ETC.), AN OIL ADSORBING FLOATING BOOM, AND ABSORBENT PADS.

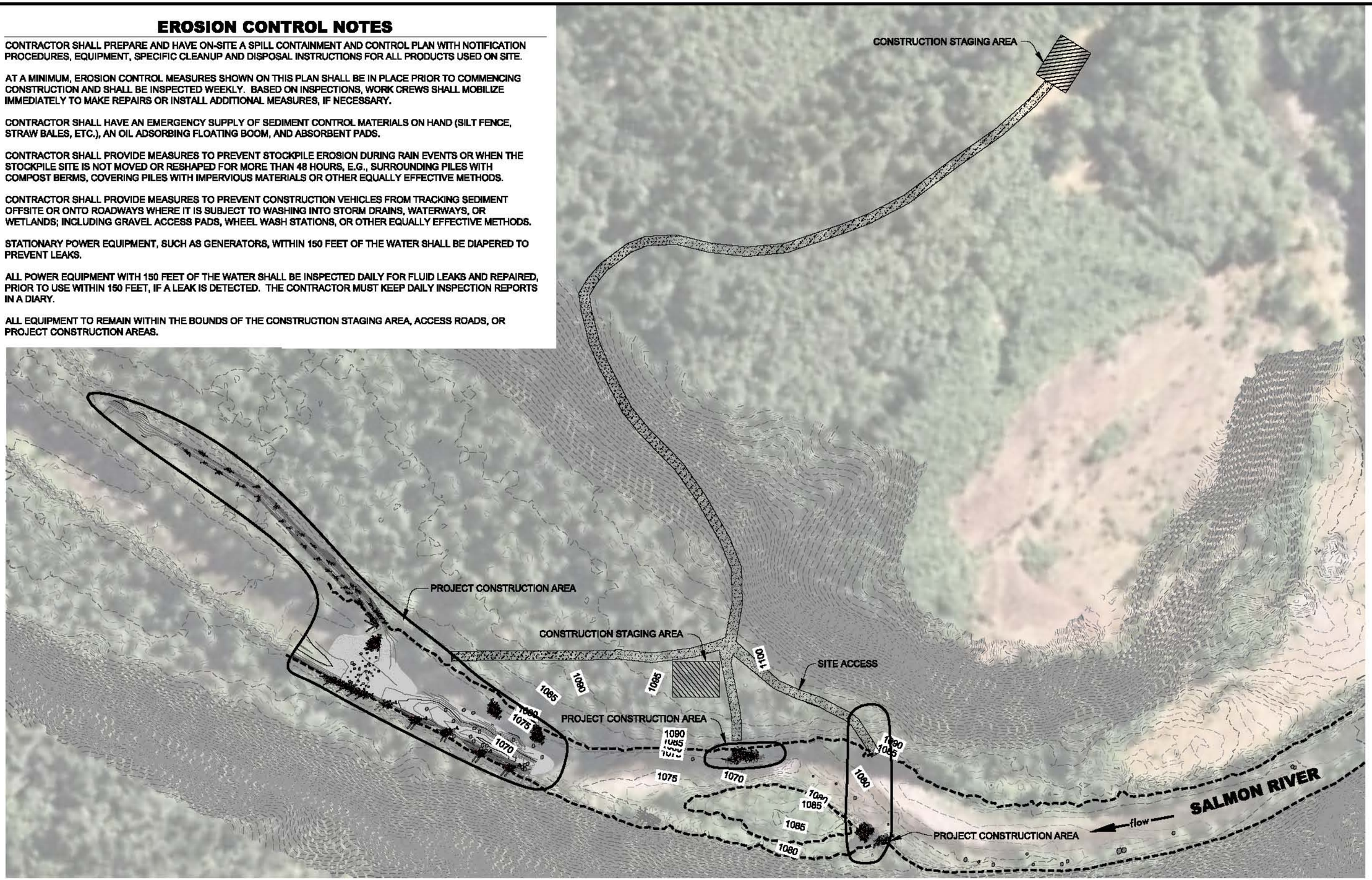
CONTRACTOR SHALL PROVIDE MEASURES TO PREVENT STOCKPILE EROSION DURING RAIN EVENTS OR WHEN THE STOCKPILE SITE IS NOT MOVED OR RESHAPED FOR MORE THAN 48 HOURS, E.G., SURROUNDING PILES WITH COMPOST BERMS, COVERING PILES WITH IMPERVIOUS MATERIALS OR OTHER EQUALLY EFFECTIVE METHODS.

CONTRACTOR SHALL PROVIDE MEASURES TO PREVENT CONSTRUCTION VEHICLES FROM TRACKING SEDIMENT OFFSITE OR ONTO ROADWAYS WHERE IT IS SUBJECT TO WASHING INTO STORM DRAINS, WATERWAYS, OR WETLANDS; INCLUDING GRAVEL ACCESS PADS, WHEEL WASH STATIONS, OR OTHER EQUALLY EFFECTIVE METHODS.

STATIONARY POWER EQUIPMENT, SUCH AS GENERATORS, WITHIN 150 FEET OF THE WATER SHALL BE DIAPERED TO PREVENT LEAKS.

ALL POWER EQUIPMENT WITH 150 FEET OF THE WATER SHALL BE INSPECTED DAILY FOR FLUID LEAKS AND REPAIRED, PRIOR TO USE WITHIN 150 FEET, IF A LEAK IS DETECTED. THE CONTRACTOR MUST KEEP DAILY INSPECTION REPORTS IN A DIARY.

ALL EQUIPMENT TO REMAIN WITHIN THE BOUNDS OF THE CONSTRUCTION STAGING AREA, ACCESS ROADS, OR PROJECT CONSTRUCTION AREAS.



1 **EROSION CONTROL AND SITE ACCESS**
1" = 200'

LEGEND
ORDINARY HIGH WATER
EXISTING CONTOURS (5FT)

NEPA REVIEW

RIVER DESIGN GROUP, INC.
3698 Hwy 93 South, Whitefish, MT 59937, 406.862.4927
311 SW Jefferson Avenue, Corvallis, OR 97333, 541.758.3920

EROSION CONTROL AND SITE ACCESS

SALMON RIVER, MILLER QUARRY REACH SALMONID HABITAT IMPROVEMENT
SALMON RIVER, CLACKAMAS COUNTY, OREGON

NO.	DATE	BY	DESCRIPTION	CHK
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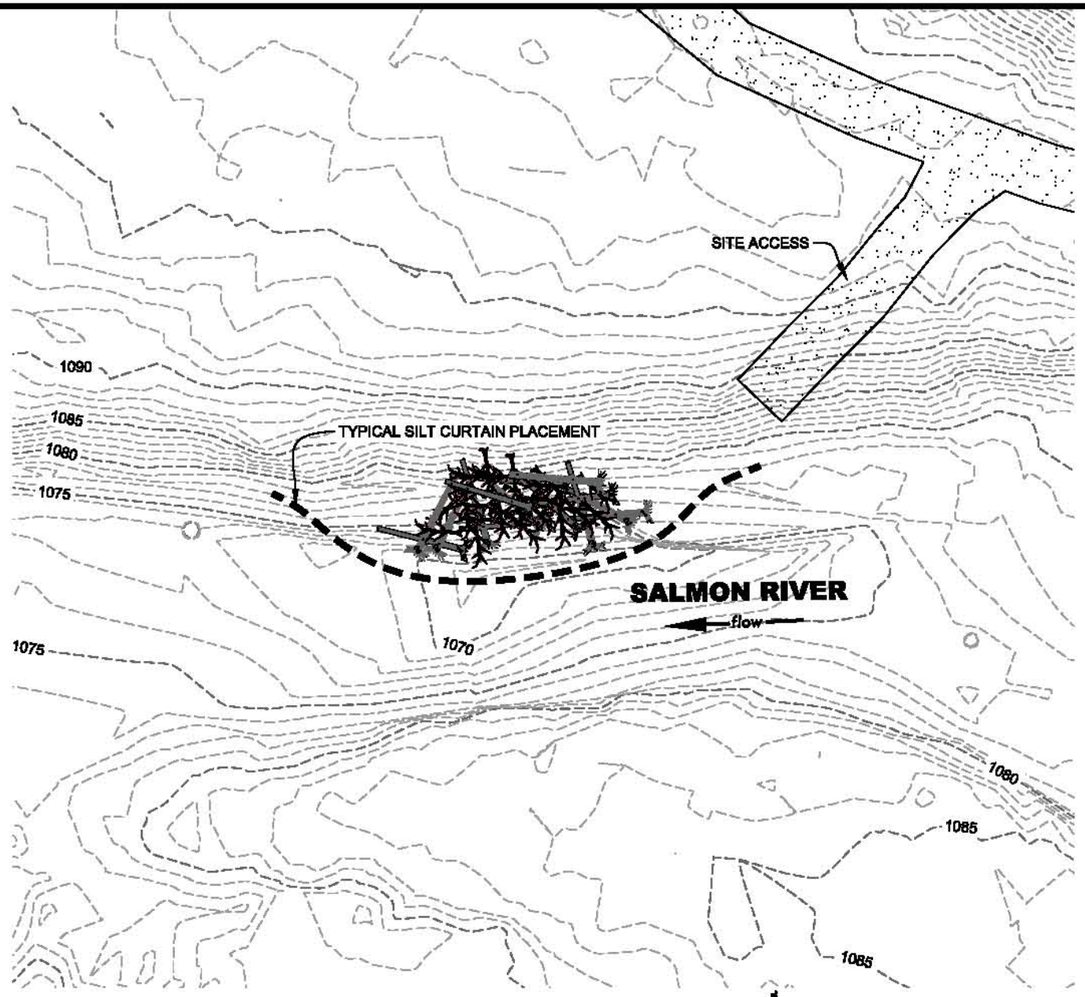
PROJECT NUMBER
RDG-09-042

DRAWING NUMBER
7.0

Drawing 12 of 13



1 WORK AREA ISOLATION TYPICAL

1" = 50'

WORK AREA ISOLATION PLAN

FLOW CONDITIONS DURING IN-WATER WORK

WORK WILL BE EXECUTED DURING THE "IN-WATER" WORK PERIOD AS ESTABLISHED BY THE OREGON DEPARTMENT OF FISH AND WILDLIFE FOR THE SALMON RIVER. FLOW IN THE CHANNEL DURING THE IN-WATER WORK PERIOD IS EXPECTED TO BE LESS THAN 100 CFS.

METHOD OF WORK AREA ISOLATION

THE WORK AREA CAN BE ISOLATED USING A FLOATING SILT CURTAIN INSTALLED AROUND THE WORK AREA. THE CONTRACTOR SHALL INSTALL A "LAYFIELD FSC 13" FLOATING SILT CURTAIN, OR APPROVED EQUAL. THE SILT CURTAIN WILL RETAIN FINE SILTS AND SEDIMENTS ON-SITE, AND WILL NOT ALLOW FISH TO ENTER THE WORK AREA. THE CURTAIN IS INSTALLED STARTING AT THE WATERLINE ALONG THE STREAM BANK AND WORKED OUTWARD (SIMILAR TO A SEINING NET) AND ALONG THE BOTTOM TO ENSURE THAT NO FISH ARE CAUGHT INSIDE THE WORK AREA.

TO FURTHER REDUCE IMPACTS OF IN-WATER WORK, THE CONTRACTOR SHALL NOT WORK MORE THAN 1 HOUR IN THE WATER AND THEN STAY OUT OF THE WATER FOR 2 HOURS BEFORE ENTERING THE WATER AGAIN. THIS CYCLE SHALL BE MAINTAINED THROUGHOUT THE PROJECT AND MAY BE MORE STRINGENT IF REQUIRED.

EQUIPMENT AND MATERIALS LIST

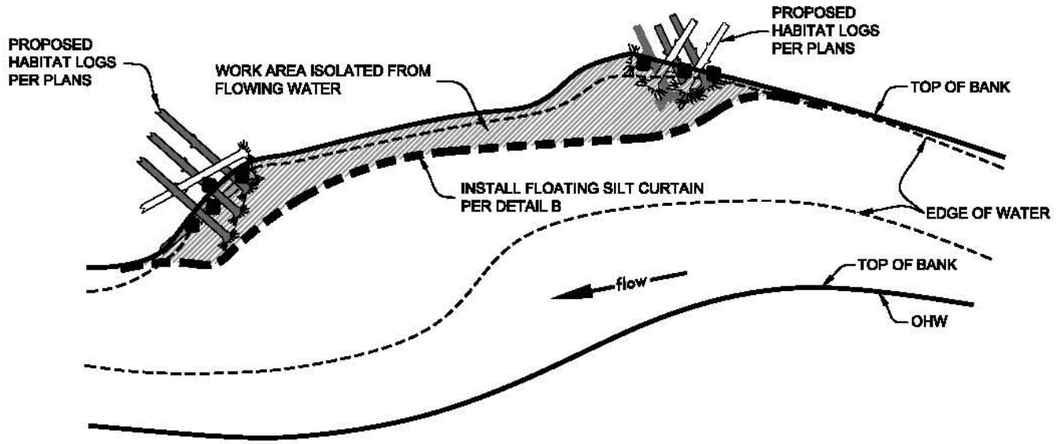
THE CONTRACTOR MUST HAVE THE FOLLOWING EQUIPMENT AND MATERIALS ON-SITE FOR THE DURATION OF CONSTRUCTION:

- SILT AND SEDIMENT FENCING
- FLOATING SILT CURTAIN
- STRAW BALES
- AN OIL-ABSORBING FLOATING BOOM AND ABSORBENT PADS
- SPILL PREVENTION KIT

DEWATERING AND RE-WATERING SEQUENCE

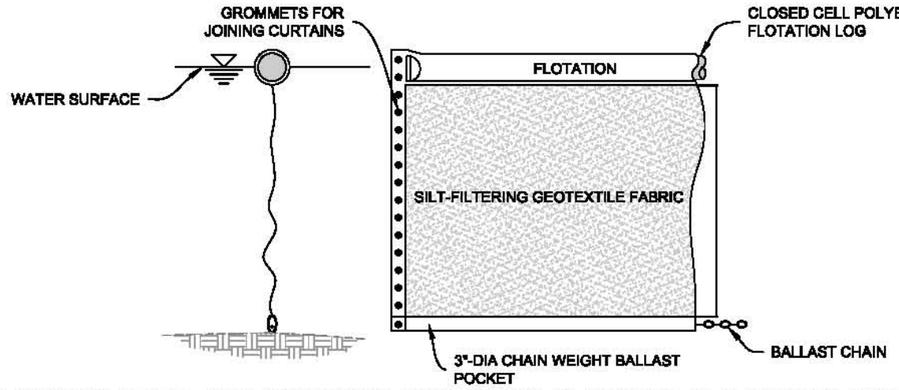
INDIVIDUAL WORK AREAS WILL BE ISOLATED USING A FLOATING SILT CURTAIN THAT TRAPS SILT AND SEDIMENT WITHIN THE DISTURBED AREA. THE SILT CURTAIN CAN BE INSTALLED IN SUCH A MANNER TO ENSURE THAT NO FISH ARE CONTAINED WITHIN THE WORK AREA AND THAT THE WORK AREA IS ISOLATED FROM FLOWING WATER.

THE SILT CURTAIN WILL REMAIN IN PLACE FOR THE DURATION OF WORK. AFTER THE WORK IN THE SPECIFIC ISOLATED WORK AREA IS COMPLETE, THE FLOATING SILT CURTAIN WILL BE REMOVED TO INTRODUCE LIVE WATER INTO THE WATER AREA.



2 WORK AREA ISOLATION - TYPICAL

NOT TO SCALE



FLOATING SILT CURTAIN SHALL BE A "LAYFIELD FSC 13" OR APPROVED EQUAL. THE BODY OF THE FLOATING SILT CURTAIN IS MADE FROM A STRONG, HIGH-FILTRATION FABRIC THAT RETAINS FINE SILTS AND SEDIMENTS ON-SITE. THE FLOAT AND BOTTOM SLEEVE ARE CONSTRUCTED FROM A UV-STABLE, HIGH-STRENGTH POLYETHYLENE (I.E. RIPSTOP-TYPE MATERIAL). THE FLOATING SILT CURTAIN IS INCREASED IN LENGTH BY JOINING ADDITIONAL SECTIONS OF CURTAIN, WHICH TYPICALLY COMES IN 50' LENGTHS.

3 FLOATING SILT CURTAIN

EXAMPLE OF FLOATING SILT CURTAIN PLACEMENT

RIVER DESIGN GROUP, INC.
311 SW Jefferson Avenue
Corvallis, OR 97333
541.738.3720
3098 Hwy 93 South
Whitefish, MT 59937
406.862.4927

WORK AREA ISOLATION

SALMON RIVER, MILLER QUARRY REACH SALMONID HABITAT IMPROVEMENT

SALMON RIVER, CLACKAMAS COUNTY, OREGON

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