## Henry M. Jackson Hydroelectric Project (FERC No. 2157)



## Side Channel Enhancement and Large Woody Debris Placement Construction Report (License Article 404)



April 2013

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## Acronyms & Abbreviations

A-LA	Aquatic License Article
ARC	Aquatic Resource Committee
cfs	cubic feet per second
District	Public Utility District No. 1 of Snohomish County
FERC	Federal Energy Regulatory Commission
LWD	large woody debris
PM&E	protection, mitigation and enhancement
Project	Henry M. Jackson Hydroelectric Project (FERC No. P-2157)
RM	river mile
RSP	Revised Study Plan
SC	side channel
SCE	side channel enhancement
USGS	U.S. Geological Survey

## **1. INTRODUCTION**

## 1.1.Background

The Public Utility District No. 1 of Snohomish County (District) is the licensee for the Henry M. Jackson Hydroelectric Project (Project) under a license issued by the Federal Energy Regulatory Commission (FERC) on September 2, 2011 (License)(FERC 2011). The Project is located on the Sultan River in Snohomish County, Washington, near the City of Sultan. The original Project license was issued in 1961 and amended in 1984. In 1964, construction of Culmback Dam was completed to create Spada Lake Reservoir – the major source of Snohomish County drinking water. In 1984, the construction of the hydroelectric facilities and raising of Culmback Dam were completed, creating the Project as it essentially exists today. The Project includes a 262-foot high rock-fill dam (Culmback Dam); a 1,870-acre reservoir (Spada Lake Reservoir) operated for the City of Everett's water supply, fisheries habitat enhancement, hydroelectric power, incidental flood control and recreational opportunities; a 111.8 megawatt nameplate capacity Powerhouse and various other facilities; about 4,400 acres of wildlife habitat management lands; and several developed and undeveloped recreation and river access sites.

During the relicensing process, several studies were undertaken to document habitat conditions and fish utilization in the Sultan River downstream of Culmback Dam. These studies included:

- Revised Study Plan (RSP) 3: Determination and Evaluation of Habitat Flow Relationships in the Sultan River, Washington – Sultan River Instream Flow Study (R2 Resource Consultants 2009a)
- RSP 5: Juvenile Fish Abundance, Life History and Distribution within the Sultan River, Washington (R2 Resource Consultants 2009b)
- RSP 18: Riverine, Riparian and Wetland Habitat Assessment Technical Report. (Stillwater Sciences 2008a, 2008b)
- RSP 22: Sultan River Physical Process Studies Final Technical Report (Stillwater Sciences 2008c, 2008d)

These studies, especially RSP 18 and RSP 22, indicated the presence of habitat changes in the lower Sultan River tied to regulation of the river and modified hydrology. The majority of the Sultan River, downstream of Culmback Dam, is confined within a canyon; however, the lowermost approximately three miles lies in an alluvial floodplain. This three-mile reach contains numerous side channels that have become encroached over time with vegetation under the regulated condition. This reach is also deficient in large woody debris (LWD), resulting in sections that are relatively homogenous in terms of habitat with little structural complexity and hydraulic diversity.

To address habitat concerns in the lower Sultan River, included in the License requirements is License Article 404 Side Channel Enhancement (SCE) Plan (FERC 2011). The SCE Plan documents how the District would implement a program to (1) restore and enhance the salmonid rearing habitat function along a negotiated minimum length of 10,000 linear feet<sup>1</sup> of side channel habitat (and with a minimum surface area of 3 acres achieved through an average channel width

<sup>&</sup>lt;sup>1</sup> Absent the identification of specific areas for restoration and enhancement, this negotiated length and surface area of side channel habitat was deemed to be generally indicative of the historic condition in the lower Sultan River.

of 13.1 feet), and (2) enhance adult and juvenile salmon habitat by the strategic placement in the main river channel of up to 12 engineered large woody debris (LWD) structures. The District awarded three contracts for the project totaling \$2,994,688. The District awarded a \$473,907 contract to Herrera Environmental Consultants, Inc. for the review of existing information, development of design alternatives, hydraulics modeling, hazard and risk evaluation, document baseline environment, permits preparation, final design, and construction support. The District award a \$187,695 contract to Cherry Valley Logging to furnish and deliver the majority of large woody debris. In May 2012, a general contractor, Jansen, Inc. was awarded a \$2,333,086 contract to perform the construction work. Jansen Inc. opted to complete the work in one year rather than two as was originally envisioned. Construction included work both in and out of the water. The in-water work was limited to 76 days between July 1 and September 14. Construction activities and restoration activities were completed in November 2012, as depicted in the as-built drawings in Appendix A.

These enhancements occur primarily within the lowermost approximate 3-mile portion of the Sultan River downstream of Powerhouse and laterally within the floodplain valley (as defined by a flow of 4,100 cfs, as measured at the U.S. Geological Survey (USGS) Streamflow Gage No. 12138160). The District restored and enhanced 11,788 linear feet (4.5 acres) of side channel habitat which were designed to maintain connectivity between the mainstem Sultan River and selected side channels at flows equal to or greater than 300 cubic feet per second (cfs) as measured at the USGS Streamflow Gage No. 12138160. The side channels are anticipated to provide prime rearing habitat for juvenile salmonids in close proximity to spawning areas upstream. This type of habitat has been identified as a limiting factor towards the recovery of salmon in the Snohomish Basin (SBSRTC 2004). The LWD structures are anticipated to also provide rearing habitat in addition to the primary benefits of providing refuge and holding habitat for upstream migrating adult salmonids, retaining and distributing transported gravels to provide additional spawning areas, promoting further exchange of water and nutrients between surface and subsurface flows (i.e. via the hyporheic zone), and helping distribute surface flows through key side channel inlets.

#### 1.2.Purpose

The purpose of this report, as identified in License Article 404, is to document the results, linear footage, and acreage of side channel reconnection efforts and habitat provided at a flow of 300 cfs as measured at the USGS Streamflow Gage No. 12138160 (FERC 2011).

### 1.3.Consultation

The District consulted and negotiated with 15 separate landowners in the vicinity of the SCE project during the acquisition of easements for construction and access. The process of acquiring easement agreements took over two years to complete and required ongoing coordination in advance and during construction. District staff worked closely with City of Sultan staff on agreements, permits, and construction details. Staff also met with the City of Sultan Council on February 9 and August 26 of 2012 to review the details of the enhancements and the environmental and recreational benefits to the local community and to provide a description of construction related issues, including temporary closure of the parks. An informative brochure was developed to accompany signage that was placed near the SCE project site to notify and inform recreationists using the local parks about the project. On October 11, 2012, the District conducted a river tour of the completed project for members of the Aquatic Resource Committee

(ARC). On October 19, 2012, the District provided a tour to additional Washington Department of Fish and Wildlife staff. Appendix B provides documentation of select consultation.

The ARC was provided a 30-day comment period on the draft report. Consultation documentation is included in Appendix C, with responses to comments included in Appendix D.

## 2. SIDE CHANNEL ENHANCEMENTS

Four side channels (SC) to the Sultan River were targeted for enhancement and/or creation of new, linked channels during 2012 (Tables 1 and 2; Figure 1). Three of the side channels (SC 2, SC 3, and SC 4) have one inlet and one outlet. SC 1 has two inlets and two outlets. Permitting for construction was not only complicated by the project area being "aquatic lands of the state" but more importantly by the fact all areas were within the Federal Emergency Management Agency (FEMA) floodway subjecting all work to meeting "zero-rise" standards. During the project design process, complex modeling of hydraulic conditions was necessary to meet the stringent permitting requirements of zero-rise for both the side channel works and the LWD installations in the main channel of the river (Herrera 2011). This modeling component in itself took over 8 months to complete and included elements such as a redundant inlet to ensure adequate flow delivery over the range of flow conditions, as well as, to provide a contingency plan in the unlikely event that the primary inlet should fail. The work conducted within each of the side channels is described below along with representative photographs.

Side Channel Description	Length of Segment (feet)	Percent of License Obligation
SC1 – Existing	2,709	27
SC1 – Redundant Inlet	605	6
SC1 – Southern Extension	2,649	26
SC2	2,052	21
SC3	2,263	23
SC4	1,510	15
Total	11,788	118

 Table 1.
 Length of side channel habitat enhanced, Sultan River.

## Table 2.Side channel enhancements by the numbers (excavation, wood, and<br/>boulders).

Side Channel Description	Excavation (cubic yards)	Wood (pieces)	Boulder (pieces)
SC1 – Existing	500	15	n/a
SC1 – Redundant Inlet	2,500	15	5
SC1 – Southern Extension	10,000	65	10
SC2	n/a	20	12
SC3	n/a	15	15
SC4	7,000	25	10
Total	20,000	155	52



Figure 1. Map of side channels enhanced during 2012.

#### 2.1. SC 1 – Existing

The inlet to Side Channel 1 (SC 1) is located on a District-owned parcel (Snohomish County Parcel Number 00765600099900) that borders the northwestern corner of the City of Sultan's Osprey Park. This parcel is adjacent to and north of the majority of Osprey Park. When watered, SC 1 functions well with documented heavy utilization by juvenile salmonids (R2 2009b). In 2004, this side channel received placements of additional wood to enhance existing habitat value as part of a cooperative effort between the District, Adopt-A-Stream, and the Washington Department of Natural Resources. The 2012 enhancement focused on maintaining year-round connectivity through excavation and grading of the existing inlet to improve flow connectivity, creation of a redundant inlet to supplement flows from the existing inlet and to ensure adequate flow should the existing inlet become blocked, and strategic placement of two LWD structures (LWD Structures 4 and 5) to create inlets that are self-maintaining and ensure the delivery of adequate flow volumes necessary for salmonid rearing habitat within the entire 5,963 feet of the SC1 network (Table 1). This network provides for nearly 60% of the License obligation. In addition to flow related enhancements, individual pieces of LWD were airlifted into place within SC 1 to provide hydraulic control near flow splits between the existing channel and the southern extension, and additional habitat benefit. A permanent equipment bridge was placed over the channel to provide access for maintenance purposes. The equipment bridge replaced a pedestrian bridge which was relocated to the SC 1 redundant inlet.



Figure 2. SC 1 (existing) inlet, looking upstream from side channel with main channel proximate to LWD Structure 5 in background.

### 2.2. SC 1 – Redundant Inlet

The redundant inlet to SC 1 was created to ensure flow delivery to the SC 1 network should the existing inlet become blocked. This 605-foot channel is located primarily on property owned by the District. The site was cleared initially, followed by excavation of the channel, placement of

in-channel structures, and finally, as with all 6.05 acres denuded during construction, planting with a diverse assemblage of native vegetation conducive to site conditions including 28 different species (Table 3). LWD Structure 4 is located near the inlet to this channel to provide mainstream habitat and direct flow into the channel. A relocated pedestrian bridge spans the channel near the inlet.

SPECIES - Scientific name	Common Name	DESCRIPTION	QUANTITY
Acer Circinatum	Vine Maple	1 gallon container	332
Acer Macrophyllum	Big-Leaf Maple	1 gallon container	88
Alnus Rubra	Red Alder	1 gallon container	61
Amelanchier Alnifolia	Western Serviceberry	1 gallon container	142
Corylus Cornuta	Beaked Hazelnut	1 gallon container	564
Cornus Sericea	Red twig Dogwood	1 gallon container	1,136
Crataegus Douglasii	Black Hawthorn	1 gallon container	51
Crataegus Gaultheria Shallon	Salal	1 gallon container	698
Holodiscus Discolor	Oceanspray	1 gallon container	396
Lonicera Involucrata	Black Twinberry	1 gallon container	1,153
Mahonia Aquifolium	Tall Oregon Grape	1 gallon container	193
Mahonia Nervosa	Low Oregon Grape	1 gallon container	395
Malus Fusca	Crabapple	1 gallon container	1,107
Oemlaria Cerasiformis	Indian Plum	1 gallon container	449
Physocarpus Capitatus	Pacific Ninebark	1 gallon container	1,107
Rubus Parviflorus	Thimbleberry	1 gallon container	581
Polystichum Munitum	Sword Fern	1 gallon container	2,499
Populus Balsamifera SSP. Trichocarpa	Black Cottonwood	1 gallon container	65
Pseudotsuga Menziesii	Douglas Fir	1 gallon container	128
Rubus Spectabilis	Salmonberry	1 gallon container	1,124
Sambucus Racemosa	Red Elderberry	1 gallon container	698
Symphoricarpos Albus	Snowberry	1 gallon container	760
Thuja Plicata	Western Red Cedar	1 gallon container	627
Cornus Sericea	Red twig Dogwood	6 FT Live Stake Cutting	336
Salix Hookeriana	Hooker Willow	6 FT Live Stake Cutting	336
Salix Lucida SPP. Lasiandra	Pacific Willow	6 FT Live Stake Cutting	336
Salix Sitchenis	Sitka Willow	6 FT Live Stake Cutting	336
Carex Obnupta	Slough Sedge	Plug	30,924

Table 3.Species and number of plants used to restore 6.05 acres denuded of<br/>vegetation during construction.



Figure 3. Downstream view of newly constructed and water redundant inlet to SC 1. Mainstem discharge at time of photo was approximately 320 cfs.



Figure 4. Downstream view of redundant inlet to SC 1 under bankfull conditions. Mainstem discharge at time of photo approximately 1,700 cfs.

#### 2.3. SC 1 – Southern Extension

The southern extension to SC 1 was the location of the majority of earthwork on the project. A new channel of 2,649 feet in length was excavated through cleared properties owned by the City of Sultan, Washington Department of Transportation, and a private landowner. Approximately 10,000 cubic yards of material were excavated and removed from the site to create this channel that accounts for roughly 26% of the License obligation (Table 1). The channel received numerous log treatments and bank structures along its length as depicted in Appendix A. The cleared areas along the banks of the channel were planted with an assemblage of native plants and seeded with an erosion control mix. Within Osprey Park, a new pedestrian bridge was installed across the channel. Further downstream, on the private landowner's property, an equipment bridge was placed over the side channel for tractor access and a cattle crossing. Fencing was erected on both sides of the channel to exclude cattle from entering the enhancement/easement area.



Figure 5. Upstream view of the upper 350 feet of the newly created southern extension to SC 1 under low flow conditions.



Figure 6. Upstream view of the upper portion of the newly created southern extension to SC 1 under bankfull conditions.



Figure 7. Downstream view of the upper portion of the newly created southern extension to SC 1.



Figure 8. Downstream view of the newly watered middle portion of the southern extension to SC 1.



Figure 9. Downstream view of low flow conditions in the middle portion of the southern extension to SC 1.



Figure 10. Downstream view of low flow conditions in the lower portion of the southern extension to SC 1.

#### 2.4. SC 2

Prior to the project, SC 2 functioned very well with good habitat structure and an intact riparian community. However, over time aggradation at the inlet impacted connectivity with the mainstem at low flows. The enhancement within SC 2 included minor excavation and grading at the inlet (Figure 11) and placement of individual pieces of LWD by helicopter to preserve the riparian community.



Figure 11. Downstream view of SC 2 with excavated inlet in foreground and placed individual habitat logs in background.

#### 2.5. SC 3

SC 3 constitutes the right channel of a major island complex in the lower river. SC 3 has always functioned well in terms of connectivity; however, a lack of in-channel habitat diversity has resulted in underutilization as rearing habitat. The enhancement effort within SC 3 included several bank treatments using LWD (Figures 12 and 13) and the placement of large boulders within the channel. The boulders were placed by helicopter to avoid damaging the intact riparian community. Future snorkel surveys, conducted per the SCE Plan, will document habitat utilization.



Figure 12. Representative view of bank treatment within SC 3.



Figure 13. Representative view of bank treatment within SC 3.

#### 2.6. SC 4

SC 4 is located within Rudolf Reese Park in the City of Sultan. A remnant side channel existed at the site prior to construction; however, it only became functional under high flow conditions. The enhancement effort involved considerable excavation (7,000 cubic yards) to provide for year-round connectivity. This excavation coupled with the strategic placement of LWD Structure 1 will ensure routing of sufficient flow to provide desired rearing habitats. Bank treatments and the placement of individual logs within the side channel are intended to provide structural complexity and hydraulic diversity.



Figure 14. Upstream view of SC 4 with LWD Structure 1 in background. Mainstem discharge at time of photo approximately 320 cfs.



Figure 15. Upstream view of SC 4 under bankfull flow conditions. Mainstem discharge at time of photo approximately 1,700 cfs.



Figure 16. Downstream view of SC 4 under mainstem flow conditions of approximately 1,500 cfs.

## 3. LARGE WOODY DEBRIS PLACEMENT

Eight LWD structures were installed in the lower river during 2012 (Figure 17). The physical dimensions of each structure and the site elevations are presented in Table 4. Structures varied by type with either a Type 1, Type 2, or Type 3 installed at each location. The design associated with each structure type is presented Appendix A. The performance of these structures will be closely monitored and inform the placement of up to an additional four structures in the future, per License requirements.

LWD Structure	Structure footprint (area in sq ft)	Structure height in feet (maximum)	Structure base elevation (feet, NAVD 88)	Bank height elevation (feet, msl)
1	2,200	6-7	96	115
2	2,200	7-8	98	117
3	2,200	7-8	100	120
4	2,200	7-8	106	126
5	2,200	7-8	106	126
6	2,200	6-7	104	122
7	2,200	7-8	107	126
8	900	5-6	113	130

## Table 4.Approximate physical dimensions and site elevations for each LWD<br/>Structure installed during 2012.



Figure 17. Map depicting locations of LWD Structures installed in 2012.

### 3.1. LWD Structure 1

LWD Structure 1, a Type 1 Structure, is located within Rudolf Reese Park near the inlet to SC 4. The structural components and quantities for a Type 1 Structure are presented in Table 5. The structure deflects water into SC 4 along the right flank and back to the main channel along the left flank. The flow split between the two flanks varies with mainstem discharge. With the exception of LWD Structure 7, all structures were planted with site appropriate native vegetation and seeded. This site will be monitored, per the SCE Plan, after high flow events to document

channel changes. Within a month after construction was completed, spawning use by Chinook salmon was documented within the riffle along the left flank. The structure also provides a large holding pool for adult salmon migrating upstream.

ENGINEERED LOG JAMS – Type 1 ELJ				
1 EA	Structural Assembly			
4 EA	Installation of 24" dia, 40' long with rootwad (R2)			
11 EA	Installation of 24" dia, 35' long with rootwad (R3)			
14 EA	Installation of 16-18" dia, 25' long with rootwad (R7)			
4 EA	Installation of 14-18" dia, 25' long (L3)			
3 EA	Installation of 14-18" dia, 20' long (L4)			
100 EA	Installation of Racking Logs – 8-16" DBH, 15' long			
120 CY	Installation of Slash			
50 EA	Installation of Drilled 3-4 Man Rocks			
260 CY	Installation of Streambed boulders (for Scour Apron)			
5 CY	Installation of Topsoil			
1 LS	Lashing Cables			

 Table 5.
 Structural components and quantities associated with a Type 1 Structure.



Figure 18. Downstream view of LWD Structure 1 at mainstem flow of 1,700 cfs. SC 4 is on right and split flow return to main channel is on left.

### 3.2. LWD Structure 2

LWD Structure 2, a Type 1 Structure, is located along the left bank of the main channel of the Sultan River upstream of Rudolf Reese Park. This structure provides mainstem diversity and gravel retention in close proximity to an area of documented high spawning use. Within a month after construction, adult Chinook salmon were observed spawning and holding in the areas around this structure.



Figure 19. Downstream view of LWD Structure 2 under low flow conditions of approximately 320 cfs.

### 3.3. LWD Structure 3

LWD Structure 3, a Type 1 Structure, is located along the left bank of the main channel near the southwestern edge of Osprey Park in the City of Sultan. The structure is located near the historic existing outlet to SC 1. This structure provides structural diversity in a homogenous stretch of the river and also serves to encourage flow towards the right bank of the main channel and SC 4 downstream.



Figure 20. Downstream view of LWD Structure 3 under low flow conditions of approximately 320 cfs.

#### 3.4. LWD Structure 4

LWD Structure 4, a Type 1 Structure, is one of two structures near the inlets to SC 1. This structure deflects mainstem flow into the redundant inlet to SC 1 and also provides holding habitat for adult salmon and steelhead in close proximity to spawning grounds that have been documented as heavily utilized by Chinook, chum, and pink salmon, as well as, steelhead trout.



Figure 21. Downstream view of LWD Structure 4 at entrance to redundant inlet to SC 1. Photo taken at low flow conditions of approximately 320 cfs in main channel.

## 3.5. LWD Structure 5

LWD Structure 5, a Type 1 Structure, is located at the historic inlet to SC 1. As with LWD Structure 4, this structure deflects mainstem flow into the inlet to SC 1 and also provides holding habitat for adult salmon and steelhead in close proximity to spawning grounds with documented heavy utilization by Chinook, chum, pink salmon, and steelhead trout. Flow into SC 1 will be monitored for sufficiency including the observations on the presence of flow constrictions from debris and/or beaver activity.



Figure 22. Downstream view of LWD Structure 5 at inlet to existing SC 1. The small island on the left is flanked on both sides by flow.

## 3.6. LWD Structure 6

LWD Structure 6, a Type 2 Structure, is located near the outlet to SC 2. The structural components and quantities for a Type 2 Structure are presented in Table 6. SC 2 is very heavily utilized by spawning chum salmon. Adult salmon typically stage near the outlet, in the area where the structure is located, prior to their upstream migration into the side channel. Shortly after construction and during landscaping of the bank, adult Chinook salmon were observed daily congregating in this area. This structure provides mainstem holding habitat, a mechanism for gravel sorting, and bank protection.

ENGINEERED LOG JAMS – Type 2 ELJ			
Type 1 subcomponent of ELJ number 6:			
1 EA	Structural Assembly		
4 EA	Installation of 24" dia, 40' long with rootwad (R2)		
11 EA	Installation of 24" dia, 35' long with rootwad (R3)		
14 EA	Installation of 16-18" dia, 25' long with rootwad (R7)		
4 EA	Installation of 14-18" dia, 25' long (L3)		
3 EA	Installation of 14-18" dia, 20' long (L4)		
100 EA	Installation of Racking Logs – 8-16" DBH, 15' long		
120 CY	Installation of Slash		
50 EA	Installation of Drilled 3-4 Man Rocks		
260 CY	Installation of Streambed boulders (for Scour Apron)		
5 CY	Installation of Topsoil		
1 LS	Lashing Cables		
200 SQ FT	Rolonaka BIO-D block bank restoration (additional may be required to cover excavated area depending on CONTRACTORS means and methods)		
Type 2 subc	omponent of ELJ number 6:		
1 EA	Installation of Structural Assembly		
2 EA	Installation of 24" dia, 40' long with rootwad (R2)		
2 EA	Installation of 16-18" dia, 40' long with rootwad (R5)		
10 EA	Installation of 16-18" dia, 25' long with rootwad (R7)		
5 EA	Installation of 14-18" dia, 25' long (L3)		
80 EA	Installation of Racking Logs – 8-16" DBH, 15' long		
80 CY	Installation of Slash		
150 CY	Installation of Streambed boulders (for Scour Apron)		
120 CY	Installation of Topsoil		
40 CY	Installation of Bark or Wood Chip Mulch		
1 LS	Installation of Lashing Cables		
200 SQ FT	Rolonaka BIO-D block bank restoration (additional may be required to cover excavated area depending on CONTRACTORS means and methods)		

 Table 6.
 Structural components and quantities associated with a Type 2 Structure.

 ENGINEERED LOG LAMS - Type 2 EL L



Figure 23. Downstream view of LWD Structure 6 under low flow conditions of approximately 320 cfs. Plastic sheeting was removed once planting was completed.

### 3.7. LWD Structure 7

LWD Structure 7, a Type 1 Structure, is located along the right bank of the river across and upstream of the historic inlet to SC 1. This structure provides structural complexity and hydraulic diversity within a homogenous stretch of the river, and also encourages the deflection of flow into SC 1.



Figure 24. Downstream view of LWD Structure 7 under low flow conditions of approximately 320 cfs.

### 3.8. LWD Structure 8

LWD Structure 8, a Type 3 Structure, is the most upstream of the structures installed in 2012. The structural components and quantities for a Type 3 Structure are presented in Table 7. This structure is located along the left bank of the river upstream of an island complex. This structure provides mainstem diversity and also encourages the redistribution of flow including mild encouragement of flow into SC 2 across the river.

Table 7.	Structural components and quantities associated with a Type 3 Structure
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ENGINEERED LOG JAMS – Type 3 ELJ	
1 EA	Installation of Structural Assembly
7 EA	Installation of 24" dia, 35' long with rootwad (R3)
5 EA	Installation of 16-18" dia, 25' long with rootwad (R7)
50 EA	Installation of Racking Logs – 8-16" DBH, 15' long
40 CY	Installation of Slash
70 CY	Installation of Streambed boulders (for Scour Apron)
1LS	Installation of Lashing Cables



Figure 25. Downstream view of LWD Structure 8 under low flow conditions.



Figure 26. View of LWD Structure 8 from left bank at mainstem discharge of approximately 1,500 cfs. Inlet to SC 2 is visible in background.

## 4. REFERENCES

FERC. 2011. Order Issuing New License. Project No. 2157-188. 136 FERC ¶ 62,188. September 2, 2011.

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## Appendix A

As-Built Drawings
## **SULTAN RIVER** SIDE CHANNEL ENHANCEMENT AND LARGE WOODY DEBRIS PLACEMENT PROJECT





	SHEET INDEX				
SHEET NO.	DWG NO.	SHEET DESCRIPTION			
1	G-1	COVER SHEET, VICINITY MAP AND INDEX			
2	G-2	GENERAL NOTES			
3	G-3	ABBREVIATIONS AND LEGEND			
4	G-4	KEY MAP AND SITE MAP			
5	EC-1	REACH 1 CLEARING, GRADING, SWPPP, AND TARGETED DRAINAGE PLAN			
6	EC-2	REACH 2 CLEARING, GRADING, SWPPP, AND TARGETED DRAINAGE PLAN			
7	EC-3	REACH 3 CLEARING, GRADING, SWPPP, AND TARGETED DRAINAGE PLAN			
8	EC-4	REACH 4 CLEARING, GRADING, SWPPP, AND TARGETED DRAINAGE PLAN			
9	EC-5	EROSION CONTROL STANDARD DETAILS			
10	EC-6	WATER MANAGEMENT DETAILS			
11	C-1	SC#3 INLET SITE PLAN			
12	C-2	SC#3 OUTLET SITE PLAN			
13	C-3	SC#2 GRADING AND SITE PLAN			
14	C-4	SC#1 INLET GRADING AND SITE PLAN			
15	C-5	SC#1 FLOW SPLIT GRADING AND SITE PLAN			
16	C-6	SC#1 UPPER CHANNEL GRADING AND SITE PLAN			
17	C-7	SC#1 LOWER CHANNEL GRADING AND SITE PLAN			
18	C-8	SC#1 OUTLET, SC#4 GRADING AND SITE PLAN			
19	C-9	SC#2 AND SC#4 PROFILES			
20	C-10	SC#1 PROFILE			
21	C-11	SC#1 PROFILES			
22	C-12	SC#1 AND SC#4 CROSS-SECTIONS			
23	C-13	SC HABITAT DETAILS			
24	C-14	SC HABITAT DETAILS			
25	C-15	SC HABITAT DETAILS			
26	C-16	SC HABITAT DETAILS			
27	C-17	ELJ TYPE 1 PLAN AND SECTION			
28	C-18	ELJ TYPE 1 LAYERING PLAN			
29	C-19	ELJ TYPE 2 PLAN AND SECTION			
30	C-20	ELJ TYPE 2 LAYERING PLAN			
31	C-21	ELJ TYPE 3 PLAN AND SECTION			
32	C-22	ELJ TYPE 3 LAYERING PLAN			
33	C-23	BRIDGE DETAILS			
34	C-24	BRIDGE DETAILS			
35	C-25	SITE DETAILS			
36	L-1	REACH 1 PLANTING PLAN			
37	L-2	REACH 2 PLANTING PLAN			
38	L-3	REACH & PLANTING PLAN			
39	L-4	REACH & DIANTING SCHEDULE			
40	L-5				
41	L-0	PLANTING PLAN DETAILS			

DRIVING DIRECTIONS FROM EVERETT, WA TO SULTAN, WA:

FROM I-5 TAKE US-2 E/STEVENS PASS HIGHWAY (EAST) TOWARD SNOHOMISH TO CITY OF SULTAN. (APPROXIMATELY 25 MINUTES)

### DISTRICT PROJECT LEAD:

SNOHOMISH COUNTY PUD NO. 1 SCOTT SPAHR, P.E. P.O. BOX 1107 EVERETT, WA 98206-1107 (425) 783-1746 SDSPAHR@SNOPUD.COM

### **ENGINEER:**

HERRERA ENVIRONMENTAL CONSULTANTS GUS KAYS, P.E. 2200 SIXTH AVENUE SUITE 1100 SEATTLE, WA 98121 (206) 441-9080 GKAYS@HERRERAINC.COM

### CITY OF SULTAN PROJECT FILE:

City of Sultan Community Development APPROVED FOR CONSTRUCTION

R/W Permit No.

### SNOHOMISH COUNTY PROJECT FILE: #11-

Snohomish County Planning & Development Services APPROVED FOR CONSTRUCTION Bv

R/W Permit No.

# CONFORMED SET HERRERA D PUBLIC UTILITY DISTRIC WO 09-04525-000 TASK SCALE AS NOTED DFTR L. TURNIDGE CHKR I. MOSTRENKO ENGR G. KAYS APVD M. SPILLANE DATE MARCH 2012 SHEET TITLE COVER SHEET, VICINITY MAP AND INDEX SHEE.



1 of 41 DRAWING G - 1

- 1. MATERIAL STAGING AREAS TO BE LOCATED AS SHOWN ON THE SITE PLAN. MATERIAL SHALL NOT BE STORED OUTSIDE OF IDENTIFIED STAGING AREAS, UNLESS APPROVED BY DISTRICT AND LAND OWNER.
- 2. CONTRACTOR SHALL LIMIT MACHINERY MOVEMENT TO PROJECT LIMITS DEFINED ON SITE PLAN OR IDENTIFIED AS ACCEPTABLE TO DISTRICT.
- 3. CLEARING LIMITS FOR TEMPORARY ACCESS ROAD AND PROPOSED STRUCTURES SHALL BE LIMITED TO THE AREA REQUIRED FOR SAFE EQUIPMENT OPERATION. CLEARING LIMITS SHALL BE STAKED BY CONTRACTOR AND APPROVED BY DISTRICT AT LEAST 3 DAYS PRIOR TO CLEARING ACTIVITIES. CLEARING LIMITS SHALL BE STAKED TO MINIMIZE THE AREA OF DISTURBANCE.
- 4. APPROVED CONSTRUCTION SEQUENCE PLAN SHALL NOT BE ALTERED UNLESS APPROVED BY DISTRICT
- 5. FIELD VERIFY WITH DISTRICT ALL ENGINEERED LOGJAM LOCATIONS, LENGTHS, WIDTHS, AND ELEVATIONS PRIOR TO EXCAVATION, ASSEMBLY, AND INSTALLATION OF EACH STRUCTURE.
- 6. EQUIPMENT USED FOR THIS PROJECT SHALL BE FREE OF EXTERNAL PETROLEUM-BASED PRODUCTS WHILE WORKING NEAR OR ANY SURFACE WATER OR WETLANDS. ACCUMULATION OF SOILS OR DEBRIS SHALL BE REMOVED FROM THE DRIVE MECHANISMS (WHEELS, TRACKS, TIRES, ETC.) AND UNDERCARRIAGE OF EQUIPMENT PRIOR TO ITS WORKING BELOW THE BANKFULL WATER ELEVATION.
- 7. EQUIPMENT SHALL BE CHECKED DAILY FOR LEAKS, AND ANY NECESSARY REPAIRS SHALL BE COMPLETED PRIOR TO COMMENCING WORK ACTIVITIES.
- 8. THE CONTRACTOR IS RESPONSIBLE TO ENSURE THAT NO PETROLEUM PRODUCTS, HYDRAULIC FLUID, SEDIMENTS, SEDIMENT-LADEN WATER, CHEMICALS, OR ANY OTHER TOXIC OR DELETERIOUS MATERIALS ARE ALLOWED TO ENTER OR LEACH INTO THE RIVER, GROUNDWATER, OR WETLANDS.
- 9. IF AT ANY TIME, AS A RESULT OF PROJECT ACTIVITIES, FISH ARE OBSERVED IN DISTRESS, A FISH KILL OCCURS, OR WATER QUALITY PROBLEMS DEVELOP (INCLUDING EQUIPMENT LEAKS OR SPILLS), OPERATIONS SHALL CEASE AND THE DISTRICT SHALL BE NOTIFIED IMMEDIATELY. WASHINGTON DEPARTMENT OF FISH AND WILDLIFE AND WASHINGTON DEPARTMENT OF ECOLOGY SHALL BE CONTACTED IMMEDIATELY BY THE DISTRICT OR BY HIS/HER DESIGNEE. WORK SHALL NOT RESUME UNTIL FURTHER APPROVAL BY DISTRICT REPRESENTATIVE.
- 10. EROSION CONTROL METHODS SHALL BE USED TO PREVENT SILT-LADEN WATER FROM ENTERING THE RIVER. INITIAL EROSION CONTROL MEASURES ARE SHOWN ON DRAWINGS EC-1, EC-2, EC-3, AND EC-4. CONTRACTOR IS SOLELY RESPONSIBLE FOR SUITABLE BMP'S TO CONTROL SILTATION FROM WORK ARFA.
- 11. ALTERATION OR DISTURBANCE OF THE BANK AND BANK VEGETATION SHALL BE MINIMIZED TO THAT NECESSARY TO CONSTRUCT THE PROJECT. CONTRACTOR SHALL KEEP DISTURBED AREAS WITHIN LIMITS SHOWN ON PLANS.
- 12. IF HIGH FLOW CONDITIONS THAT MAY CAUSE SILTATION OR EROSION ARE ENCOUNTERED DURING CONSTRUCTION, WORK SHALL STOP UNTIL THE FLOW SUBSIDES.
- 13. DECKED LOGS SHALL BE ACCESSIBLE FOR INSPECTION.
- 14. LOG TYPE IDENTIFICATION SHALL BE PAINTED ON ALL LOGS IN A PLACE VISIBLE FOR INSPECTION PRIOR TO PLACEMENT WITH LEAD-FREE, BLAZE-ORANGE SURVEY MARKING PAINT.
- 15. EXCAVATIONS THAT HAVE POTENTIAL TO IMPACT THE WETTED CHANNEL OF THE SULTAN RIVER OR SIDE CHANNEL SHALL BE ISOLATED FROM THE ACTIVE CHANNEL. ISOLATION MEANS SHALL CONSIST OF SILT BOOMS, BULK BAGS, BLADDER DAMS OR APPROVED EQUAL AS NECESSARY TO PREVENT IMPACTS TO WATER QUALITY.

### SURVEY NOTES:

- 1. BASIS OF BEARINGS IS THE WASHINGTON STATE PLANE COORDINATE SYSTEM, NORTH ZONE, N.A.D. 83/91.
- 2. TOPOGRAPHY SHOWN DEVELOPED FROM LIDAR (2004) AND GROUND SURVEY (HARMSEN AND ASSOCIATES, 2009).
- 3. VERTICAL DATUM IS NAVD 88.
- 4. BASE MAP SURVEY CONTROL FILE TO BE PROVIDED TO CONTRACTOR CONTRACTOR REQUIRED TO MAINTAIN SURVEY CONTROL. STAKING BY DISTRICT IS DESCRIBED IN PROJECT SPECIFICATION.
- 5. EXISTING TRAILS, ROADS, BUILDINGS, WETTED CHANNEL EXTENTS, PARCEL LINES, TREES, AND VEGETATION SHOWN ARE APPROXIMATE.

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<u>LEGEND:</u>					
	APPROX WETTED AREA, SHOWN FOR REFERENCE ONLY	SIDE CHANNEL	L INLET DREDGING		
	100 YEAR FEMA FLOOD ZONE	2 ORDER OF LC	DG PLACEMENT		<u>detail and s</u>
	FEMA FLOODWAY		JMBER		<u> </u>
OHW	EXISTING ORDINARY HIGH WATER (OHW)		(ENGINEERED LOG JAM)		<u>.</u>
	CRITICAL AREA BUFFER	ELJ TYPE 1, 1	SEE 1		
	EXISTING 2 FT CONTOUR	N AN IN A		SCALE: NTS	
	EXISTING 10 FT CONTOUR	ELJ TYPE 2, 3	SEE (C-19)		
	EXISTING PARCEL LINE	ELJ TYPE 3, 1	SEE (1)		
· · · · · ·	SULTAN CITY LIMITS	BANK ROUGHE	ENING STRUCTURE, SEE $\begin{pmatrix} 1 \\ c_{-15} \end{pmatrix}$	A C-2	
	EXISTING TRAIL			SECTION	
	EXISTING FARM ROAD	MID-CHANNEL	ROUGHENING STRUCTURE, SEE	SCALE: NTS	<u> </u>
	EXISTING ROAD	OVERFLOW ST	RUCTURE, SEE C-15		
	PROPOSED CHANNEL CENTERLINE	HIGH BANK H.	IABITAT STRUCTURE, SEE 2		
	EXISTING BRIDGE		(1)		
*         *         *         *           *         *         *         *         *           *         *         *         *         *         *	EXISTING WETLAND	GRAVEL RETEN	NTION STRUCTURE, SEE C-14		
	FLOW DIRECTION	BANK HABITAT	T STRUCTURE, SEE 2 G-13		
SC#1	SIDE CHANNEL NUMBER	BOULDER CLU	JSTER, SEE (1)		
$\oslash$	TEXT PIT/BORE HOLE				
	HUB & TACK POINT	BOULDER			
$\odot$	CONTROL POINT	HELICOPTER F	PLACED MATERIAL		
SC3-B	WETLAND NAME		PLACEMENT ID NUMBER		
	PROPOSED TEMPORARY CONSTRUCTION ACCESS ROAD	SLASH AND R	RACKING		
	PROPOSED RELOCATED TRAIL	TOP SOIL			
-0-0-0-0-0	PROPOSED RIPARIAN FENCE				
	TEMPORARY SILT FENCE	WORK AREA V	WITH ADDITIONAL SCHEDULE CONSTRAINTS		
+++++++++++++++++++++++++++++++++++++++	TEMPORARY SITE CONTROL FENCE				
	TEMPORARY BULK BAG ISOLATION	PROFILE AND CROSS-	-SECTION LEGEND:		
	SITE ACCESS	— — — — — — EX	KISTING GROUND		
	NEW PERMANENT BRIDGE	PR	ROPOSED GRADE		
	TEMPORARY BRIDGE (APPROXIMATE LOCATION)	SWPPP CODING SYST	EM:		
	STABILIZED CONSTRUCTION ENTRANCE $\begin{pmatrix} 1 \\ EC-5 \end{pmatrix}$	CL CLEARING LIMITS (PROJEC	CT AREA)		
	STAGING AREA	CRS) CONSTRUCTION ROAD STAI	BILIZATION (BMP C107)		
	WATER MANAGEMENT/INFILTRATION AREA	(FF) FILTER FABRIC FENCE (BM	MP C233)		

### SECTION REFERENCING

- DETAIL REFERENCE NUMBER
  DRAWING ON WHICH DETAIL APPEARS

("TYP" SPECIFIES THAT DETAIL IS UNIFORMLY TYPICAL THROUGHOUT PROJECT EXCEPT WHERE OTHERWISE NOTED) ("VAR" SPECIFIES THAT DETAIL WAS TAKEN FROM SEVERAL DRAWINGS)



G-3

2012





staging a	area 3 – district supplied l	OGS	CPENDERGAST	
			The statisting garage to be	PROTE
R2	$24^{\circ}$ + LOCS WITH POOTWARS - 40' LONG	4		maak
R3	$24^{\circ}$ + LOGS WITH ROOTWADS - 35' LONG	11	1> ( A SE / B S S S S S S S S S S S S S S S S S S	
R5	16-24" LOGS WITH ROOTWARS - 40' LONG	2	RESTORED	
R7	12-24" LOGS WITH ROOTWADS - 25' LONG	4	TEMPORARY WITH SOD	ЭЖ
R8	18-24" LOGS WITH ROOTWADS - 25' LONG	7	HOG FUEL GRADE ROAD AT PROJECT	
L3	16-24" LOGS - 25' LONG	9	ACCESS, SEE NOTE 2 OF 5/8"-MINUS FOR FILL OF ANY	, 1 L J
	TOTAL	37	Destruction of the second dress-up -	$\mathcal{L}$
RACKING	4"-16" DIA, 15'-30' LONG	60	BARK BARK	Al
		0.00	SET HUB & TACK	L
STAGING A	AREA 4 – DISTRICT SUPPLIED L	.065	CONSTRUCTION, SEE 5	$\geq$
LOG TYPE	LOG SIZE	QTY	ELEV=134.04	<u> </u>
R2	24"+ LOGS WITH ROOTWADS - 40' LONG	8	AND REMOVE SLOUGHING DEBRIS + 33 * 1 / / / / / / / / / / / / / / / / / /	
R3	24"+ LOGS WITH ROOTWADS - 35" LONG	29	- CACCESS TO FOLLOW	
R7	12-24 LOGS WITH ROOTWADS - 25 LONG	12	STAGING AREA 8, SEE NOTE 6	5
	16-24 LOGS WITH ROUTWADS - 25 LONG	19		
4	$16-24^{\circ} + 1005 - 20^{\circ} + 1000$	8		
	TOTAL	80	- + OF HOG FUEL ON ROOT ZONE	<i>'</i> \
RACKING	4"-16" DIA, 15'-30' LONG	120		,
				(
staging A	AREA 5 – DISTRICT SUPPLIED L	.OGS	BLADE ROAD AND ADD	$\sim$
LOG TYPE	LOG SIZE	QTY	J 60 CY OF 1-1/4"-MINUS AT CONCLUSION OF J SC2-AP	-1
R4	16-24" LOGS WITH ROOTWADS - 50' LONG	20	CONSTRUCTION	$\backslash <$
R5	16-24" LOGS WITH ROOTWADS - 40' LONG	2	GATE GATE CATE CONTRACTOR	71
R6	16-24" LOGS WITH ROOTWADS - 30' LONG	3	HELICOPIER	
R7	12-24" LOGS WITH ROOTWADS - 25' LONG	3		
L1	16-24" LOGS - 50' LONG	5		
LZ	16-24 LOGS - 40 LONG	5		
LJ	16-24 LOGS - 25 LONG	40		/
RACKING	4"-16" DIA. 15'-30' LONG	0		
				- 7
STAGING A	area 6 – district supplied l	.OGS	$(1YP), SEE \left(\frac{1}{2}\right)$	0
LOG TYPE	LOG SIZE	QTY		-
R2	24"+ LOGS WITH ROOTWADS - 40' LONG	4	- EXISTING ROAD. BRUSH	
R3	24"+ LOGS WITH ROOTWADS - 35' LONG	11	ACCESS. FINAL GRADING TO BE	~^
R5	16-24" LOGS WITH ROOTWADS - 40' LONG	3	CONSTRUCTION AND 200 CY OF	5
R6	16-24" LOGS WITH ROOTWADS - 30' LONG	9	1-1/4"-MINUS TO BE PLACED TO	~)
R7	12-24" LOGS WITH ROOTWADS - 25' LONG	11	ADDRESS RUTTING OR POTHOLES	SULT
R8	18-24" LOGS WITH ROOTWADS - 25' LONG	/		K
LS	16-24 LOGS - 25 LONG	2		
L4	16-24 LOGS - 20 LONG	50	- PROTECT EXISTING	
RACKING	4"-16" DIA. 15'-30' LONG	60		
			HELICOPTER PLACED LOGS	
STAGING A	AREA 7 – DISTRICT SUPPLIED L	OGS		
LOG TYPE	LOG SIZE	QTY		
R2	24"+ LOGS WITH ROOTWADS - 40' LONG	4	SAVE AND PROTECT	7
R3	24"+ LOGS WITH ROOTWADS - 35' LONG	11		11
R4	16-24" LOGS WITH ROOTWADS - 50' LONG	2	L WRIGHL / CALL / PLACED LUGS	$(\mathbf{i})$
R5	16-24" LOGS WITH ROOTWADS - 40' LONG	7		2
R6	16-24" LOGS WITH ROOTWADS - 30' LONG	18		
R7	12-24" LOGS WITH ROOTWADS - 25' LONG	20	FOLLOW EXISTING	· د
<u>К</u> 1 1	16-24 LUGS WITH ROUTWADS - 25° LONG	1	PRIMITIVE ROAD - CROSSING (MIN 40FT CLEAF	₹ SPAN
12	$16-24" \mid OGS = 40" \mid ONG$	2		
L.3	16-24" LOGS - 25' LONG	20		
L4	16-24" LOGS - 20' LONG	4	1 \   / - / / NO WORK UNTIL AUGUST 20TH	EMPOR.
	TOTAL	96	2012, SEE SPECIFICATIONS	LT BO
RACKING	4"-16" DIA, 15'-30' LONG	60		/
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			CLEAR BLACKBERRIES	* * *
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### WATER MANAGEMENT NOTES:

- 1. WITH THE TESC PLAN.
- 2. FROM WORK AREA
- 3.
- 4. FORTH IN THE PROJECT PERMITS. 5.
- 6. SPECIFICATIONS AND PERMITS
- 7. WATER PUMPING ACTIVITIES.
  - 8. UNLESS TO CONTROL TURBIDITY.
  - 9.
  - 10. PROTECTION
  - DIVERSION SYSTEM.

### SHORING NOTES:

- CONTRACTOR SHALL DESIGN ALL REQUIRED SHORING AND ALL FLOW AND WATER EXCLUSION STRUCTURES AND SYSTEMS. HYDROSTATIC PRESSURES SHALL BE ADDED TO LATERAL PRESSURES DUE TO EARTH. SURCHARGES AND SPECIAL PRESSURES. SPECIAL PRESSURES MAY INCLUDE BUT ARE NOT LIMITED TO HYDROSTATIC PRESSURES RESULTING FROM BACKWATER CONDITIONS TEMPORARY SHORING SEEPAGE, MACHINERY SURCHARGE AND FLUCTUATING GROUNDWATER.
- 2. OTHER SURCHARGES SHALL BE DETERMINED BY THE CONTRACTOR ON THE BASIS OF CONSTRUCTION TRAFFIC, EQUIPMENT STORAGE, SPOILS HANDLING, WORK SEQUENCE AND OTHER FACTORS.

WATER MANAGEMENT METHODS SHALL BE USED TO DIVERT FLOW AND ISOLATE WORK AREAS AS NECESSARY TO COMPLETE CONSTRUCTION OF NEW CHANNELS AND ELJS AND TO AVOID IMPACTS TO WATER QUALITY. THE CONTRACTOR SHALL SUBMIT FOR APPROVAL BY THE ENGINEER PRIOR TO INITIATING ANY ONSITE CONSTRUCTION ACTIVITIES, A WATER MANAGEMENT AND WORK AREA ISOLATION PLAN ADDRESSING SITE SPECIFIC TECHNIQUES AND METHODS FOR TEMPORARILY DIVERTING FLOW AND ISOLATING WORK AREAS, AND FOR DEWATERING DURING CHANNEL AND LOG STRUCTURE CONSTRUCTION. DIVERSION AND ISOLATION MEANS SHALL CONSIST OF SILT BOOMS, BULK BAGS, BLADDER DAMS OR APPROVED EQUAL AS NECESSARY TO ALLOW CONSTRUCTION WHILE PREVENTING IMPACTS TO WATER QUALITY. COMBINATION OF ISOLATION MEASURES MAY BE USED AS NECESSARY. THIS PLAN MAY BE COMBINED

CONTRACTOR SHALL CONSTRUCT TEMPORARY FLOW DIVERSION MEASURES STARTING AT UPSTREAM END OF WORK AREA TO DIRECT WATER AWAY

CONSTRUCTION WITHIN THE ISOLATED WORK AREA MAY NOT COMMENCE UNTIL THE OWNER HAS COMPLETED ALL FISH EXCLUSION ACTIVITIES.

GROUND WATER ENCOUNTERED DURING CHANNEL AND ELJ EXCAVATIONS MAY BE PUMPED AS NECESSARY TO INFILTRATION AREAS SHOWN ON THE DRAWINGS TO ALLOW CONSTRUCTION AND INSPECTION OF NEW CHANNELS AND ELJS, AND TO FACILITATE THE REMOVAL OF SEDIMENT AND TURBIDITY FROM THE WATER. ANY DISCHARGE OF WATER RETURNING TO THE RIVER SHALL NOT EXCEED THE WATER QUALITY REQUIREMENTS SET

WATER MAY BE PUMPED TO UPLAND INFILTRATION AREAS AND DISCHARGED THROUGH AN ENERGY DISSIPATER, LEVEL SPREADER, SILT BAGS, OR APPROVED OTHER AS APPROVED BY THE ENGINEER. WATER DISCHARGED OR INFILTRATED IN WATER MANAGEMENT AREAS SHALL NOT CAUSE EROSION OR RESULT IN TURBIDITY IMPACTS TO THE RIVER.

GROUND WATER MAY NOT BE PUMPED DIRECTLY TO WETLANDS OR NEW OR EXISTING CHANNELS WITHOUT PRIOR APPROVAL FROM THE ENGINEER. WATER SHALL BE DISCHARGED IN ACCORDANCE WITH THE PLANS,

THE ENGINEER SHALL BE NOTIFIED 24 HOURS IN ADVANCE OF ANY

CONSTRUCTION WATER MANAGEMENT SHALL BE MAINTAINED 24 HOURS PER DAY DURING CONSTRUCTION AND MONITORED BY THE CONTRACTOR DURING NON-WORKING HOURS. 24-HOUR PUMPING IS NOT REQUIRED

DIVERSION OF WATER AND HANDLING OF STREAM FLOW WILL BE REQUIRED DURING CONSTRUCTION. THE PLANS ON THIS DRAWING SHOW A SUGGESTED METHOD FOR THE CONTRACTOR TO ROUTE WATER AROUND THE WORK SITE. ACTUAL SITE CONDITIONS MAY REQUIRE ADJUSTMENTS TO THE PLANS SHOWN. THE CONTRACTOR SHALL BE RESPONSIBLE FOR DEVELOPING AND SUBMITTING A TEMPORARY STREAM FLOW DIVERSION PLAN TO ALLOW CONSTRUCTION TO BE PERFORMED IN THE DRY.

THE ACTUAL DIVERSION PLAN (BY THE CONTRACTOR) SHALL BE DESIGNED TO ALLOW PASSAGE OF STREAM FLOW WITHOUT OVERTOPPING THE UPSTREAM DAM. THE CONTRACTOR SHALL CHOOSE THE LEVEL OF

11. ANY DAMAGE TO THE WORK RESULTING FROM FAILURE OR INADEQUACY OF THE DIVERSION SYSTEM SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR. THE CONTRACTOR WILL NOT BE ENTITLED TO ANY ADDITIONAL PAYMENT FOR COSTS ASSOCIATED WITH FAILURE OF THE



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- DOWNSTREAM GRADES.

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### NOTES:

- 1. RESTRICT TEMPORARY ACCESS ROAD TO EXTENTS NECESSARY FOR CONSTRUCTION EQUIPMENT OPERATION TO MINIMIZE DISTURBANCE OF WETLANDS DURING SIDE CHANNEL CONSTRUCTION. ACCESS LIMITED TO ROADS SHOWN OR EXCAVATION FOOTPRINT UNLESS APPROVED BY DISTRICT.
- 2. TEMPORARY ACCESS FOR ELJ 2 SHALL BE STAKED BY CONTRACTOR TO MINIMIZE CLEARING OF TREES 2 DAYS PRIOR TO CLEARING AND APPROVED BY THE DISTRICT. NOTIFY DISTRICT 2 DAYS PRIOR TO CLEARING TO ALLOW APPROVAL.
- HABITAT LOG LENGTHS ARE APPROXIMATE.



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### NOTES:

- 1. NOTIFY ENGINEER AND MARK CHANNEL EXCAVATION WITH OFFSET GRADE STAKES AT 100' INTERVALS AT LEAST 24 HOURS IN ADVANCE OF START OF EXCAVATION FOR APPROVAL BY DISTRICT.
- 2. CONTROL OF GROUNDWATER WITHIN THE EXCAVATED AREA IS RESPONSIBILITY OF CONTRACTOR.
- 3. PROPOSED GRADES SHOWN DO NOT INCLUDE 1FT DEEP LOW FLOW CHANNEL BOTTOM.
- 4. PROFILE SLOPES SHOWN ARE FOR REFERENCE, SEE SPECIFICATIONS FOR GRADING TOLERANCES

PROFILE - SC#4	A
HORIZ. SCALE: 1" = 30' VERT. SCALE: 1" = 5'	

HORIZONTAL SCALE IN FEET 30 0 30 60 5 0 5 10 VERTICAL SCALE IN FEET VERTICAL EXAGGERATION X 6

Plot





4. PROFILE SLOPES SHOWN ARE FOR REFERENCE, SEE SPECIFICATIONS FOR GRADING TOLERANCES

	ENGR CHKR APVO
MATCHLINE	NOLIGARDION
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ATCHLINE	ENGS CHEES
17+00	DE SORIP
TRANSITION UNIFORMLY TO MATCH GRADE AT DOWNSTREAM WORK	CONFORMED SET
	HERRERA SNOHOMISH COUNTY PUBLIC UTILITY DISTRICT NO 1 WO 09-04525-000
20100	INSK     Digg       SCALE     AS NOTED       DFTR     L. TURNIDGE       CHKR     I. MOSTRENKO       ENGR     G. KAYS       APVD     M. SPILLANE
	DATE MARCH 2012 SHEET TITLE SC#1 PROFILE SHEET
4.45234 53 45 55 55 55 55 55 55 55 55 55 55 55 55	20 of 41 <u>REV</u> <u>DRAWING</u> <u>C</u> -10

7+00

16+00

25+00





HORIZONTAL SCALE IN FEET 30 60 10 VERTICAL SCALE IN FEET VERTICAL EXAGGERATION X 6

### NOTES:

- 1. NOTIFY ENGINEER AND MARK CHANNEL EXCAVATION WITH OFFSET GRADE STAKES AT 100' INTERVALS AT LEAST 24 HOURS IN ADVANCE OF START OF EXCAVATION FOR APPROVAL BY DISTRICT.
- 2. CONTROL OF GROUNDWATER WITHIN THE EXCAVATED AREA IS RESPONSIBILITY OF CONTRACTOR.
- PROPOSED GRADES SHOWN DO NOT INCLUDE 1FT DEEP LOW FLOW CHANNEL 3. BOTTOM.
- PROFILE SLOPES SHOWN ARE FOR REFERENCE, SEE SPECIFICATIONS FOR 4. GRADING TOLERANCES







30/2012 11:08 AM Cad User: Laura Turnidge Plot Styl



12012 Public Utility District No. 1 of Snohomish County





1. PLACE BOULDERS IN A TRIANGULAR CONFIGURATION AS SHOWN WITH BOULDERS SPACED (FROM CENTER TO CENTER) APPROXIMATELY 3 TIMES THE AVERAGE BOULDER DIAMETER APART. BOULDERS SHALL BE FREE OF MUD AND SEDIMENT PRIOR TO INSTALLATION

2. NO WORK AREA ISOLATION NEEDED FOR BOULDER PLACEMENT.

EDULE –	BANK HAE	BITAT STRUG	CTURE:
MINIMUM DIAMETER (IN)	LENGTH (FT)	ROOTWAD	TOTAL QTY PER STRUCTURE
16-24	40	YES	1
16-24	30	YES	3

\ \	LOG	PLACEMENT	ORDER	
7				



C-13

2012





MINIMUM DIAMETER (IN)	LENGTH (FT)	ROOTWA D	TOTAL QTY PER STRUCTURE
12-24	25	YES	1
16-24	25	NO	2
	MINIMUM DIAMETER (IN) 12-24 16-24	MINIMUM DIAMETER (IN) LENGTH (FT) (FT) 12-24 25 16-24 25	MINIMUM DIAMETER (IN)LENGTH (FT)ROOTWA D12-2425YES16-2425NO



2012 Public Utility District No. 1 of Snohomish Cou







- 1. PLANT ELJ BACKFILL WITH TREES AND SHRUBS.
- 2. RACKING PLACEMENT SHALL BE COORDINATED WITH LOG LAYER PLACEMENT AND SLASH PLACEMENT TO ENSURE RACKING MEMBERS AND SLASH EXTEND THROUGH RACKING MATERIAL
- 3. CAP BACKFILL LANDWARD OF PILES WITH 1' OF TOP SOIL TO THE EXTENTS SHOWN ON PLANS.
- 4. EXCAVATION SPOILS SHALL BE STOCKPILED ADJACENT TO EXCAVATION WHILE MAINTAINING ACCESS TO ALLOW LOG LAYER PLACEMENT
- 5. ISOLATION DAM SHOULD ACCOMMODATE ELJ TYPE 2 CONSTRUCTING WITH ELJ TYPE 1 CONSTRUCTION.
- 6. RACKING LOGS SHOWN IN THE SECTION SHALL BE INSTALLED WITH APPROXIMATELY 1/3 OF THE LOGS ON THE UPSTREAM FACE OF THE ELJ AND PERPENDICULAR TO THE FLOW, 1/3 PARALLEL TO THE FLOW AND EXTENDING INTO THE CORE OF THE STRUCTURE AND 1/3 PLACED IN RANDOM ORIENTATIONS. PLACEMENT SHALL PRODUCE AN INTERLOCKING/WOVEN EFFECT BETWEEN THE LOG MEMBERS, RACKING, AND SLASH WITH MINIMIZED VOIDS.
- 7. PLACE TETHERED BOULDERS AS SHOWN ON STRUCTURE LAYERING PLAN.
- DEPTH TO TOE OF EXCAVATION SHALL BE MEASURED FROM 8 THE ADJACENT MAINSTEM LOWEST CHANNEL BOTTOM

### COIR LIFT NOTES:

- 9. PLACE A MINIMUM OF 4 STAKES (APPROX 24" O.C.) ALONG COIR FACE AND 2 STAKES ALONG BACK EDGE OF FABRIC (APPROX 60" O.C.) PER 10' SECTION OF BIO D-BLOCK INSTALLED AS SHOWN ON PLAN VIEW DETAIL).
- 10. ENSURE THAT A MINIMUM OF 2 STAKES (FRONT AND BACK) ARE INSTALLED THROUGH OVERLAP OF EACH BLANKET.
- 11. ENSURE THAT EACH ROW OF STAKES INSTALLED ALONG FRONT FACE PENETRATE THE TOP BLANKET OF THE WRAP DIRECTLY BELOW THEM WITH A MINIMUM OF 4" OF STAKE PROTRUDING ABOVE

APPROX. LOW WATER SURFACE - EXISTING LOWEST ADJANCENT - MAINSTEM CHANNEL BED ELEVATION. LOCATION VARIRES







COMPLETE

LOG SCHEDULE – ELJ TYPE 2:							
LOG TYPE	MINIMUM DIAMETER (IN)	LENGTH (FT)	ROOTWAD	TOTAL QTY PER ELJ			
R2	24+	40	YES	2			
R5	16-24	40	YES	2			
R7	12-24	25	YES	5			
R8	18-24	25	YES	5			
L3	16-24	25	NO	5			
RACKING	4-16	15-30	OPTIONAL	40			
SLASH				80 CY			



### GENERAL NOTES:

- 1. ENGINEER SHALL STAKE 1) LOCATION OF TWO VERTICAL LOGS, OR 2) OFFSETS FOR TWO VERTICAL LOGS IF LOCATION IS NOT ACCESSIBLE. STAKES SHALL INDICATE WHICH PILE THE STAKE REFERS TO. CONTRACTOR SHALL CONFIRM LOCATION OF VERTICAL LOGS WITH ENGINEER PRIOR TO BEGINNING ELJ CONSTRUCTION ACTIVITIES.
- 2. LOG MATERIALS SHALL BE PLACED AT THE LOCATIONS, ELEVATIONS AND ORIENTATIONS SPECIFIED ON THE DRAWINGS OR AS DIRECTED BY THE ENGINEER. TRIM LOGS TO FIT AS REQUIRED.
- 3. PLACE SLASH OVER AND BETWEEN KEY LOGS AND PILES AS SHOWN FOR EACH LAYER FOLLOWING PLACEMENT OF KEY LOGS AND RACKING LOGS. PLACE APPROXIMATELY 2' TO 3' OF NATIVE ALLUVIUM OVER 1/2 THE WIDTH OF SLASH TO SECURE IN PLACE SUCH THAT SLASH IS VISIBLE FOLLOWING CONSTRUCTION. COORDINATE WITH ENGINEER PRIOR TO PLACING RACKING AND SLASH.
- CABLE VERTICAL LOGS AT CONTACT POINTS. CABLE 4. LASHING SYSTEM SHALL BE PUT IN TENSION TO 1/4 OF ITS WORKING LOAD LIMIT AND MAINTAIN DURING CABLE CLAMPING.
- LOCATION OF TETHERED BOULDERS SHOWN IS APPROXIMATE AND WILL VARY BASED ON ROCK SIZE AND LOG DIAMETER. PLACE TETHERED BOULDERS AS CLOSE TO LOCATION SHOWN ON THESE LAYERING PLANS, OR AS DIRECTED BY THE ENGINEER IF THEIR LOCATION DIFFERS SIGNIFICANTLY THAN AS SHOWN. ENGINEER TO APPROVE OF FINAL LOCATION.
- 6. WIRE ROPE LENGTH REQUIRED WILL VARY BASED ON LOG SIZES USED.





- 2. DEPOSITIONAL BAR EXTENTS VARY.
- COMPLETION OF GRADING ACTIVITIES.
- THROUGH RACKING MATERIAL.
- EXTENTS SHOWN ON PLANS.
- AND CONSTRUCTION ACCESS.
- PROPERTIES ENCOUNTERED.



**SECTION - ELJ TYPE 3** SCALE: 1" = 10'



1. PLANT DEPOSITIONAL BAR, SEE PLANTING PLAN.

3. CONTRACTOR SHALL IDENTIFY FINAL GRADING EXTENTS 3 DAYS PRIOR TO

4. RACKING PLACEMENT SHALL BE COORDINATED WITH LOG LAYER PLACEMENT AND SLASH PLACEMENT TO ENSURE RACKING MEMBERS AND SLASH EXTEND

5. CAP DEPOSITIONAL BAR WITH 1' OF GRUBBED OR IMPORTED TOP SOIL TO THE

6. EXCAVATION SPOILS SHALL BE STOCKPILED TO ALLOW LOG LAYER PLACEMENT

7. CONTRACTOR SHALL USE SHORING OR EXTRA EXCAVATION AS REQUIRED FOR LOCAL SOIL CONDITIONS ENCOUNTERED. SHORING EXTENTS MAY VARY DEPENDING ON CONSTRUCTION TECHNIQUES USED AND LOCAL SOIL

8. RACKING LOGS SHOWN IN THE SECTION SHALL BE INSTALLED WITH APPROXIMATELY 1/3 OF THE LOGS ON THE UPSTREAM FACE OF THE ELJ AND PERPENDICULAR TO THE FLOW, 1/3 PARALLEL TO THE FLOW AND EXTENDING INTO THE CORE OF THE STRUCTURE AND 1/3 PLACED IN RANDOM ORIENTATIONS. PLACEMENT SHALL PRODUCE AN INTERLOCKING/WOVEN EFFECT BETWEEN THE LOG MEMBERS, RACKING, AND SLASH WITH MINIMIZED VOIDS.

9. PLACE TETHERED BOULDERS AS SHOWN ON STRUCTURE LAYERING PLAN.

10. DEPTH TO TOE OF EXCAVATION SHALL BE MEASURED FROM THE ADJACENT MAINSTEM LOWEST CHANNEL BOTTOM.

- OUTER VERTICAL LOG WITH ROOTWAD, TYP OF 2 CONFORMED SET - CENTER VERTICAL LOG WITH ROOTWAD, CUT TO BE FLUSH WITH BOTTOM OF TOP LAYER CENTER LOG, TYP OF 1 - DEPOSITIONAL BAR CONSTRUCTED WITH NATIVE ALLUVIUM STRUCTURE EXCAVATION SPOILS - PLACE TETHERED 3.5' TO 4' DIA DRILLED BOULDERS OVER LAYER 2 HORIZONTAL LOGS. BOULDERS NOT SHOWN FOR CLARITY. SEE NOTE 9 HERRERA -1' OF TOPSOIL (TYP) D PUBLIC UTILITY DISTRICT NO WO 09-04525-000 TASK SCALE AS NOTED EXCAVATION EXTENTS DFTR L. TURNIDGE CHKR I. MOSTRENKO SCOUR APRON CONSTRUCTED WITH SCOUR APRON BOULDERS ENGR G. KAYS APVD M. SPILLANE DATE MARCH 2012 SHEET TITLE ELJ TYPE 3 PLAN AND SECTION SHEET

31 of 41 DRAWING C-21



LOG SCHEDULE – ELJ TYPE 3:						
LOG TYPE	MINIMUM DIAMETER (IN)	LENGTH (FT)	ROOTWAD	TOTAL QTY PER ELJ		
R3	24+	35	YES	7		
R8	18-24	25	YES	5		
RACKING	4-16	15-30	OPTIONAL	20		
SLASH				20 CY		



- 1. ENGINEER SHALL STAKE 1) LOCATION OF TWO VERTICAL LOGS, OR 2) OFFSETS FOR TWO VERTICAL LOGS IF LOCATION IS NOT ACCESSIBLE. STAKES SHALL INDICATE WHICH PILE THE STAKE REFERS TO. CONTRACTOR SHALL CONFIRM LOCATION OF VERTICAL LOGS WITH ENGINEER PRIOR TO BEGINNING ELJ CONSTRUCTION ACTIVITIES.
- 2. LOG MATERIALS SHALL BE PLACED AT THE LOCATIONS, ELEVATIONS AND ORIENTATIONS SPECIFIED ON THE DRAWINGS OR AS DIRECTED BY THE ENGINEER. TRIM LOGS TO FIT AS REQUIRED.
- 3. PLACE SLASH OVER AND BETWEEN KEY LOGS AND PILES AS SHOWN FOR EACH LAYER FOLLOWING PLACEMENT OF KEY LOGS AND RACKING LOGS. PLACE APPROXIMATELY 2' TO 3' OF NATIVE ALLUVIUM OVER 1/2 THE WIDTH OF SLASH TO SECURE IN PLACE SUCH THAT SLASH SHALL IS VISIBLE FOLLOWING CONSTRUCTION. COORDINATE WITH ENGINEER PRIOR TO PLACING RACKING AND SLASH.
- CABLE VERTICAL LOGS AT CONTACT POINTS. CABLE LASHING SYSTEM SHALL BE PUT IN TENSION TO 1/4 OF ITS WORKING LOAD LIMIT AND MAINTAIN DURING CABLE CLAMPING.
- 5. LOCATION OF TETHERED BOULDERS SHOWN IS APPROXIMATE AND WILL VARY BASED ON ROCK SIZE AND LOG DIAMETER. PLACE TETHERED BOULDERS AS CLOSE TO LOCATION SHOWN ON THESE LAYERING PLANS, OR AS DIRECTED BY THE ENGINEER IF THEIR LOCATION DIFFERS SIGNIFICANTLY THAN AS SHOWN. ENGINEER TO APPROVE OF FINAL LOCATION.
- 6. WIRE ROPE LENGTH REQUIRED WILL VARY BASED ON LOG SIZES USED.





- BRIDGE SPAN, BRIDGE ABUTMENTS, BEARING ASSEMBLIES, APPROACHES AND FOUNDATION SHALL BE DESIGNED BY CONTRACTOR, SEE SPECIFICATIONS. SCOUR PROTECTION SHOWN IS THE MINIMUM REQUIRED. THE CONTRACTOR SHALL INCORPORATE 1 ANY MODIFICATIONS REQUIRED TO THE SHOWN SCOUR PROTECTION AS PART OF DESIGN OF THE ABUTMENTS, FOUNDATIONS AND SUPERSTRUCTURE. SCOUR PROTECTION SHALL NOT PROTRUDE BEYOND THE EXISTING GRADE FOR BRIDGE A OR BEYOND FINISH GRADES FOR THE REMAINDER OF BRIDGES. CONTRACTOR SHALL ADJUST BRIDGE SPAN, ABUTMENTS, AND APPROACHES TO ACCOMMODATE BRIDGE FOUNDATION AND SCOUR PROTECTION ACCORDINGLY. ABUTMENT FOUNDATION SHALL BE SET BACK A MINIMUM OF 1FT FROM SCOUR PROTECTION TO ALLOW MAINTENANCE. FIELD FITTING OF ABUTMENT AND APPROACH LOCATIONS +/- 10FT OF THE NORTHING AND EASTING PROVIDED IS ALLOWABLE AS APPROVED PROVIDED THE ROAD AND/OR TRAIL CONNECTION AND PERMIT CONDITIONS ARE MAINTAINED
- 2. QUARRY SPALL BLANKET OR APPROVED EQUAL SHALL BE PLACED ON ALL SURFACES BETWEEN RIPRAP SCOUR PROTECTION AND CONTRACTOR DESIGNED FOOTINGS TO PROTECT FROM EROSION. QUARRY SPALLS SHALL HAVE A MINIMUM OF 1FT OF CLEARANCE BELOW THE LOWEST MEMBER OF THE BRIDGE



10

20



![](_page_70_Figure_0.jpeg)

![](_page_71_Figure_0.jpeg)

2012 Public Utility District No. 1 of Snohomish Cour
#### 100 100 200 SCALE IN FEET

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### <u>LEGEND:</u>



UPLAND PLANTING ZONE

WETLAND PLANTING ZONE

TURF RESTORATION ZONE

ELJ PLANTING ZONE

SEEDING ONLY ZONE

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<u>NOTES:</u>

- 1. SEE DRAWING L-6 FOR GENERAL NOTES.
- 2. SEE DRAWING L-6 FOR PLANTING DETAILS.
- 3. AT PLANT ZONE SC2-W1, PLANT LIVE STAKE CUTTINGS WITHIN 5 FEET OF WETTED CHANNEL -WITH OTHER CONTAINERIZED PLANTS.
- AT PLANT ZONE SC2-U2, PLANT LIVE STAKE CUTTINGS ONLY WITHIN 5 FEET OF WETTED CHANNEL.
- 5. AT PLANT ZONE SC2-U2, PLANT TREES WITHIN 20 FEET LANDWARD OF WETTED CHANNEL.
- AT PLANT ZONES SC2-ELJ7 AND SC2-ELJ8, PLANT LIVE STAKE CUTTINGS ONLY WITHIN 5 FEET OF BASE OF THE ELJ FILL PRISM.

PLANT SCHEDULE	<u> </u>			$\rightarrow$		-	<u> </u>			
STRATUM	SCIENTIFIC NAME	COMMON NAME	PLANT MATERIAL	SPACING			PLANT ZONE	QUANTITIES		
					SC2-W1	SC2-U1	SC2-U2	SC2-U3	SC2-ELJ7	SC2-ELJ8
TREE	POPULUS BALSAMIFERA SSP. TRICHOCARPA	BLACK COTTONWOOD	1 GAL. CONT.	15' O.C.					3	2
	PSEUDOTSUGA MENZIESII	DOUGLAS FIR	1 GAL. CONT.	15' O.C.				16	3	
	THUJA PLICATA	WESTERN RED CEDAR	1 GAL. CONT.	15' O.C.	2		4			
SHRUB	ACER CIRCINATUM	VINE MAPLE	1 GAL. CONT.	5'0.C.				15		
	AMELANCHIER ALNIFOLIA	WESTERN SERVICEBERRY	1 GAL. CONT.	5' O.C.					12	3
	CORNUS SERICEA	RED TWIG DOGWOOD	1 GAL. CONT.	5'0.C.	7					
	CORYLUS CORNUTA	BEAKED HAZELNUT	1 GAL. CONT.	5' O.C.				15		
	GAULTHERIA SHALLON	SALAL	1 GAL. CONT.	5' O.C.		17	34	15		
	HOLODISCUS DISCOLOR	OCEANSPRAY	1 GAL. CONT.	5' O.C.				15	12	3
	LONICERA INVOLUCRATA	BLACK TWINBERRY	1 GAL. CONT.	5' O.C.	7					
	MAHONIA AQUIFOLIUM	TALL OREGON GRAPE	1 GAL. CONT.	5' O.C.					12	
	MAHONIA NERVOSA	LOW OREGON GRAPE	1 GAL. CONT.	5' O.C.		17	34	15		
	MALUS FUSCA	CRABAPPLE	1 GAL. CONT.	5' O.C.	7					
	OEMLARIA CERASIFORMIS	INDIAN PLUM	1 GAL. CONT.	5' O.C.		17	34	15		
	PHYSOCARPUS CAPITATUS	PACIFIC NINEBARK	1 GAL. CONT.	5' O.C.	7					
	RUBUS PARVIFLORUS	THIMBLEBERRY	1 GAL. CONT.	5' O.C.				15		
	RUBUS SPECTABILIS	SALMONBERRY	1 GAL. CONT.	5' O.C.	7					
	SAMBUCUS RACEMOSA	RED ELDERBERRY	1 GAL. CONT.	5' O.C.		17	34	15		
	SYMPHORICARPOS ALBUS	SNOWBERRY	1 GAL. CONT.	5' O.C.		17	34	15	12	3
LIVE STAKE CUTTING	CORNUS SERICEA	RED TWIG DOGWOOD	LIVE STAKE CUTTING	5'0.C.			10		12	8
	SALIX HOOKERIANA	HOOKER WILLOW	LIVE STAKE CUTTING	5'0.C.			10		12	8
	SALIX LUCIDA SPP. LASIANDRA	PACIFIC WILLOW	LIVE STAKE CUTTING	5' O.C.			10		12	8
	SALIX SITCHENSIS	SITKA WILLOW	LIVE STAKE CUTTING	5'0.C.			10		12	8
GROUNDCOVER	POLYSTICHUM MUNITUM	SWORD FERN	1 GAL. CONT.	4' O.C.		48	103	85		

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#### PLANT SCHEDULE – REACH 3:

STRATUM	SCIENTIFIC NAME	COMMON NAME	PLANT MATERIAL	SPACING												PLANT Z	ZONE QU	JANTITIES	S										
	·	•		•	SC2- U4	SC1- W1	SC1- W2	SC1- W3	SC1- W4	SC1- W5	SC1- W6	SC1- W7	SC1- W10	SC1- W11	SC1- U1	SC1- U2	SC1- U3	SC1- U4	SC1- U5	SC1- U6	SC1- U7	SC1- U8	SC1- U9	SC1- U10	SC1- U11	SC1- U12	SC1- U13	SC1- U14	SC1- ELJ3
TREE	ACER MACROPHYLLUM	BIG-LEAF MAPLE	1 GAL. CONT.	15' O.C.	10												10		13	8		6							
	ALNUS RUBRA	RED ALDER	1 GAL. CONT.	15' O.C.	10																		5	5					
	CRATAEGUS DOUGLASII	BLACK HAWTHORN	1 GAL. CONT.	15'0.C.	10																								
	POPULUS BALSAMIFERA SSP. TRICHOCARPA	BLACK COTTONWOOD	1 GAL. CONT.	15' O.C.	10																								3
	PSEUDOTSUGA MENZIESII	DOUGLAS FIR	1 GAL. CONT.	15' O.C.	10												10		13	8		6				8	3	15	2
	THUJA PLICATA	WESTERN RED CEDAR	1 GAL. CONT.	15' O.C.	10	46	60	13			193	154											5	5		8	3	15	
SHRUB	ACER CIRCINATUM	VINE MAPLE	1 GAL. CONT.	5' O.C.	54												20		27	17		13	10	17		17	11	31	
	AMELANCHIER ALNIFOLIA	WESTERN SERVICEBERRY	1 GAL. CONT.	5' O.C.																									10
	CORNUS SERICEA	RED TWIG DOGWOOD	1 GAL. CONT.	5' O.C.		76	98	21	5	5	317	252																	
	CORYLUS CORNUTA	BEAKED HAZELNUT	1 GAL. CONT.	5' O.C.	54												20		27	17		13	10			17	11	31	
	GAULTHERIA SHALLON	SALAL	1 GAL. CONT.	5' O.C.	54										21	36	20	6	27	17	10	13	10		10	17	11	31	
	HOLODISCUS DISCOLOR	OCEANSPRAY	1 GAL. CONT.	5' O.C.	54																						1		10
	LONICERA INVOLUCRATA	BLACK TWINBERRY	1 GAL. CONT.	5' O.C.		76	98	21	5	5	317	252												17					
	MAHONIA AQUIFOLIUM	TALL OREGON GRAPE	1 GAL. CONT.	5' O.C.	54																								10
	MAHONIA NERVOSA	LOW OREGON GRAPE	1 GAL. CONT.	5' O.C.											21	36	20	6	27	17	10	13	10		10	17	11	31	
	MALUS FUSCA	CRABAPPLE	1 GAL. CONT.	5' O.C.		76	98	21	5	5	317	252																	
	OEMLARIA CERASIFORMIS	INDIAN PLUM	1 GAL. CONT.	5' O.C.	54										21	36	20	6	27	17	10	13	10		10	17	11	31	
	PHYSOCARPUS CAPITATUS	PACIFIC NINEBARK	1 GAL. CONT.	5' O.C.		76	98	21	5	5	317	252																	
	RUBUS PARVIFLORUS	THIMBLEBERRY	1 GAL. CONT.	5' O.C.	54												20		27	17		13	10	17		17	11	31	
	RUBUS SPECTABILIS	SALMONBERRY	1 GAL. CONT.	5' O.C.		76	98	21	5	5	317	252												17					
	SAMBUCUS RACEMOSA	RED ELDERBERRY	1 GAL. CONT.	5'0.C.	54										21	36	20	6	27	17	10	13	10		10	17	11	31	
	SYMPHORICARPOS ALBUS	SNOWBERRY	1 GAL. CONT.	5' O.C.	54										21	36	20	6	27	17	10	13	10	17	10	17	11	31	10
LIVE STAKE CUTTING	CORNUS SERICEA	RED TWIG DOGWOOD	LIVE STAKE CUTTING	5' O.C.									90	48															
	SALIX HOOKERIANA	HOOKER WILLOW	LIVE STAKE CUTTING	5' O.C.									90	48													1		
	SALIX LUCIDA SPP. LASIANDRA	PACIFIC WILLOW	LIVE STAKE CUTTING	5' O.C.									90	48															
	SALIX SITCHENSIS	SITKA WILLOW	LIVE STAKE CUTTING	5'0.C.									90	48															
EMERGENT	CAREX OBNUPTA	SLOUGH SEDGE	PLUG	2'0.C.		2253	2913	630			8208	7496																	
GROUNDCOVER	POLYSTICHUM MUNITUM	SWORD FERN	1 GAL. CONT.	4'0.C.	306										61	100	99	17	135	84	28	64	53		27	86	51	156	

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2012 Public Utility District No. 1 of Snohomish County

L-4

2012

SCI-EU22 SCI-U15 SCI-U15 SCI-U16 SCI-U16 SCI-U17		MATCHLINE SEE	SHEET L-3						
	PLANT SCHEDULE STRATUM	- REACH 4: SCIENTIFIC NAME	COMMON NAME	PLANT MATERIAL	SPACING	SC1- W8	SC1- W9	SC1- W1	SC1 U1
	TREE	ACER MACROPHYLLUM ALNUS RUBRA CRATAEGUS DOUGLASII	BIG-LEAF MAPLE RED ALDER BLACK HAWTHORN	1GAL. CONT.1GAL. CONT.1GAL. CONT.	15' 0.C. 15' 0.C. 15'0.C.				
		POPULUS BALSAMIFERA SSP. TRICHOCARPA PSEUDOTSUGA MENZIESII	BLACK COTTONWOOD DOUGLAS FIR	1 GAL. CONT. 1 GAL. CONT.	15' O.C. 15' O.C.				8
		THUJA PLICATA	WESTERN RED CEDAR	1 GAL. CONT.	15' O.C.				8
	SHRUB	ACER CIRCINATUM	VINE MAPLE	1 GAL. CONT.	5' O.C.				16
		AMELANCHIER ALNIFOLIA	WESTERN SERVICEBERRY	1 GAL. CONT.	5' O.C.				
		CORNUS SERICEA	RED TWIG DOGWOOD	1 GAL. CONT.	5'0.C.	L			
SCI-WE		CORYLUS CORNUTA	BEAKED HAZELNUT	1 GAL. CONT.	5' O.C.	<b> </b>			16
SEE DWG L-3		GAULTHERIA SHALLON	SALAL	1 GAL. CONT.	5'0.C.	$\vdash$			16
ISEE DWG L-3		HOLODISCUS DISCOLOR	OCEANSPRAY	1 GAL. CONT.	5'0.C.				
		LONICERA INVOLUCRATA	BLACK TWINBERRY	1 GAL. CONT.	5'0.C.				
		MAHONIA AQUIFOLIUM	TALL OREGON GRAPE	1 GAL. CONT.	5'0.C.				
		MAHONIA NERVOSA	LOW OREGON GRAPE	1 GAL. CONT.	5' O.C.	Í de la compañía de la			16
		MALUS FUSCA	CRABAPPLE	1 GAL. CONT.	5' O.C.				
Sci-wa		OEMLARIA CERASIFORMIS	INDIAN PLUM	1 GAL. CONT.	5' O.C.				16
		PHYSOCARPUS CAPITATUS	PACIFIC NINEBARK	1 GAL. CONT.	5' O.C.				
SC4-w1		ROSA SPP.	NOOTKA OR SWAMP ROSE	1 GAL. CONT.	5' O.C.	<b> </b>			
		KUBUS PARVIFLORUS		I GAL. CONI.	5 0.C.	<b>↓</b> ↓			16
The second secon		RUBUS SPECTABILIS	SALMONBERRY	1 GAL. CONT.	5′0.C.	──┤			
		SAMBUCUS RACEMOSA	RED ELDERBERRY	1 GAL. CONT.	5' O.C.	$\vdash$			16
		SYMPHORICARPOS ALBUS	SNOWBERRY	1 GAL. CONT.	5' O.C.	$\square$			16
	LIVE STAKE CUTTING	CORNUS SERICEA	RED TWIG DOGWOOD	LIVE STAKE CUTTING	5' O.C.	26	36	48	
		SALIX HOOKERIANA	HOOKER WILLOW	LIVE STAKE CUTTING	5' O.C.	26	36	48	
		SALIX LUCIDA SPP.	PACIFIC WILLOW	LIVE STAKE CUTTING	5' O.C.	26	36	48	
		SALIX SITCHENSIS	SITKA WILLOW	LIVE STAKE CUTTING	5' O.C	26	36	48	
	EMERGENT	CAREX ORNUPTA	SLOUGH SEDGE	PLUG	2'00			,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	
	GROUNDCOVER		SWORD FERM		4' 0.0.	<u> </u>			70
	SKOUNDOUVEN				+ 0.0.				



2 Public Utility District No. 1 of Snohomisl

SHEET 40 of 41

drawing

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12012



#### GENERAL PLANTING PLAN NOTES:

1. REMOVE ALL WEEDS AND PEST VEGETATION FROM PLANTING ZONES PRIOR TO SEEDING AND PLANTING.

2. THE DISTRICT SHALL APPROVE GRADING PRIOR TO SEEDING AND PLANT INSTALLATION.

FINAL APPLICATION OF SEEDING, FERTILIZING, AND MULCHING SHALL BE PERFORMED DURING MARCH 1 THROUGH MAY 15 OR SEPTEMBER 1 THROUGH OCTOBER 1.

4. ALL UPLAND PLANT ZONES SHALL BE SEEDED WITH NATURAL REVEGETATION EROSION CONTROL SEED MIXTURE PRIOR TO

5. ALL WETLAND PLANT ZONES SHALL BE SEEDED WITH STREAMBANK AND WETLAND SEED MIXTURE PRIOR TO PLANTING.

6. ALL SEED ONLY PLANT ZONES SHALL BE SEEDED WITH LONG TERM MAINTENANCE EROSION CONTROL SEED MIXTURE.

7. PLANT SUBSTITUTIONS ARE SUBJECT TO APPROVAL BY THE DISTRICT.

8. PLANTS SHALL BE TAGGED FOR IDENTIFICATION AND VERIFIED BY THE DISTRICT PRIOR TO INSTALLATION.

9. KEEP PLANTS SHADED UNTIL ACTUAL TIME OF PLANTING. DO NOT LET PLANT MATERIAL SIT IN SUN OR DRY OUT BEFORE PLANTING.

10. INSTALL TREES, SHRUBS, LIVE STAKE CUTTINGS, AND GROUNDCOVER FROM JANUARY 1 THROUGH MARCH 1 OF THE FIRST DORMANT SEASON FOLLOWING GRADING AND SEEDING. INSTALL EMERGENTS BETWEEN MARCH 1 AND MARCH 31.

11. SEE SPECIFICATION SECTIONS 02920, 02922, AND 02930 FOR ADDITIONAL REQUIREMENTS.



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DRAWING |-6|

## Appendix B

Consultation Documentation Regarding Project Construction

## **Benefits From Enhancements**

#### Fish Populations

Enhancement of side channel and placement of large woody debris:

- provides habitat diversity in the mainstream of the Sultan River and in key side channels,
- enhances habitat for juvenile salmon,
- helps retain and distribute gravels moving downstream to provide additional spawning areas.
- promotes further exchange of water and nutrients between surface and subsurface flows.
- and helps distribute surface flows through key side channel inlets.

#### Vegetation

Weeds invade riparian areas and out-compete native vegetation. Their presence can prevent establishment of native trees, leading to the formation of permanent thickets with little other vegetation present. These dense, impenetrable thickets can block access of larger wildlife to water and other resources (not to mention causing problems for people trying to enjoy parks and natural areas). Disturbed areas will be replanted with native/locally adapted vegetation.

#### Recreation

Bridges will be added to new side channels, and disturbed trails will be re-surfaced. Environmental enhancements like these will improve the aesthetics and enjoyment of the parks.

These measures to enhance the aquatic resources of the Sultan River were developed in cooperation with federal and state resource agencies, local municipalities, recreational groups and the Tulalip Tribes. In addition, this work would not be possible without the cooperation of the City of Sultan and local landowners.



**Ouestions:** Keith Binkley Natural Resources Manager 425-783-1769 kmbinkley@snopud.com

# Side Channel **Enhancements**

## AT OSPREY AND REESE PARKS

## Improving and Protecting Environmental Habitats

#### www.snopud.com



This summer, you may notice some work being performed in two of the City of Sultan's parks.

This work is being done by Snohomish County PUD as a requirement to relicense the Jackson Hydroelectric Project located in the Sultan River watershed. The PUD is implementing a suite of environmental enhancement measures, including creation of nearly two miles of side channel habitat along the lower Sultan River. This work will benefit salmon that use the Sultan River.

Here is detailed information on what is being done and why:

- ▶ Osprey Park: improvement of rearing habitat for juvenile salmon. Side channels (channels that are connected to the main channel but are much smaller) provide optimal conditions for young fish. Some of these channels have changed over time as a result of the operation of the hydroelectric project. The value of these habitats will be increased significantly by improving the flow into and out of these channels. This will be accomplished by creating engineered log jams in the main channel to re-direct flow and by excavating the channel in certain areas. The goal is to provide diverse high-quality habitat throughout the year.
- Reese Park: improvement of rearing habitat for juvenile salmon. As with Osprey Park, restoration of a side channel inlet will be conducted to improve the connection with the main channel of the river. The relic inlet is not functioning in its



current form and requires excavation to restore it to good health and provide aquatic habitat. A strategically placed series of engineered log jams will permanently re-direct a portion of the river's flow into the newly excavated side channel.

## Timeline

Land Work: June – October 2012 Water Work: July 1 – September 15, 2012 Replanting: October 2012 – April 2013

### **Construction closures**

For safety purposes, certain areas and trails at both parks will be fenced and unavailable for public use during construction. A map of closed areas is posted near the entrance at each park.

## Construction activities will include:

- Installing temporary fencing and closing some segments of park trail near construction zones
- Widening of trails (and subsequent restoration) to accommodate construction equipment
- Using bulk bags to temporarily isolate flow from work areas in the main river
- Excavating, grading and off-site removal of earthen materials
- Limited clearing of selected trees and reuse at enhancement locations
- Transporting and placing logs with the main river and in side channels

### Presler, Dawn

From:	Presler, Dawn
Sent:	Tuesday, October 09, 2012 10:26 AM
То:	'Leonetti, Frank'; 'Steven Fransen'; 'Anne Savery'; 'brock.applegate@dfw.wa.gov'; 'cmay461 @ecy.wa.gov'; 'Loren Everest - USFS'; 'Thomas O'Keefe'
Cc:	Binkley, Keith
Subject:	FW: ARC - Oct 11 - float trip logistics
Attachments:	20121011_Agenda.docx

Last reminder for the float trip on Thursday. I will be at a conference for the rest of the week, so please contact Keith on his cell at 425-293-6201 if there are any last minute cancellations. Otherwise, he'll see you all by 9:00 sharp at Sportsman's Park off Highway 2 in Sultan, WA.

Thanks Tom for bringing the extra raft!

Have a great float trip everybody!

Dawn

From: Presler, Dawn
Sent: Wednesday, September 12, 2012 3:27 PM
To: 'Leonetti, Frank'; 'steven.m.fransen@noaa.gov'; 'tim\_romanski@fws.gov'; 'Anne Savery'; 'Jim Miller'; 'mick.matheson@ci.sultan.wa.us'; 'brock.applegate@dfw.wa.gov'; 'Maynard, Chris (ECY)'; 'Loren Everest - USFS'; 'Okeefe@americanwhitewater.org'
Cc: Moore, Kim; Binkley, Keith
Subject: ARC - Oct 11 - float trip logistics

Hello Again,

Attached is the agenda for the float trip on Thursday October 11 to view the side channels enhancements and engineered log jams on the lower Sultan River that the District is just about to complete. Please review the agenda for meeting location, time, and things to bring. Also, let me know by September 20 if you plan on attending so we can get an accurate head count for raft spaces.

Tom,

We'll likely need to use your raft that you previously volunteered as well. Keith will verify with you after we get the head count. Thanks!

Dawn Presler Sr. Environmental Coordinator Generation Resources (425) 783-1709

PUD No. 1 of Snohomish County PO Box 1107 Everett, WA 98206-1107

## ARC Float Trip Agenda

Date and Time:	Thursday October 11, 2012; 9:00 to ~12:00
Location:	Lower Sultan River, Sultan, Washington
Purpose:	View Side Channel Enhancements
Invited:	ARC Members Only (No additional attendees please)

Agenda	Time
<ol> <li>Meet at the Sportsman's Park in Sultan, Washington just off Highway 2</li> </ol>	9:00 a.m.
2. Shuttle to Side Channel 3 to Start Float Trip	9:05 a.m.
<ol> <li>Float/Walking Tour – view side channels and all engineered log jams along the way         <ul> <li>a. Side Channel 3</li> <li>b. Side Channel 2</li> <li>c. Side Channel 1</li> <li>d. Side Channel 1 Extended</li> <li>e. Side Channel 4</li> </ul> </li> </ol>	9:10 a.m. – ~12:00 p.m.
4. Return to Sportsman Park	~12:15 p.m.

### Bring:

- Personal floatation device
- Waders
- Water
- Snack/lunch

### Presler, Dawn

From:Presler, DawnSent:Thursday, February 07, 2013 9:33 AMTo:Presler, DawnSubject:FW: r.knuckey@comcast.net (Form Submission: Form Builder)

-----Original Message-----From: <u>r.knuckey@comcast.net</u> [<u>mailto:r.knuckey@comcast.net</u>] Sent: Wednesday, November 28, 2012 10:15 PM To: CustomerCommentCards Subject: <u>r.knuckey@comcast.net</u> (Form Submission: Form Builder)

Name Bob Knuckey

Address (including city and ZIP code) 606 1st Street

Phone Number (including area code) 360-793-0622

Email Address <u>r.knuckey@comcast.net</u>

Confirm Email Address r.knuckey@comcast.net

Bimonthly E-Newsletter Sign me up!

Comment

A comment on The Side Channel Enhancement Project at Osprey Park. I am the unofficial Stewart of Osprey Park for the City of Sultan. I would just like to say that I am more than pleased with the finished results of the project. Iam also getting a lot of feed back from people nowjusing the Park. Most seam to like the results and are very happy to get back to using the Park. I worked with Keith Binkley before the project started and stated my concerns. Keith told me at the time that we would be happy with the final results. He was right and then some. Good man, easy to work with and a man of his word. AND it was finished on time. Wow 2 thumbs up for all involved. Thank you Bob Knuckey





USA 279 4102524 CANADA 359 ATY11228401C ©AGC, LLC MADE IN U.S.A.

THINGS TO BE THANKFUL FOR iqeh) (O)(Oh, how we take if for granted.) 08 D) 0 (Consider the unpleasant alternative.) (Ignore this if you're a vegetarian.) **t taste good** t a vegetarian.) 0 0 (Ignore this if you're not a vegetarian.) cans 0) (But only on really cute butts.) rols Son R Can you believe we ever lived without them?) (They're always there for you... with you!) well, they're usually in the same room with you!) Em Immo (That pause button is great for not missing anything.) le! hocol  $\odot$ 0 (O\_) (In all its many delicious forms.) Number One 2 And, be Thankful for is... thing 0

AMERICAN GREETINGS CLEVELAND, OHIO 44144



RECEIVED OCT 1 0 2012 10/9/12 WATER DEPT. Pud My husband And I goto Osprey Paril Trails + RudolF you First start work on these parks we were worked that They were Never GONNA Se The same. Well we were right, their much better. Who ever you haved to do the work did a great job. Sincer-L TIM + NANCE Erain S272 Tremost of MUNTUE 2 U FI Anc Monroe, WA 98272-9576 Vancy Crain 4402 252Nd Ave. SE





November 21, 2012

Mr. Keith Binkley Senior Environmental Coordinator Snohomish County Public Utility District No. 1 2320 California St. P.O. Box 1107 Everett, WA 98206-1107

Subject: Thank You for the Sultan River Salmon Enhancement

Dear Mr. Binkley:

On behalf of the City Council and the Sultan community, I extend my appreciation to the Snohomish PUD and to your team for an outstanding contribution to the environment and the City park system through the Sultan River Side Channel Enhancement Project.

This project was executed in a highly professional and cooperative fashion, from coordination with City and County staff, to community information, to construction within a single season.

Our Community Development Director, Bob Martin, kept me informed throughout the project, and was consistently complimentary of you and your team's attention to the City's interests and responsiveness to any questions. The presentation by Mr. Scott Spahr to the City Council was informative and appreciated.

The new channels and pedestrian bridges present an opportunity for the community and the region to come into contact with the wonderful natural cycle of the salmon that inhabit the Sultan River. We are beginning to plan for community events involving the "Return of the Pinks" in 2013. Locally based eco-tourism is a great community economic development opportunity that I hope the PUD may find a way to participate in with the City and the Sky Valley Chamber of Commerce. We will contact the PUD early in 2013 when we have a preliminary plan.

Again, thanks and congratulations on a job very well done!

Sincerely,

dyn Eslice

Mayor Carolyn Eslick

319 Main Street, Suite 200 • P.O. Box 1199 • Sultan Washington 98294 City Hall (360) 793-2231 • Fax (360) 793-3344

## Appendix C

Consultation Documentation Regarding the Draft Report

From: Presler, Dawn

**Sent:** Tuesday, February 12, 2013 2:08 PM

**To:** 'Steven Fransen' (steven.m.fransen@noaa.gov); 'Loren Everest - USFS' (leverest@fs.fed.us); 'Tim\_Romanski@fws.gov' (Tim\_Romanski@fws.gov); 'brock.applegate@dfw.wa.gov' (brock.applegate@dfw.wa.gov); 'Anne Savery' (asavery@tulaliptribes-nsn.gov); 'Leonetti, Frank' (frank.leonetti@snoco.org); 'Jim Miller' (JMiller@ci.everett.wa.us);

'mick.matheson@ci.sultan.wa.us' (mick.matheson@ci.sultan.wa.us); 'Thomas O'Keefe' (okeefe@americanwhitewater.org)

Cc: Binkley, Keith; Moore, Kim

Subject: JHP - Draft SCE/LWD Construction Report for your 30-day review and comment

Dear ARC,

Attached is a link to the draft Side Channel Enhancement Project Construction Report for the Jackson Hydro Project. (Due to its size at 26 MB, I couldn't send as an attachment to this email.) Per License Article 404, you are being provided a 30-day review and comment period on the draft report. Please send your comments, if any, back to me (with cc: to Keith) <u>by March 13</u>. If you have no comments on the draft report, an email stating as such would be appreciated too. Thanks!

http://www.snopud.com/Site/Content/Documents/relicensing/ARC/DraftSCE ConstructReport.pdf

Dawn Presler Sr. Environmental Coordinator Generation Resources (425) 783-1709

PUD No. 1 of Snohomish County PO Box 1107 Everett, WA 98206-1107

From: Presler, Dawn
Sent: Tuesday, March 12, 2013 1:03 PM
To: "Steven Fransen' (steven.m.fransen@noaa.gov)'; "Loren Everest - USFS'
(leverest@fs.fed.us)'; "Tim\_Romanski@fws.gov' (Tim\_Romanski@fws.gov)';
"brock.applegate@dfw.wa.gov' (brock.applegate@dfw.wa.gov)'; "Anne Savery'
(asavery@tulaliptribes-nsn.gov)'; "Leonetti, Frank' (frank.leonetti@snoco.org)'; "Jim Miller'
(JMiller@ci.everett.wa.us)'; "mick.matheson@ci.sultan.wa.us' (mick.matheson@ci.sultan.wa.us)';
"Thomas O'Keefe' (okeefe@americanwhitewater.org)'
Cc: Binkley, Keith; Moore, Kim

Subject: RE: JHP - Draft SCE/LWD Construction Report for your 30-day review and comment

Hi All,

I haven't received any emails from anyone on this, so I'm sending out a reminder to you all. If you have no comments on the draft report, an email stating as such would be appreciated too. Otherwise, I'll take your silence as approval of the report as written.

Thanks!

Dawn

From: Romanski, Tim [mailto:tim\_romanski@fws.gov]
Sent: Tuesday, March 12, 2013 3:02 PM
To: Presler, Dawn
Subject: Re: JHP - Draft SCE/LWD Construction Report for your 30-day review and comment

Of course, I meant no, not "not".

Tim Romanski Fish and Wildlife Biologist U.S. Fish and Wildlife Service Washington Fish and Wildlife Office Branch Manager of Conservation and Hydropower Planning 510 Desmond Drive SE, Lacey, WA 98503 360.753.5823 (phone) 360.753.9518 (fax)

On Tue, Mar 12, 2013 at 3:00 PM, Presler, Dawn <<u>DJPresler@snopud.com</u>> wrote:

And thank you for the follow-up email!

Dawn

From: Romanski, Tim [mailto:tim romanski@fws.gov]
Sent: Tuesday, March 12, 2013 3:00 PM
To: Presler, Dawn
Subject: Re: JHP - Draft SCE/LWD Construction Report for your 30-day review and comment

Dawn,

I reviewed it early and have not comments. Thanks for the reminder.

Tim Romanski Fish and Wildlife Biologist U.S. Fish and Wildlife Service Washington Fish and Wildlife Office Branch Manager of Conservation and Hydropower Planning 510 Desmond Drive SE, Lacey, WA 98503 360.753.5823 (phone) 360.753.9518 (fax)

From: Steven Fransen - NOAA Federal [mailto:steven.m.fransen@noaa.gov]
Sent: Wednesday, March 13, 2013 9:40 AM
To: Presler, Dawn
Cc: Keith Kirkendall - NOAA Federal
Subject: Re: JHP - Draft SCE/LWD Construction Report for your 30-day review and comment Hi Dawn,

Thanks for the timely reminder! I don't know where this past month has gone. The Side Channel Enhancement and Construction report is really well done. Maybe that's why it took so long to down load, lots of photographs and construction drawings. The photos are a pleasant reminder of the site visit and river float last fall with Keith, and they document all the key features incorporated in the work. I was very impressed with the work the PUD's contractors did, and it was very refreshing to read the positive public feedback regarding the project. That's not something I see every day. All that extensive behind the scenes coordination paid off. I think it's a testament to the hard work you folks at the PUD accomplished. Congratulations!

Now I'm looking forward to the fish use surveys in the side channels.

From: Mick Matheson [mailto:mick.matheson@ci.sultan.wa.us]
Sent: Wednesday, March 13, 2013 1:40 PM
To: Presler, Dawn; "Steven Fransen"; "Loren Everest - USFS"; Tim\_Romanski@fws.gov; brock.applegate@dfw.wa.gov; "Anne Savery"; "Leonetti, Frank"; "Jim Miller"; "Thomas O'Keefe"
Cc: Binkley, Keith; Moore, Kim
Subject: RE: JHP - Draft SCE/LWD Construction Report for your 30-day review and comment

Dawn,

I have reviewed the report and have no comments.

Thanks,

Mick Matheson, P.E. City of Sultan Director of Public Works/City Engineer Tel: (360) 793-2231 Fax: (360) 793-3344 Direct: (360) 793-2262 Cell: (425) 583-6528 mick.matheson@ci.sultan.wa.us

From: Binkley, Keith

Sent: Thursday, March 21, 2013 4:21 PM
To: 'Leonetti, Frank'; Presler, Dawn; "Steven Fransen' (steven.m.fransen@noaa.gov)'; "Loren Everest - USFS' (leverest@fs.fed.us)'; "Tim\_Romanski@fws.gov' (Tim\_Romanski@fws.gov)'; "brock.applegate@dfw.wa.gov' (brock.applegate@dfw.wa.gov)'; "Anne Savery' (asavery@tulaliptribes-nsn.gov)'; "Jim Miller' (JMiller@ci.everett.wa.us)'; "mick.matheson@ci.sultan.wa.us' (mick.matheson@ci.sultan.wa.us)'; "Thomas O'Keefe' (okeefe@americanwhitewater.org)'
Cc: Moore, Kim
Subject: RE: JHP - Draft SCE/LWD Construction Report for your 30-day review and comment

Hi Frank – Thanks for your constructive review. I am updating the report per your request and suggested additions. We will be sending it out next week. I am also answering some of your questions below directly in the body of your email. The answers are highlighted in yellow.

Thanks again,

Keith

From: Leonetti, Frank [mailto:frank.leonetti@snoco.org]
Sent: Wednesday, March 13, 2013 10:28 AM
To: Presler, Dawn; "Steven Fransen' (steven.m.fransen@noaa.gov)'; "Loren Everest - USFS' (leverest@fs.fed.us)'; "Tim\_Romanski@fws.gov' (Tim\_Romanski@fws.gov)'; "brock.applegate@dfw.wa.gov' (brock.applegate@dfw.wa.gov)'; "Anne Savery' (asavery@tulaliptribes-nsn.gov)'; "Jim Miller' (JMiller@ci.everett.wa.us)'; "mick.matheson@ci.sultan.wa.us' (mick.matheson@ci.sultan.wa.us)'; "Thomas O'Keefe' (okeefe@americanwhitewater.org)'
Cc: Binkley, Keith; Moore, Kim
Subject: RE: JHP - Draft SCE/LWD Construction Report for your 30-day review and comment

Hi Dawn, I have a few questions about the side channels that may not need to be addressed in the draft, but as Im reading it these come to mind:

- 1.) How was the 10000 lf agreed to? More particularly, was this length based on a technical estimate of "lost" side channel habitat due to the effect of altered hydrology from Culmback? Add 1-2 sentences in Intro?
- 2.) Are there design reports from Herrera that more specifically describe the modeling effort? There are none in the reference list.
- 3.) For each of the side channels, the percent of license obligation is reported as a fraction of the whole but is there a need to provide for adherence to these % values for each side channel or simply to maintain the grand total? Adherence is to the grand total but all four of the side channels are required to achieve that.
- 4.) Monitoring/research (non-required) Is the PUD collaborating with anyone to evaluate either habitat development, fish use, or channel evolution? I m thinking about UW grad students, NOAA Science Center staff, other scientists that may be able to incorporate these sites within other research projects that don't need/require PUD \$\$ and would be outside of the PUDs monitoring scope. We are not but I do plan to give a presentation at a future Snohomish Basin Salmon Recovery Technical Committee meeting which might stimulate that discussion.
- 5.) Costs I think summarizing costs for high level categories of design (modeling), permitting/consultation/cultural resources, materials, and construction would be great. It would be of wider interest to restoration practitioners.
- 6.) Planting work the Table 2 includes a summary of quantities, but doesn't include plants.

The as-built design drawings in the Appendix 1 appear to be the construction and spec sheets and not actual "as-builts." I understand the confusion as we incorporated "as-builts" into the original drawing set by replacing several sheets.

For planting work completed to date based on the drawings in Appendix 1, can the quantities be summarized or can the total area planted be summarized. There are several quantities that are very important for Salmon Recovery implementation in the Snohomish Basin – LWD count, side channel length, edge length, and riparian restoration (acres). This report is most of the way there as far as summarizing quantities for basin-wide implementation reporting.

7.) LWD jam as-builts – for each of the jams in section 3.1-3.8, are there specific quantities that can be summarized apart from the grant totals in Table 2. For each jam, LWD piece count, jam footprint area, jam height (max), and jam base elevation relative to thalweg and bank height elevations would be great to know as baseline. Im sure you have lots of photos – specifying photopoint locations would be great too.

Thanks - Frank

Frank Leonetti | Senior Habitat Specialist Surface Water Management

## Snohomish County Department of Public Works

 Solution
 Solution

#### NOTICE:

All emails, and attachments, sent to and from Snohomish County, are public records and may be subject to disclosure pursuant to the Public Records Act (<u>RCW 42.56</u>)

## Appendix D

Response to Comments Regarding the Draft Report

No.	Comment:	Response:
Snor	omish County, email dated March 13, 2013	Although many of the comments are out of scope for the requirements of the Construction Report per License Article 404, the District updated the report as follows:
1	How was the 10000 If agreed to? More particularly, was this length based on a technical estimate of "lost" side channel habitat due to the effect of altered hydrology from Culmback? Add 1-2 sentences in Intro?	Added footnote 1.
2	Are there design reports from Herrera that more specifically describe the modeling effort? There are none in the reference list.	Added Herrera modeling reference.
3	For each of the side channels, the percent of license obligation is reported as a fraction of the whole – but is there a need to provide for adherence to these % values for each side channel or simply to maintain the grand total?	The District is obligated to meet a grand total of 10,000 feet. There is not a side channel specific requirement to meet a set percentage of the grand total.
4	Monitoring/research (non-required) - Is the PUD collaborating with anyone to evaluate either habitat development, fish use, or channel evolution? – I m thinking about UW grad students, NOAA Science Center staff, other scientists that may be able to incorporate these sites within other research projects that don't need/require PUD \$\$ and would be outside of the PUDs monitoring scope.	The District is currently not collaborating with other scientists for monitoring and is not planning on conducting non-required research.
5	Costs – I think summarizing costs for high level categories of design (modeling), permitting/consultation/cultural resources, materials, and construction would be great. It would be of wider interest to restoration practitioners	High level costs were added to the document.
6	Planting work – the Table 2 includes a summary of quantities, but doesn't include plants.	Updated table to include plants.
7	The as-built design drawings in the Appendix 1 appear to be the construction and spec sheets and not actual "as-builts."	The majority of the project was essentially constructed as designed so the drawings represent the "as-built" condition. In some instances, drawings were updated and inserted as replacements to the original design sheets.
8	For planting work completed to date based on the drawings in Appendix 1, can the quantities be summarized or can the total area planted be summarized. There are several quantities that are very important for Salmon Recovery	Updated table to include quantities.

	implementation in the Snohomish Basin – LWD count, side channel length, edge length, and riparian restoration (acres). This report is most of the way there as far as summarizing quantities for basin-wide implementation reporting.	
9	LWD jam as-builts – for each of the jams in section 3.1-3.8, are there specific quantities that can be summarized apart from the grant totals in Table 2. For each jam, LWD piece count, jam footprint area, jam height (max), and jam base elevation relative to thalweg and bank height elevations would be great to know as baseline. I'm sure you have lots of photos – specifying photopoint locations would be great too.	Updated with additional tables summarizing quantities of wood, jam physical dimensions, and site elevations. GPS readings will be collected at photopoint locations.