Plan for Side Channel Enhancement and Large Woody Debris Placement

May 2011

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

Public Utility District No. 1 of Snohomish County

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Acronyms and Abbreviations

A-LA	Aquatic License Article
ARC	Aquatic Resource Committee
cfs	cubic feet per second
ELJ	engineered log jam
FERC	Federal Energy Regulatory Commission
HEA	Habitat Enhancement Account
LWD	Large Woody Debris
MCS	Marsh Creek Slide
msl	mean sea level
PM&E	Protection, mitigation and enhancement
RM	River mile
RSP	Revised Study Plan
SC	Side channel
SCE	Side channel enhancement
USGS	United States Geological Survey
USFS	United States Forest Service

1. Introduction

1.1. Background

The Public Utility District No. 1 of Snohomish County (District) will be the sole licensee for the Henry M. Jackson Hydroelectric Project (Project) under a new license to be issued by the Federal Energy Regulatory Commission (FERC). 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 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 Powerhouse and various other facilities; wildlife mitigation lands; and several developed and undeveloped recreation and river access sites.

On October 14, 2009, the District filed with the FERC a comprehensive settlement agreement (Settlement Agreement) on behalf of itself, National Marine Fisheries Service, United States Forest Service, United States Fish and Wildlife Service, United States National Parks Service, Washington Department of Fish and Wildlife, Washington Department of Ecology, the Tulalip Tribes of Washington, the City of Everett, Snohomish County, the City of Sultan and American Whitewater (collectively referred to as "Settlement Parties"). The Settlement Agreement resolved among the signatories all issues associated with issuance of a new license for the Project, including reservoir operation, minimum instream flows, process flows, whitewater boating flows, ramping rates, fish passage, fish habitat improvements, wildlife habitat management, marbled murrelet protection measures, recreation, historic properties and license term.

The Settlement requests that the Commission adopt, without material modification, Proposed License Articles. These Proposed License Articles will implement a complex and interrelated suite of protection, mitigation and enhancement (PM&E) measures that will result in improved resource conditions and ecological processes in the Sultan River over the term of a new license. The Proposed License Articles mainly address instream flows, fish passage, fish and wildlife habitat enhancement and protection, water quality, municipal water supply, rule curves for reservoir operation, fish supplementation, recreation, historic properties, and noxious weeds. Of these Proposed License Articles, the Proposed Aquatic License Article 7: Side Channel Projects (A-LA 7) and Proposed Aquatic License Article 6: Large Woody Debris (A-LA 6) are relevant to this particular plan (see Appendix 1).

1.2. Coordination and Integration

1.2.1. District's Role

Upon issuance of the new license and approval of the Plan for Side Channel Enhancement and Large Woody Debris Placement (SCE/LWD Plan, Plan), the District will be responsible for implementing the Plan. This responsibility will include:

- funding to carry out the measures as described herein;

- coordinating with surrounding landowners regarding land management in or near the Project boundary that may affect or be affected by the measures provided;
- consulting with the Aquatic Resource Committee (ARC) and the FERC as needed; and
- reporting to the ARC and the FERC.

The District's resource specialists and consultants will be involved as needed. Operational staff will also be trained on the unique requirements of the Plan.

1.2.2. ARC's Role

The District will meet quarterly with the ARC on license implementation measures. As necessary, these meetings will address outstanding issues associated with the implementation of this plan.

1.2.3. Resources

Due to the natural setting of the Project facilities and the complicated interactions among natural resources, unintended effects may occur without close monitoring and consideration of these resource interactions and other PM&E measures. The District will coordinate the actions of the SCE/LWD Plan with the actions of the various Project resource management plans including the:

- Process Flow Plan – for cross reference to the process flows.
- Adaptive Management Plan – for cross reference to the process for modifying this Plan within the constraint of the license article based on monitoring results.
- Fisheries and Habitat Monitoring Plan - for cross reference to monitoring components (such as habitat surveys, redd surveys and smolt traps).
- Operating Plan – for cross reference to instream flows and downramping requirements.

2. Purpose

2.1. Plan

This SCE/LWD Plan documents how the District will implement a program to (1) enhance the salmonid rearing habitat function along a minimum length of 10,000 linear feet of side channel habitat (and with a minimum surface area of 3 acres achieved through an average channel width 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 (LWD structures). These enhancements will 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 USGS Streamflow Gage No. 12138160). The District will restore and maintain flow connectivity between the mainstem Sultan River and selected side channels at flows greater than 300 cfs (as measured at the USGS Streamflow Gage No. 12138160). The planned structures are anticipated to provide refuge and holding habitat for upstream migrating adult salmonids, help retain and distribute gravels moving downstream to provide additional spawning areas, promote further exchange of water and nutrients between surface and subsurface flows (i.e. via the hyporheic zone) and help distribute surface flows through key side channel inlets.

The SCE/LWD Plan articulates provisions that describe the:

1. objectives of side channel enhancements and placement of LWD (within mainstem LWD structures and within side channels using woody debris from Culmback Dam);
2. restrictions necessary to minimize adverse impacts to public safety and property;
3. method and schedule for restoring and maintaining year-round flow connectivity between the mainstem Sultan River and selected side channels;
4. method (design and location) and schedule for installation of LWD structures;
5. method and schedule for moving woody debris from Culmback Dam to areas targeted for restoration; and
6. monitoring effectiveness, and related reporting, of side channels and LWD structures.

2.2. Objectives

The SCE/LWD Plan has a number of objectives to advance the overall goal of enhancing adult and juvenile salmon habitats in the lower river. These objectives include:

1. Provide for adult holding and spawning habitat in the main river channel over a range of hydrologic flow conditions.
2. Expand the range of hydrologic flow conditions over which side channels receive inflow from the main river by manipulating the hydraulic inlet controls to ensure inflows at a mainstem minimum flow of 300 cfs.
3. Use LWD structures to increase both adult and juvenile habitat availability in the mainstream and side channels.
4. Ensure that the overall design of LWD structures takes advantage of natural river geomorphic processes that promote their long-term effectiveness and sustainability.
5. Provide for maintenance of existing adult spawning habitat and expand potential off-channel refuge and summer rearing habitat in side channels for native salmon and trout species.
6. Develop and implement a long-term monitoring program to track overall performance of these enhancement measures.

2.2.1. Side Channel Enhancement

The greatest opportunity to increase overall habitat available to salmonid juvenile rearing and adult spawning is to increase the area and quality of habitat conditions in the existing network of side channels. Although multiple primary side channels exist along the Sultan River, only one (SC3) is currently providing its full year-round potential in terms of habitat area. The restoration strategy has identified four side channels (Figure 1) for improvement including:

- Side Channel 1 (SC1), located along the left bank of the Sultan River with the inlet near RM 1.3, largely within Osprey Park and extending south through private property to its outlet on WA Department of Transportation property;
- Side Channel 2 (SC2), located along the right bank of the Sultan River between RM 1.2 and 1.6 near prominent island / gravel bar known as Kiens Bar;
- Side Channel 3 (SC3), located along the right bank, near prominent island complex downstream of Ames Creek; and
- Side Channel 4 (SC4), located along the right bank near RM 0.5 with Rudolf Reese Park.

The overall restoration treatment recommended primarily involves increasing inflow by altering the inlet controls at all of the side channels except at SC3 where year-round connectivity already exists. Altering the inlet controls will be supplemented with localized enhancements within each side channel using a combination of woody debris and boulder clusters. Reconnection of relic flow pathways will further extend the overall network of side channel habitats. An additional treatment includes the excavation of a new inlet to an abandoned side channel (SC 4) to allow fish access to a relic channel disconnected from the main river (Figure 1). A total of 10,000 linear feet of side channel enhancements (existing and new), equivalent to a minimum of 3 acres of new or enhanced habitat, will be included in the overall enhancement effort. These actions will be coupled with the concurrent installation of LWD structures to promote natural geomorphic processes to maintain increased side channel inflow, and otherwise to enhance habitat complexity and suitability for salmon rearing and spawning. The banks of excavated new side channels as well as areas disturbed during construction will be planted with native vegetation.

2.2.1.1. Connectivity

Flow in side channels is controlled by: 1) the degree of groundwater emergence into the channel from either the adjacent hillsides or groundwater levels determined by the river itself, and 2) the interplay of water-surface elevation in the river and inlet elevation of the side channel. Because water-surface elevations rise and fall with discharge, the inlet elevation is critical to determining the range of flows over which any given side channel is active. The requirement that side channels be flowing at discharges >300 cfs was thus an important consideration for both the assessment and design recommendations for the side channels as well as the strategic placement of LWD structures in the main river. Under the minimum flow conditions of the new license, SC3 is the only side channel currently fully functional in terms of receiving sufficient inflow from the main river to provide access to suitable habitat.

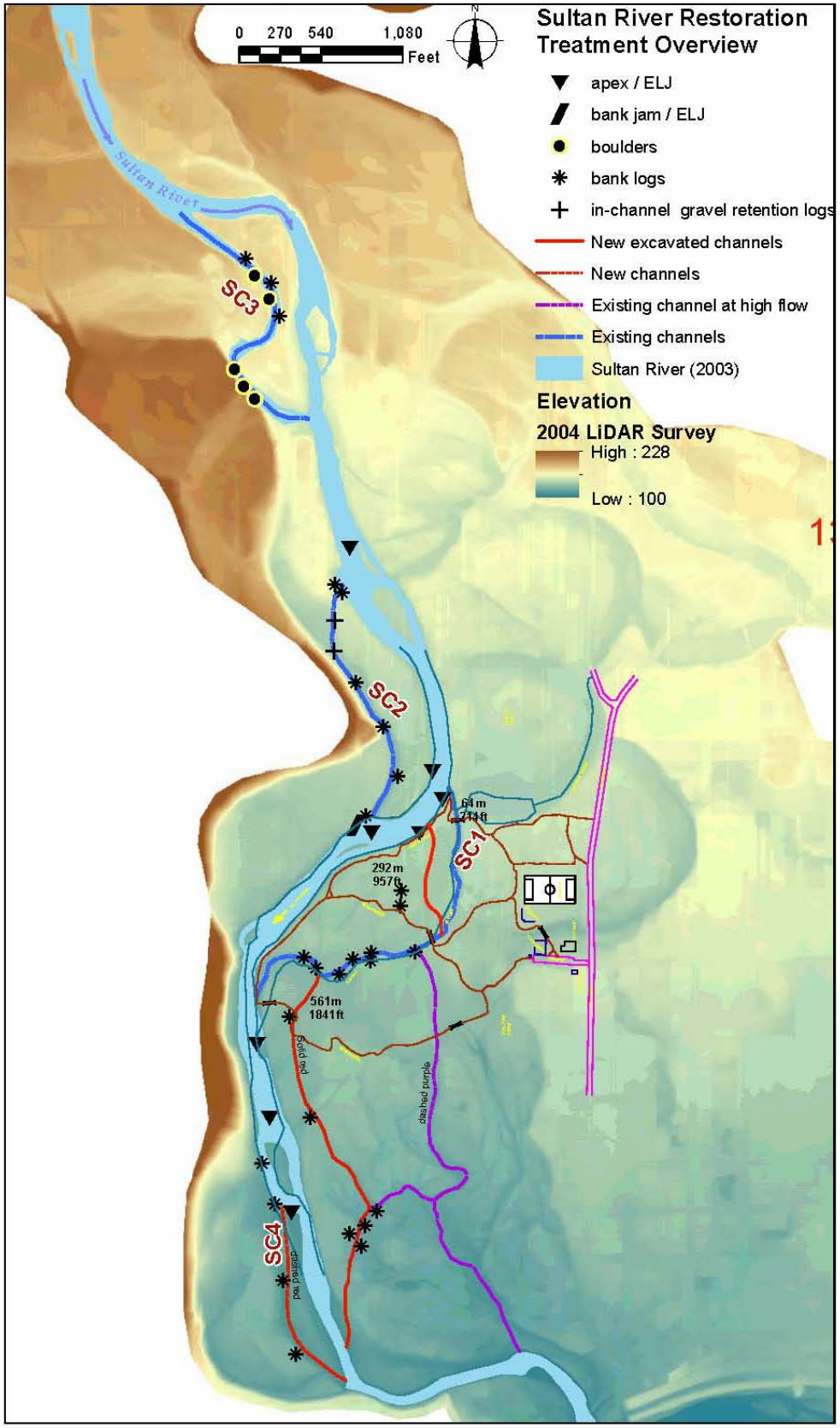

Figure 1. Topography of the lower Sultan River valley, showing the location of the four side channels discussed below.

2.2.1.2. Increased Habitat Diversity

Salmon habitat in the lower three miles of the Sultan River lacks hydraulic and structural diversity and includes long stretches of homogenous habitat (Stillwater 2008). A major goal of these combined PM&Es is to increase the overall quality and quantity of seasonally available aquatic habitats by the combined use of main channel engineered log structures, and the reconnection and increased complexity of side channels. Habitat complexity, especially pool formation, gravel retention and sorting, and diversification in the main channel will be significantly increased by the strategic placement of up to 12 LWD structures, which should increase adult holding and spawning habitats throughout the lower river. Habitat diversity in side channels will be significantly increased by a general increase in depth and velocity associated with increased flow, installation of boulder clusters and large wood to provide localized hydraulic and structural complexity, and extensions of the channel network by excavation and reconnection of relic flow pathways in the existing floodplain.

2.2.1.2.1. Localized enhancements using woody debris from Culmback Dam

On an annual basis, the woody debris that accumulates in the forebay of Culmback Dam will be collected and selectively screened to provide suitable-sized materials for the side channel enhancement projects. The collection will occur under full pool conditions during the summer. Suitable-sized materials will initially be stockpiled for subsequent delivery to specific side channel areas targeted for restoration and deficient in wood. These areas will be identified by the District and approved in consultation with the ARC. The District will deliver or contract for the delivery of this material to the designated areas. Using this resource also ensures that the total wood budget for the river is more fully available to help rebuild habitat complexity in the lower river. The District anticipates that wood from outside sources will be needed to construct the larger engineered wood structures in the mainstem of the Sultan River. Any wood pieces deemed unsuitable or not needed for restoration, will be disposed of by the District outside of the side channel project areas or made available to other resource management entities in the Snohomish Basin.

2.2.1.2.2. Strategic Boulder Placement

Where feasible, appropriate, and practical, boulders (individual boulders and boulder clusters) will be strategically placed to increase habitat complexity in localized side channel areas in the lower 2.5 miles of the river. Boulder clusters will be used where access is difficult for placement of LWD and where the disturbance associated with stabilizing LWD through embedment below channel grade or adjacent banks makes the net restoration benefit questionable. The river currently has a scattering of large boulders that reflect the history of glacial advance and retreat, and the reworking of glacial sediments over the millennium. Examination of these existing boulders provides support for their inclusion in the enhancement plan.

2.2.2. Mainstem Large Woody Debris Installations

Currently, there is a lack of natural large woody debris accumulations within the Sultan River associated with prior land uses, a historic policy of LWD removal, and the lack of recruitable key pieces (trees of a size and shape that are hydraulically stable within the river) available within the riparian forest system. Large woody debris jams were historically a common feature of alluvial river valleys in rivers like the Sultan River. To restore these features to the river, up to 12 LWD structures will be strategically placed within the main river corridor to provide longitudinal and lateral habitat complexity in the river channel. All of these LWD structures will be designed to increase channel complexity and the frequency and distribution of deep pool habitats, re-direct flow, retain and sort sediment, and provide for in-channel salmon holding and rearing habitat. As

a secondary benefit, several will be placed to encourage flow into side-channel inlets to improve connectivity and ensure that side channel inlets function (maintain connectivity) down to a low flow of 300 cfs as measured at USGS Gage No. 12138160.

3. Side Channel Enhancement

Although numerous side channels or relic floodplain features occur in the lower river, only a few provide nominal aquatic habitat under current conditions. After consideration of a variety of enhancement opportunities, three of the existing but not fully functional side channels were identified as providing the greatest opportunity to meet the habitat enhancement objectives. A fourth location was also identified as providing the opportunity to re-engage an abandoned side channel by modifying the inlet and doing minor channel excavation to increase its functional habitat values. These four focal areas and the specific enhancement are depicted in Figure 1 and discussed below.

3.1. Side Channel 1

SC1 holds the greatest potential in terms of affording opportunities for expansion of its length and enhancement of its habitat characteristics. The existing channel is approximately 2,536 feet in length (depicted in blue on Figure 1). The total length of the proposed project is significant, with the creation of redundant inlets to ensure the delivery of adequate flow and the extension of the channel to the south (both depicted in red), is approximately 6,397 feet (Table 1). At present, it is generally a low-gradient, meandering channel. The elevation of the control inlet on left bank is relatively high and does not functioning properly at flows <375 cfs. This inlet is close to the terminal end of a man-made oxbow wetland fed by Winters Creek. Flow from the wetland enters this side channel by spilling over two small beaver dams. Under moderate mainstem discharges of around 1,500 cfs, some flow is routed overland along the channel depicted in purple on Figure 1. At present, two options exist for the final 600 feet of the southern extension and the associated location of the outlet. The preferred outlet location, on Washington Department of Transportation property, is under environmental review by that agency.

The bed substrate in the upper extent of the existing side channel is very fine, with limited gravel and very low hydraulic gradient. Gradient increases midway down the channel where more gravel is present. The complexity and quality of habitat also improves farther downstream, suggesting that the system is not sediment-supply limited but rather transport limited. Therefore, increasing the volume of inflow to this channel should substantially increase sediment transport and improve overall quality of the juvenile salmonid rearing habitat potential. Large wood structures are also present in this section of the channel, but complexity could be increased by the addition of more wood and/or boulder clusters. Many of the existing structures have initiated scour in the channel, but due to lower channel gradient and small flow volumes, pool and glide substrate is mainly often composed of fine sediments providing limited spawning habitat.

Table 1. Length of side channel habitats proposed for enhancement, Sultan River.

Side Channel Description	Length of segment (ft)
SC1 – existing	2,536
SC1 – redundant inlet A	957
SC1 – redundant inlet B	214
SC1 – southern extension (Extension C)	2,690
SC2	1,778
SC3	2,130
SC4	1,322
Total	**11,627**

3.2. Side Channel 2

SC2 is a complex channel throughout most of its approximate 1,778 feet of length. The detailed hydraulic function of the inlet control is presently not well-defined, and so improvements are planned to ensure low-flow connectivity to maintain habitats at flows as low as 300 cfs. Habitats at present are a typical sequence of riffles, pools and glides, floored with annually mobilized small- to large-sized gravels. This reach exhibited the highest fish abundance during earlier juvenile fish surveys and has historically been heavily utilized by spawning chum salmon. Glacial till forms the left bank substrate and may introduce minor quantities of fine sediment into the gravels during erosive flows, but this is not considered a threat to habitat conditions or population viability. A few large wood accumulations currently exist in the channel and present ideal opportunities for further enhancement. One LWD structure is proposed to be placed at the outlet of the side channel to provide habitat complexity along the right bank on an eroding meander bend.

The greatest enhancement challenge at SC2 is creating inlet flow controls to maintain inflow from the main channel, especially during summer low-flow periods. At present, very little water enters this side channel during the summer low-flow period. In improving low-flow connectivity, however, the risk of permitting too much inflow at other times must be avoided, which could reduce the suitability of this channel as spawning habitat by increasing depth and velocities. The District therefore proposes little or no additional wood placement at the SC2 inlet and modest excavation of the hydraulic (grade) control. Some wood will be placed on the inlet banks to reduce the risk of avulsion. This cautious approach will be monitored regularly for how well it performs, and additional adjustments would be made to ensure poor inflow will not persist as a factor limiting habitat suitability.

SC2 has been documented to provide significant spawning and thus produces the highest productivity for juvenile salmonids of any of the existing side channels. As a result, we propose implementing minor treatments to promote additional habitat quality in addition to the inlet control work. These include the placement of additional logs along the banks and a few boulder clusters to enhance heterogeneity in the upper and lower reaches and to improve juvenile rearing habitat while preserving existing, functioning spawning habitat. Additionally, bank logs will be installed near the outlet of SC2 to create additional complexity and fish attraction to the side channel at a high-energy meander bend and to also help forestall further erosion on the downstream bank.

3.3. Side Channel 3

Side Channel 3 (SC3) is approximately 2,130 feet in length (Table 1) and at present is a reasonably steep, homogenous channel with little complexity and coarse substrate that limits its utility as spawning or rearing habitat. Bed substrate within SC3 is relatively coarse as compared to other side channels in the lower river, with spawning gravels being limited. There appear to be many opportunities to add complexity to SC3 that would increase suitability for both rearing and, possibly, spawning. At present, the inlet control to SC3 appears to function well under the range of flows seen in the main channel, even during summer low-flow periods. There are no proposed modifications at the inlet of this channel because current conditions allow the side channel to function at flows less than 300 cfs and because of potential risk to properties adjacent to the river. Due to the fact that the current relative habitat value in SC3 is low compared with that of SC2 but it is already well-connected to flow in the main channel, it would clearly benefit from the placement of structures to add complexity.

The objective of proposed treatments in SC3 is to increase habitat suitability for juvenile salmonid rearing and, potentially, to increase useable spawning-habitat area. Habitat in the uppermost 500 feet of the side channel is very homogeneous and provides little quality adult holding, juvenile rearing or spawning habitat. Increasing complexity by adding LWD along the banks and some boulder clusters will create channel roughness and, thus, more diverse habitats than are currently present. The few pools that already exist in the channel could serve as a base for additional enhancement.

3.4 Side Channel 4

Side Channel 4 (SC4) is a relic side channel that presents a great opportunity to provide additional juvenile rearing habitat, which is particularly lacking in the lower reach of the main river. The proposed treatment includes limited excavation of the existing shallow side channel on the right bank of the river near Reese Park on land owned by the City of Sultan. The relic inlet to SC4 is virtually non-functional in its current form and would require excavation to restore connectivity. An LWD structure would be required to direct flow into the excavated inlet. Additional wood would be placed within the new channel to create additional habitat complexity for juvenile salmonids. This proposed treatment would create approximately 1,322 feet of new side channel habitat (Table 1).

4. Placement of Mainstem Large Woody Debris Structures

In association with both the side channel and mainstem restoration efforts, a series of LWD structures will be strategically placed in the lower ~2.5 miles of the Sultan River (Table 2) to enhance habitat for migrating and spawning adults, and to create additional rearing habitat for juvenile salmonids, especially Chinook, coho, and steelhead. Totaling up to 12 LWD structures over the life of the license, they will provide needed habitat complexity in the main channel by creating an obstruction to flow that will allow hydraulic scour to occur, which in turn should create deep pools and provide retention of gravel in reachs of the river that are now homogenous in character. Some of the LWD structures will provide additional benefit by shunting a portion of the flow from the main channel into the two existing and one new side channel (see above), greatly expanding the quantity and quality of off-channel rearing and spawning habitats.

Table 2. Proposed location and function of mainstem LWD structures including proximity to side channels targeted for enhancement

LWD Structure #	Proposed[1] Location (RM / bank)	Proximity to	Function
1	0.5 / right bank	Inlet to SC4	Direct flow towards SC4, mainstem structural complexity and hydraulic diversity
2	0.7 / left bank to mid channel		Mainstem structural complexity and hydraulic diversity
3	0.8 / left bank to mid channel	Downstream of existing outlet to SC1	Mainstem structural complexity and hydraulic diversity
4	1.1 / right bank	Downstream of outlet to SC2	Mainstem structural complexity and hydraulic diversity, bank stabilization
5	1.3 / left bank	Inlet to SC1 and redundant inlets to SC1	Mainstem structural complexity and hydraulic diversity, direct flow towards SC1
6	1.3 / left bank	Immediately upstream of inlet to SC1	Mainstem structural complexity and hydraulic diversity, direct flow towards SC1
7	1.3 / right bank	Upstream of inlet to SC1	Mainstem structural complexity and hydraulic diversity, direct flow towards SC1
8	1.6 / left bank	Upstream of inlet to SC2	Mainstem structural complexity and hydraulic diversity, direct flow towards SC2
9 – 12	TBD, after Year 10 of the license		

The District will meet with the ARC on a regular basis as identified in section 1.2.2 above. Starting in year 8, the District will discuss the monitoring results and effectiveness of the installed structures. Based on these discussions, the ARC will determine if additional structures

[1] The final siting of the LWD structures is subject to gaining all required construction and access easement agreements from the adjacent property owners. In the event that the necessary agreements are not procured for a given site, alternative sites will be considered in consultation with the ARC.

need to be installed or if a delay in further actions is warranted. The ARC will annually discuss the need for additional LWD placement until the four remaining structures are installed.

5. Maintenance and Monitoring

5.1 Structure Performance

Engineered log structures will be routinely inspected for structural integrity and signs of degradation / changes in form, orientation, or function. Racking of additional woody debris will be noted and in instances where it negatively impacts the functioning of the structure, it will be removed. Observations will be recorded and photo documented. In the event that any of the eight originally installed large wood structures is damaged or obliterated, it may be replaced using one of the four additional structures set aside for this purpose.

5.2 Physical Habitat Measurements

Side channel habitats will be monitored seasonally to qualitatively assess functionality over the full range of flow conditions with focused surveys conducted when mainstem flows drop below 400 cfs. Benchmarks for horizontal and vertical control will be established near the inlet to each side channel. Bed elevation, water depth / stage, and velocity will be collected along an established transect during each site visit. This information will define flow connectivity and the relationship between mainstem and side channel flow. This will also provide information relevant to the evaluation of downramping rates and restrictions that may be necessary to protect juvenile salmon from stranding.

Monitoring will include a pedestrian (walking) habitat survey along the length of each channel, photo documentation and systematic measurement of select habitat characteristics (depth, width, substrate, presence of woody debris, and riparian condition).

Consistent with the Fisheries and Habitat Monitoring Plan, during Year 1 through Year 10, if there is a high flow event or other major event causing change, the District will perform a comprehensive quantitative habitat survey of the lower river including side channel habitats.

5.3 Documentation of Fish Presence / Habitat Utilization

Side channel habitat will also be monitored for habitat use by spawning and rearing salmonids. Spawning use will be documented in association with routine escapement surveys conducted in the mainstem Sultan River during the spring and fall. Snorkeling and minnow traps will be used to document the distribution, relative abundance, and utilization of side channel habitats by rearing salmonids. These surveys will be conducted during the summer on an annual basis for the first five years after project completion.

6. Reporting

6.1. Project Design / Status Updates

The enhancement and restoration effort presented in this plan represents a major commitment to the aquatic resources of the Sultan River. The size, scope, and visibility of this undertaking warrants regular involvement of and reporting to the members of the ARC. As such, progress / status reports will be regularly presented at ARC meetings. During these meetings, the ARC will be given an opportunity to comment on the 30-60-90% plans and provide input.

6.2 Project Completion

Upon completion of the initial enhancements in 2013, as-built drawings will be prepared. In addition, a comprehensive tour of the completed projects will be conducted.

6.3 Annual Report

Reporting related to the performance of the actions carried out in this Plan and the items identified in Section 5 will be integrated into and presented within the Annual Project Operations Report.

7. Schedule

The following schedule is anticipated for implementation of this Plan:

Side Channel Enhancements	
Permitting	2011 – with submittal complete by fall
Initial Enhancements	2012-13 (if granted necessary permits)
Monitoring	Seasonally throughout term of license
Maintenance	As necessary throughout term of license
Reporting	Annually, as part of the Project Operations Report
Identifying, enhancing and maintaining other off channel habitat suitable for enhancement	Per Funded Habitat Fund Project schedules
Large Woody Debris	
Permitting	2011 – with submittal complete by fall
Initial Installations	2012-13
Future Installations	2021 to 2056
Culmback Wood Placement	Ongoing, annual collection and distribution
Monitoring	Seasonally throughout term of license

Appendix 1

Proposed License Articles 6 and 7

A-LA 6: Large Woody Debris (LWD)

Within five (5) years of the Commission's approval of the Large Woody Debris Plan (LWD Plan), the Licensee shall install five (5) to eight (8) large woody debris (LWD) structures in the lower Sultan River (River Mile (RM) 0 to RM 16) subject to gaining regulatory approval and necessary legal access. In addition, starting ten (10) years after License issuance through the remainder of the term of the License, the Licensee shall install up to four (4) additional LWD structures in the Sultan River at a schedule to be determined by the Aquatic Resource Committee (ARC), subject to gaining regulatory approval and necessary legal access. In addition, throughout the License term, the Licensee shall move woody debris accumulated in Spada Reservoir between Culmback Dam and the log boom to areas targeted for restoration decided by the ARC.

Up to five (5) of the initial eight (8) structures shall be main channel LWD structures designed to improve main channel habitat complexity. The Licensee shall design the main channel LWD structures to re-direct flow, carve and create habitat, add diversity, retain and sort sediment, provide salmonid rearing habitat, and/or provide a medium for use by macroinvertebrates.

Up to three (3) of the initial eight (8) structures shall be associated with side channels and designed to improve mainstem / side channel connectivity by re-directing flow into the side channel, as reasonably feasible and appropriate.

Every LWD structure installed pursuant to this License Article shall include a minimum of five (5) and up to thirty (30) structural pieces and where possible, shall be designed to collect additional wood over time. Additionally, each structural piece shall be between 24-inches to 36-inches in diameter (dbh) and approximately 35-feet to 40-feet in length with rootwads intact. The size and length of each structural piece shall be limited by the transportation capacity of moving structures to a staging area by truck. Further limitations shall be imposed for projects relying on the use of helicopter transport of structural pieces. The weight of each structural piece shall be limited by aerial transport capabilities by Chinook helicopter between the staging area and the project site. The structural pieces shall be one of the following species: fir, hemlock or cedar. Structural pieces greater than 36-inches in diameter (dbh) shall be considered subject to availability and the limitations previously described.

In selecting the specific location and design of an LWD structure, the Licensee shall consult with the ARC and consider the probability of structure retention and risk to property.

The Licensee shall use woody debris from Spada Reservoir that accumulates between Culmback Dam and the log boom where possible to support the LWD projects described herein and also to provide materials in support of the Side Channel Enhancement (SCE) projects. The Licensee shall consult with the ARC regarding movement and placement of materials downstream of Culmback Dam.

To accomplish this, within one (1) year of issuance of the License, the Licensee shall file with the Commission, for approval, an LWD Plan. This LWD Plan shall document how the Licensee shall implement a program to install up to eight (8) LWD structures between RM 0 and

RM 16 in the Sultan River within five (5) years of Commission approval of the LWD Plan and up to an additional four (4) LWD structures from ten (10) years after License issuance through the term of the License. The LWD Plan shall include provisions that describe: 1) the design and location of each LWD structure; 2) the LWD installation schedule; 3) the restrictions necessary to minimize adverse impacts to public safety and property; 4) the method and schedule for monitoring the effectiveness of the LWD structures; and 5) the method and schedule for moving woody debris accumulated in Spada Reservoir between Culmback Dam and the log boom to areas targeted for restoration decided by the ARC.

The Licensee shall develop the LWD Plan in consultation with the ARC. The Licensee shall allow a minimum of thirty (30) days for members of the ARC to comment and make recommendations before submitting the LWD Plan to the Commission. When filing the LWD Plan with the Commission, the Licensee shall include documentation of consultation; copies of comments and recommendations; and specific descriptions of how comments and recommendations from the ARC are accommodated by the Licensee's plan. If the Licensee does not adopt a recommendation, the filing shall include the Licensee's reasons based upon Project-specific information.

Upon Commission approval, the Licensee shall implement the LWD Plan.

The following is an excerpt from the Settlement Agreement's Joint Explanatory Statement discussing the intent of the proposed license article:

F. Article A-LA 6: Large Woody Debris

In its License Application (*see* Appendix B at 14), the District proposed to enhance aquatic habitat diversity in the lower Sultan River through the implementation of a large woody debris ("LWD") plan. The proposed LWD plan included the installation of up to eight LWD structures in the Sultan River between RM 0 and RM 16. Up to five of the eight structures would be placed in the main channel and would be designed to improve main channel habitat complexity and to decrease pool spacing in the main channel. Up to three of the eight structures would be associated with side channels and designed to improve mainstem / side channel connectivity by directing part of the flow into the side channel, as feasible and where appropriate.

The intent of A-LA 6 is generally the same as that described in the License Application, but it includes the installation of up to four additional LWD structures in the Sultan River after 10 years from License issuance (a total of 12 structures). In addition, throughout the License term, the District will move woody debris accumulated in Spada Lake between Culmback Dam and the log boom to areas targeted for habitat restoration.

The four additional LWD structures included in A-LA 6 are expected to further increase habitat diversity in the Sultan River (compared to what was proposed in the License Application), reduce pool spacing and create and maintain higher value habitat for resident and anadromous fish and other aquatic biota. Increased LWD could also substantially increase

nutrients available to the aquatic environment. These additional four structures could also be used to replace any of the original structures that are destroyed during high flow events.

Installation of LWD structures is intended to increase habitat productivity and diversity and is expected to increase salmon and steelhead production and contribute to the recovery of ESA listed fish species in the Snohomish River basin.

During settlement negotiations, the Aquatic Resources stakeholders identified this measure as a high priority item; therefore, the District will prioritize the implementation of this measure upon License issuance.

A-LA 7: Side Channel Projects

The Licensee shall enhance the salmonid habitat function of a minimum of 10,000 linear feet of side channel area to provide a minimum of three (3) acres of additional rearing habitat and other habitat functions. This habitat shall be located within the wetted geographic area defined by a flow of 4,100 cfs, within the Sultan River, measured downstream of the Powerhouse. This enhancement shall be achieved through projects that improve flow connectivity or other habitat modification projects. This enhancement shall be subject to obtaining regulatory approval and legal access to any property necessary to carry out the above enhancement.

As part of this commitment, the Licensee shall restore and maintain flow connectivity between the mainstem Sultan River and the five prominent side channels at flows greater than 300 cfs (as measured at the USGS Streamflow Gage No. 12138160). These five prominent side channels are identified in the Preliminary License Proposal (December 2008) at Figure 5.3-12 as Side Channels 1, 2, 3, A, and B. At Side Channels 1, 2, 3, A and B, the Licensee shall excavate the inlets or use other means to redirect and maintain flow to ensure that flow connectivity and habitat value is achieved at flows greater than 300 cfs. The Licensee shall design the excavation or other means utilized in these side channels so that connectivity is self-maintaining. The Licensee shall also design the side channel enhancements to avoid adverse impacts to surrounding properties (including the City of Sultan's recreational properties). If property easements or regulatory approval cannot be obtained, the Licensee shall develop, in consultation with the Aquatic Resource Committee (ARC), other similar projects in the Sultan or Skykomish river systems to meet the linear foot and square foot requirements dictated by this License Article obligation.

The Licensee shall rely upon LiDAR, HEC_RAS modeling, existing studies and other available information to identify other side channels, swales, backwater and off channel habitats suitable for enhancement as salmonid rearing habitat within the Sultan River downstream of Culmback Dam.

As described in the LWD License Article, the Licensee shall use large woody debris collected at Culmback Dam to add structure and function to side channels.

Within one (1) year of issuance of the License, the Licensee shall file with the Commission, for approval, a Side Channel Enhancement Plan (SCE Plan). This SCE Plan shall

document how the Licensee shall implement a program to enhance the salmonid rearing habitat function in a minimum of 10,000 linear feet of side channel area within the wetted geographic area defined by a flow of 4,100 cfs as measured at the USGS gaging station below the Powerhouse within the Sultan River downstream of Culmback Dam. The SCE Plan shall include provisions that describe: 1) the method and schedule for restoring and maintaining year-round flow connectivity between the mainstem Sultan River and Side Channels 1, 2, 3, A, and B; 2) the method and schedule for excavating or utilizing other means to redirect and maintain flow, Side Channels 1, 2, 3, A, and B; 3) the method and schedule for identifying, enhancing and maintaining other off channel habitat suitable for enhancement; 4) the use of large woody debris or other flow re-direction means to re-direct a portion of the mainstem flow into the side channels, 5) the use of large woody debris collected at Culmback Dam to add structure and function within the side channel; and 6) the method and schedule for monitoring (including reporting requirements) and maintaining side channel enhancements throughout the term of the License.

The Licensee shall develop the SCE Plan in consultation with the ARC. The Licensee shall allow a minimum of thirty (30) days for members of the ARC to comment and make recommendations before submitting the SCE Plan to the Commission. When filing the SCE Plan with the Commission, the Licensee shall include documentation of consultation, copies of comments and recommendations, and specific descriptions of how comments and recommendations from the ARC are accommodated by the Licensee's plan. If the Licensee does not adopt an individual ARC member's recommendation, the filing shall include the Licensee's reasons based upon Project-specific information.

Upon Commission approval and obtaining any necessary regulatory approvals, the Licensee shall implement the SCE Plan.

The following is an excerpt from the Settlement Agreement's Joint Explanatory Statement discussing the intent of the proposed license article:

G. Article A-LA 7: Side Channel Projects

The side channel habitat enhancement measures presented in A-LA 7 are the same as those proposed in the License Application (*see* Appendix B at 15). Under A-LA 7, the District will consult with the ARC to develop a Side Channel Enhancement Plan ("SCE Plan"). The SCE Plan will include provisions that describe: (1) the method and schedule for restoring and maintaining flow connectivity between the mainstem Sultan River and Side Channels 1, 2, 3, A, and B; (2) the method and schedule for excavating or using other means to redirect and maintain flow in Side Channels 1, 2, 3, A, and B; (3) the method and schedule for identifying, enhancing and maintaining other off channel habitat suitable for enhancement; (4) the use of LWD or other flow re-direction means to re-direct a portion of the mainstem flow into the side channels; (5) the use of large woody debris collected at Culmback Dam to add structure and function within the side channel; and (6) the method and schedule for monitoring (including reporting requirements) and maintaining side channel enhancements throughout the term of the License and any subsequent annual Licenses.

Specifically, the District will enhance the habitat function in a minimum of 10,000 linear feet of side channel in the lower Sultan River (to provide a minimum of 3 acres of additional habitat area). This enhancement will be achieved through projects that improve side channel flow connectivity or other habitat modification projects located within the wetted area of the Sultan River downstream of the Powerhouse that is defined by a flow of 4,100 cfs.

The existing side channels in the lower Sultan River provide important spawning and rearing habitats for numerous salmonids and other aquatic species. Enhancement of habitat within side channels and maintenance of year-round connectivity will substantially increase the amount and quality of habitat available to anadromous and resident fish particularly during the summer and early fall low flow period. This increase in critical side channel habitat area is expected to increase the survival and production of resident and anadromous salmonids, particularly for coho, Chinook and cutthroat rearing, and pink and chum salmon spawning.

Appendix 2

Documentation on Consultation Opportunities regarding Draft Side Channel Enhancement and Large Woody Debris Plan

Presler, Dawn

From: Presler, Dawn
Sent: Monday, July 26, 2010 3:44 PM
To: 'Tim_Romanski@fws.gov'; 'Steven.M.Fransen@noaa.gov'; 'Applegate, Brock A (DFW)'; 'Maynard, Chris (ECY)'; 'Abby Hook'; 'Andy' 'Haas'; 'Deborah Knight'
Cc: 'Barry Gall'; 'Engel, John'; 'jsklare@ci.everett.wa.us'; 'Jim Miller'; 'Thomas O'Keefe'; Moore, Kim; Binkley, Keith
Subject: ARC - Side Channel Addendum - Your Input Needed!
Attachments: FINAL_Side Channel and LWD Alternatives 1 and 2_July1_Stillwater.pdf

Importance: High

Dear ARC Side Channel Quorum Members:
Attached is Stillwater's addendum describing the two alternatives. Please send back a preference for Alternative 1 or Alternative 2 **by this Friday noon**! If we all agree on the Alternative measure, Stillwater will be able to conduct further analysis and design work for the development of the Side Channel/LWD Plan. Please add your selection below and reply all. Thanks!!

PUD's selection: Alternative 2
USFWS selection:
NMFS selection:
WDFW selection:
WDOE selection:
Tribe selection:
Snohomish County selection:
City of Sultan selection:

Dawn

From: Binkley, Keith
Sent: Monday, July 26, 2010 11:05 AM
To: Presler, Dawn; Moore, Kim
Subject: FW: Addendum document for ARC

Looks fine to me – let's send it out asap

From: Stephen Ralph [mailto:ralph@stillwatersci.com]
Sent: Monday, July 26, 2010 10:40 AM
To: Binkley, Keith
Cc: Derek Booth; Liz Gilliam; Gus Kays; Ian Mostrenko; Michael Spillane; Kelli Wheat
Subject: Addendum document for ARC

Hi Keith,

Attached please find the addendum memo that describes the two issues raised by the ARC. If you approve of its contents, could you please distribute to the ARC, and ask that they give a decision on which of the two alternatives they wish you (and us) to pursue. We'd really appreciate it if we could get their decision by no later than this Friday (Thursday would be even better!!).

Hope you had a fabulous weekend!

Steve

<<FINAL_Side Channel and LWD Alternatives 1 and 2_July1_Stillwater.pdf>>

Stephen C. Ralph, Senior Aquatic Ecologist
Stillwater Sciences, Inc.
NW Offices - Seattle
1314 NE 43rd St., Suite 210
Seattle, WA 98105
Office - 206 632-0107
Cell - 206 295-1223
www.stillwatersci.com

Presler, Dawn

From: Presler, Dawn
Sent: Tuesday, January 25, 2011 12:36 PM
To: 'okeefe@amwhitewater.org'; 'Jim Miller'; 'Deborah Knight'; 'steven.m.fransen@noaa.gov'; 'Haas, Andy'; 'Abby Hook'; 'Tim_Romanski@fws.gov'; 'Loren Everest'; 'Maynard, Chris (ECY)'; 'Applegate, Brock A (DFW)'
Cc: Moore, Kim; Binkley, Keith
Subject: ARC - draft Side Channel/Large Woody Debris Plan
Attachments: DRAFT_SCE_Plan_ARC_021611.DOC

Dear ARC Members:
Attached is the draft Side Channel/LWD Plan that is up for discussion at the February 16 ARC meeting. If you have a chance to review prior to the meeting, it would be appreciated.

If you have any questions between now and then about this draft Plan, feel free to contact Keith.

Dawn Presler
Sr. Environmental Coordinator
Generation Resources

Snohomish County PUD No. 1
PO Box 1107 Everett, WA 98206-1107
Phone: 425-783-1709

Presler, Dawn

From: Presler, Dawn
Sent: Thursday, February 17, 2011 12:06 PM
To: 'Deborah Knight'; 'okeefe@amwhitewater.org'; 'Jim Miller'; 'steven.m.fransen@noaa.gov'; 'Haas, Andy'; 'Abby Hook'; 'Tim_Romanski@fws.gov'; 'Loren Everest'; 'Maynard, Chris (ECY)'; 'Applegate, Brock A (DFW)'
Cc: 'mick.matheson@ci.sultan.wa.us'; 'jsklare@ci.everett.wa.us'; Binkley, Keith; Moore, Kim
Subject: ARC - draft Side Channel/Large Wood Plan - 30-day review
Attachments: ARCReview_Side_Channel_Enhancement_Plan_SCE.DOC

Per the ARC meeting yesterday, attached is the draft Side Channel/Large Woody Debris Plan for your 30-day review. (This is the same one as previously provided.) Please provide your comments/edits, if any, back to me and Keith by Monday March 21. You can also contact Keith directly for any questions/clarifications at 425-783-1769 or KMBinkley@snopud.com .

Dawn

From: Presler, Dawn
Sent: Thursday, February 17, 2011 11:56 AM
To: 'Deborah Knight'; 'okeefe@amwhitewater.org'; 'Jim Miller'; 'steven.m.fransen@noaa.gov'; 'Haas, Andy'; 'Abby Hook'; 'Tim_Romanski@fws.gov'; 'Loren Everest'; 'Maynard, Chris (ECY)'; 'Applegate, Brock A (DFW)'
Cc: 'mick.matheson@ci.sultan.wa.us'; 'jsklare@ci.everett.wa.us'; Binkley, Keith; Moore, Kim
Subject: ARC Mtg 2/16 - draft meeting summary

Attached is the draft ARC meeting summary and attachments from our ARC meeting yesterday. Per the ARC Guidelines, please review and provide edits, if any, back to me by Thursday Feb 24.

Future Y2011 ARC Meetings are:

- April 13, 2011 (2nd Wednesday since Loren was unavailable the week of April 19)
- June 15, 2011
- August 17, 2011
- October 19, 2011

Dawn Presler
Sr. Environmental Coordinator
Generation Resources

Snohomish County PUD No. 1
PO Box 1107 Everett, WA 98206-1107
Phone: 425-783-1709

Presler, Dawn

From: Presler, Dawn
Sent: Thursday, June 09, 2011 12:01 PM
To: 'Steve Fransen'; 'Leonetti, Frank'; 'Abby Hook'; 'Tim_Romanski@fws.gov'; 'Loren Everest'; 'Maynard, Chris (ECY)'; 'Applegate, Brock A (DFW)'; 'okeefe@amwhitewater.org'; 'Jim Miller'; 'Deborah Knight'
Cc: Binkley, Keith; Moore, Kim
Subject: ARC - final review of plans
Attachments: FINAL_WQMP_Water_Quality_Monitoring_Plan.pdf; FINAL_Water_Quality_Plan.pdf; FINAL_SCELWD_Plan.pdf

Dear ARC Members:
Attached are the final plans to be filed with the FERC after the new license is issued as discussed at the April ARC meeting. Plans include: SCE/LWD, WQ, and WQM. DDVP will come in another email due to size of attachments.

SCE/LWD Plan – Keith updated per discussions at the last ARC meeting and specifically integrates suggestions from Brock and Abby. In addition, the revised version includes an updated map to reflect the relocation of one engineered log jam. We have also modified the naming convention for the ELJ's to be consistent with the plans being prepared by Herrera.

Please take the next week to review these final plans and provide comments, if any, back to me by June 17 COB. Otherwise, I will take your silence as concurrence with the attached plans and I will file them with the FERC for their approval after the new license is issued. Thanks everyone!

Dawn Presler
Sr. Environmental Coordinator
Generation Resources
(425) 783-1709
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PUD No. 1 of Snohomish County
PO Box 1107
Everett, WA 98206-1107