



Your Northwest renewables utility

August 28, 2014

VIA ELECTRONIC FILING

Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission (FERC)
888 First Street NE
Washington, DC 20426

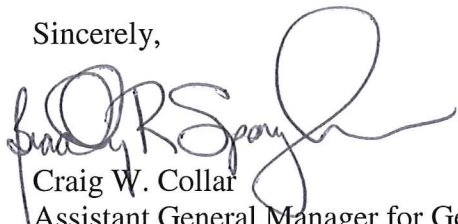
**Re: Jackson Hydroelectric Project, FERC No. P-2157
Side Channel Enhancements – Ramping Rate Evaluation Plan Supplement
License Article 405**

Dear Secretary Bose:

Enclosed is Public Utility District No. 1 of Snohomish County's Side Channel Enhancement Ramping Rate Evaluation Plan Supplement (RREP Supplement) per License Article 405 for the Jackson Hydroelectric Project and the Office of Energy Projects' letters dated January 30, 2014, and April 21, 2014. The draft RREP Supplement was provided to the Aquatic Resource Committee (ARC) for a 30-day review and comment period; consultation documentation is included in the RREP Supplement's appendices.

If you have any questions on the RRE Plan, please contact Keith Binkley, Natural Resources Manager, at (425) 783-1769 or KMBinkley@snopud.com.

Sincerely,


for Craig W. Collar
Assistant General Manager for Generation
CWCollar@snopud.com
(425) 783-1825

Enclosed: RREP Supplement

Side Channel Enhancements Ramping Rate Evaluation Plan Supplement

License Article 405



Everett, WA



August 2014

Final – This document has been prepared for the District. It has been peer-reviewed by the District for accuracy and formatting based on information known at the time of its preparation and with that understanding is considered complete by the District. The document may be cited as:

Public Utility District No. 1 of Snohomish County (District). 2014. Side Channel Enhancements Ramping Rate Evaluation Plan Supplement for the Henry M. Jackson Hydroelectric Project, FERC No. 2157. August 2014.

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Acronyms and Abbreviations

A-LA	Aquatic License Article
ARC	Aquatic Resource Committee
cfs	cubic feet per second
District	Public Utility District No. 1 of Snohomish County
ELJ	engineered log jam
FERC	Federal Energy Regulatory Commission
Project	Henry M. Jackson Hydroelectric Project (FERC No. 2157)
RM	River mile
SC	Side channel
SCE	Side channel enhancement
USGS	United States Geological Survey

1. INTRODUCTION

1.1. Background

Public Utility District No. 1 of Snohomish County (the 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 (FERC 2011). The Project is located on the Sultan River in Snohomish County near Sultan, Washington. 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; 111.8 MW nameplate capacity powerhouse; 8-mile long power penstock; and associated facilities.

Aquatic License Article 5 (A-LA 5) establishes downramping rate schedules for the Project. These schedules were established for the protection of salmonid fry that may be vulnerable to stranding associated with rapid changes in water surface elevation (stage) during operation of the Project. Seasonal schedules apply to Reach 1 (River Mile (RM) 0.0 to 4.5) and Reach 2 (RM 4.5 to 9.7) of the Sultan River. These are highly specific to time of day and flow range in the Sultan River. Further upstream in Reach 3, flow adjustments are made infrequently and not tied to changes in generation as in Reach 1 and to a lesser extent in Reach 2. In Reach 3, specific downramping rates apply only to flow releases directly from Culmback Dam.

The focus of this evaluation of ramping rates is in Reach 1, downstream of the Project powerhouse. This reach is directly under the influence of powerhouse discharge and exhibits habitat characteristics of an alluvial system, especially in the lower 2.7 miles, that may add to fry vulnerability as opposed to the more confined channel further upstream. While the existing rates were developed through detailed studies and are considered protective of the resource, changes in habitat conditions associated with side channel (SC) enhancement efforts in 2012 (District 2013a) prompted an initial supplemental evaluation in 2013.

The District developed the Side Channel Enhancement Ramping Rate Evaluation Plan (RREP) in consultation with the Aquatic Resource Committee (ARC) (District 2013b). The RREP was filed with the FERC on January 24, 2013, after ARC approval of its contents including methodology. The FERC approved the RREP on March 19, 2013.¹ The objective of the District's 2013 RREP study was to assess flow behavior and distribution and to determine whether additional downramping rate restrictions were necessary to prevent juvenile fish stranding. The study surveys included measurements of: 1) topography at the side channel inlets, 2) water surface and channel elevation at the point of hydraulic control near the inlet, 3) flow routing and distribution into and within the side channels under conditions of low to moderate mainstem discharge, 4) wetted width and depth at systematic intervals along each channel, and 5) photo documentation of low flow habitat conditions along the length of each side channel.

¹ 142 FERC ¶ 62,223 Order Approving Ramping Rate Evaluation Plan Pursuant to Article 405.

The results of the District's surveys indicated that connectivity between the mainstem and side channel habitat was maintained over the range of normal operational flow conditions (District 2013c). The surveys also documented sufficient flow volume under normal operational conditions and the presence of suitable and diverse physical habitat conditions in terms of wetted width, depth, and flow exchange at the inlets and the outlets. While the District concluded that stranding potential was extremely limited under the existing range of flows, the side channel surveys were conducted prior to the occurrence of a significant high flow event as river flows had not exceeded 2,300 cfs by the time the survey was conducted. The District also noted that several side channels, most notably SC4 and SC1, were still undergoing post-construction adjustments to the Sultan River flow regime. These two areas underwent significant earthwork as new side channel habitats were created.

Consistent with Article 405, the District's 2013 study report was prepared in consultation with the members of the Project's ARC, and the ARC was provided a copy of the draft report for a 30-day review and comment period prior to filing it with the Commission. While the majority of the comments received from the ARC were editorial or requested further clarification, some comments from Washington Department of Fish and Wildlife (WDFW), the Tulalip Tribes, and Snohomish County Surface Water Management were focused on perceived data gaps and the need for additional information to better understand the behavior of hydraulic controls during downramping.

On October 21, 2013, the District filed its report with the FERC. Upon review, FERC staff agreed that additional monitoring and evaluation of the suitability of the downramping rates was warranted and requested in its letter dated January 30, 2014, that the District develop a supplemental plan designed to address some of the aforementioned data gaps and concerns (Appendix 1). The District held a field meeting on June 10 with two members of the ARC and a representative from the Washington Department of Fish and Wildlife (WDFW). These individuals subsequently recommended the implementation of additional monitoring activities to better ascertain the appropriate ramping rates and fish stranding potential within the newly built side channels (see Appendix 2).

This proposed Supplemental Ramping Rate Evaluation Plan (Supplemental RREP) expands on the District's original study (District 2013) and incorporates several recommendations received from the ARC and FERC to specifically address gaps and concerns relative to the need for adoption of more conservative ramping rates.

1.2. Purpose

License Article 405 requires, *"Within 6 months of completing the side-channel enhancement projects required by Appendix A, condition 5.2 (A-LA 7), the licensee shall file, for Commission approval, a Ramping Rate Evaluation Plan. The plan shall include: 1) the methods and schedule for conducting an evaluation to determine whether additional ramping rate restrictions are necessary to protect juvenile fish from stranding in the reconnected side channels required by Appendix A, condition 5.2 (A-LA 7); and 2) a provision to file a ramping rate report within one year of completing the side channel enhancements, with any specific proposals for more restrictive ramping rate based on the outcome of the ramping rate evaluation."*

The objective of this proposed Supplemental RREP is to further describe aquatic habitat and channel conditions, and evaluate downramping rates in the four side channels in Reach 1 of the Sultan River beyond what was already completed for the RREP. More specifically, the proposed study approach outlined in this plan includes the following tasks:

1. Conduct initial field reconnaissance with ARC members to identify monitoring site.
2. Measure channel transects at fixed monitoring stations within each side channel.
3. Conduct a ramping rate evaluation from 600cfs to 300 cfs to assess the adequacy of existing downramping criteria.

This Supplemental RREP covers the “revisit after high flows” activities that were mentioned in the District 2013 report, and of which the FERC requested clarification in its April 21, 2014 letter.

1.3. Consultation

The draft of this Plan was provided to members of the ARC for a 30-day review and comment period. Consultation documentation is included in Appendix 3, and the District’s responses to written comments received are included in Appendix 4.

2. METHODS

In this supplement, the District proposes to further evaluate patterns of flow behavior in four distinct side channels in the lower Sultan River. These side channels: SC1, SC2, SC3, and SC4 each underwent restoration in summer 2012 (Figure 1). With the exception of SC1, all side channels have one inlet and one outlet. SC1 has two inlets and two outlets. While this supplemental evaluation and post high-flow revisiting of the side channels would complement previous surveys, it is considered to be a comprehensive and quantitative stand-alone evaluation to address the license requirements related to ramping rates.

The District proposes focused quantitative surveys within each of the side channels. These surveys would be conducted when mainstem flows drop below 600 cfs, as measured at United States Geological Survey (USGS) Streamflow Gage No. 12138160. The flow range below 600 cfs was selected for this evaluation to be consistent with prior survey efforts related to project downramping (CH2MHill 1990, District 2013). Table 1 depicts the applicable downramping schedule in Reach 1 when the flow range is between 600 and 300 cfs (minimum instream flow), as measured at USGS Streamflow Gage No. 12138160.

Table 1. Downramping Rate Schedule, 600 to 300² cfs flow range, Reach 1, Lower Sultan River (per License Appendix G, A-LA 5).

Season	Day Rate	Night Rate
January 1 to May 31 ³	2 inches per hour	4 inches per hour
June 1 to September 15	2 inches per hour	1 inch per hour
September 16 to October 31	2 inches per hour	2 inches per hour
November 1 to December 31	4 inches per hour	4 inches per hour

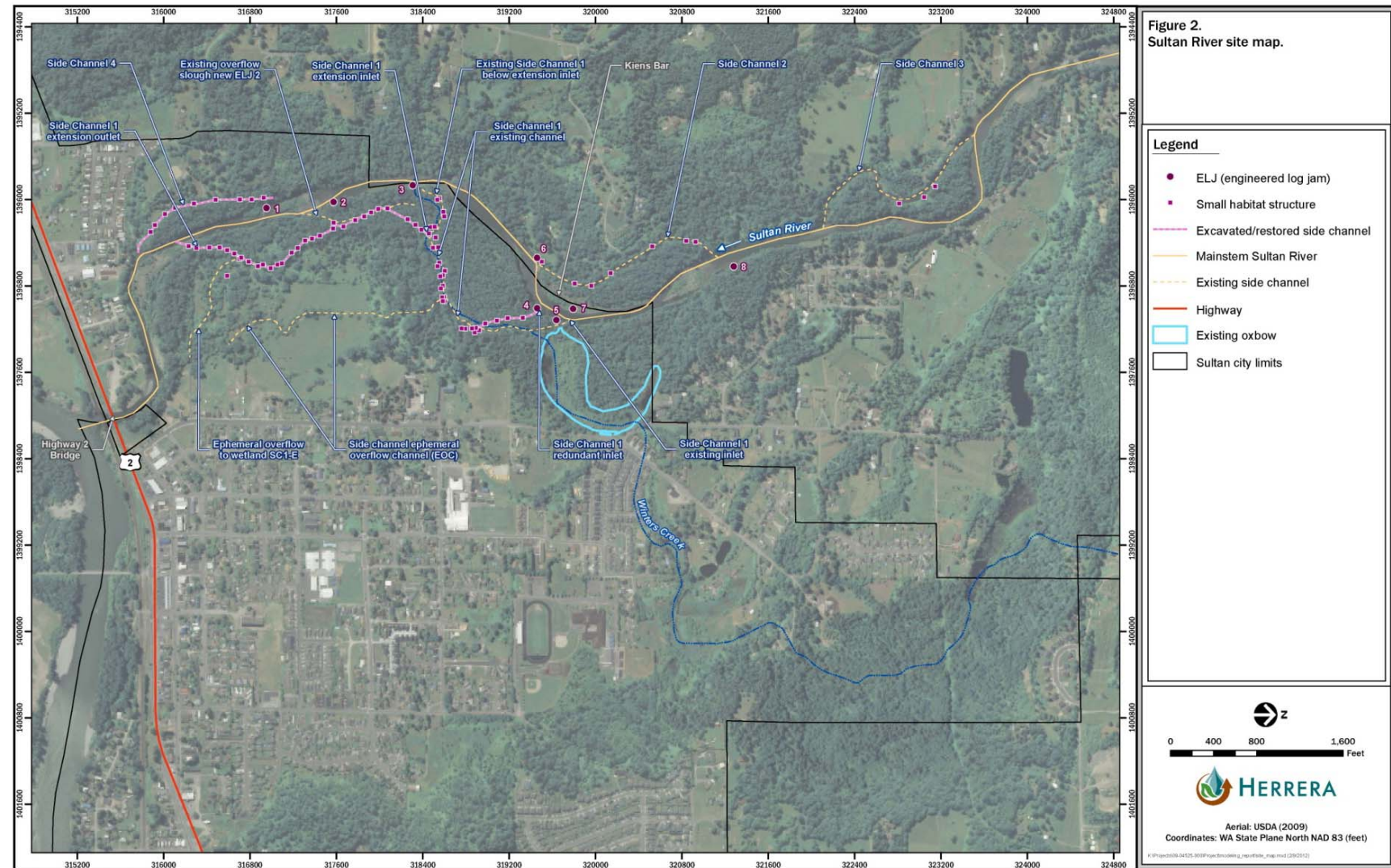
Specific study plan tasks are described below.

2.1 Task 1: Identify Representative Permanent Monitoring Sites

Per the Fisheries and Habitat Monitoring Plan (License Article 410), the District is conducting a comprehensive Riverine Habitat Survey during summer 2014. The license requirement was triggered by the occurrence of a significant high flow event of 3,800 cfs (mean daily flow) on March 17, 2014. Upon completion of this habitat survey, District staff and members of the ARC (if interested) will review the survey results and conduct a field reconnaissance of the four newly enhanced side channels to identify potential high risk stranding areas (such as low gradient gravel bars) and identify permanent representative monitoring sites.

² If the District determines, in consultation with the ARC, that a drought event resulting in advisory reductions in domestic water consumption (as described by the 2007 City of Everett's Drought Response Plan as a Stage 1 response to a drought event) is occurring, the most conservative downramping rate of 1 inch per hour will be used as minimum flows are reduced below 300 cfs.

³ Due to the presence of salmon fry, the frequency of downramping at rate greater than 1 inch per hour during the January 1 to May 31 season is limited to a total of 48 hours with no more than 16 hours occurring in any single month. Per A-LA 5, this limitation applies at river flows below 750 cfs.



2.2 Task 2: Establish and Survey Channel Transects

Within each side channel, the District will establish and monument a permanent representative monitoring site and measure a series of channel cross sections at fixed stations. Transects will be placed at hydraulic controls and/or habitat units of interest that may affect stranding or available habitat area during downramping events (e.g., where the bed is wide and gently sloping from bank to thalweg). It is anticipated that between 6 and 10 transects will be established and measured in each side channel using a crew of two experienced surveyors. The location of each transect will be determined during the initial reconnaissance using input from ARC members.

At each side channel transect, surveyors will establish a benchmark, set end posts (rebar or spike), stretch the survey tape between the end posts, and set up the tripod and level transit. Surveyors will then begin taking channel profile water surface elevation, water depth, and water velocity/flow data using a stadia rod and Swoffer velocity meter (or equivalent) following standard USGS procedures. Data will include the station number, substrate the rod is resting upon, the reading on the rod as seen through the transit, water depth, and water velocity. Surveyors will also record the edge of channel (EOC) and edge of water (EOW) on each side of the cross section. The surveyors will continue this procedure until they reach the stake on the opposite side of the channel. For side channels with non-uniform bottoms, additional measurements may be required at points of significant slope changes, and at enough intermediate points to adequately represent the cross-section. All transects will be monumented (benchmarked); and clearly documented using field notes, GPS, survey flagging, and photographs.

Each side channel transect will be surveyed two times. The first survey will collect the full set of data described above at the lowest initial ramping rate flow (300 cfs). The second survey (600 cfs) will determine the flow rates and change in water surface elevation (relative to the established benchmark), EOC, and EOW. A total of 20 measurements will occur at each transect to accurately portray the applicable channel attributes.

To visually present these data, the District will prepare plots of the individual cross sections that include bankfull width, depth/water surface elevation, and area versus distance along the center line. These plots will provide a simple way of determining if changes in channel characteristics are statistically significant, and to determine if the changes are due to large changes in a small section of the channel or if they are spread over the entire reach. These plots, photographs, transect location and benchmark location data will be included in the draft and final ramping rate evaluation reports.

In addition to the survey of channel cross sections, a longitudinal survey of the channel thalweg will be performed within each of the established representative monitoring sites.

2.3 Task 3: Conduct a Ramping Rate Evaluation at Three Study Flows

According to WDFW and Washington Department of Ecology (Beecher and Caldwell 2007), information needed for ramping rate determinations includes: (1) identification of critical stranding sites, (2) determination of stage -discharge relationship at critical sites, (3) determination of travel time for a block of water traveling through a reach of interest, and (4)

determination of attenuation of stage change over distance at different flows. To address these needs, the District will install a series of temporary staff gages and/or Hobo Water Level instruments for recording water level (stage) within each of the four side channels in or near areas of potential stranding habitat identified during the reconnaissance survey. The gages will be located near the monumented cross-sections, making sure the lower end of the gage is within the channel at low flow.

The downramping evaluation will occur at flows ranging from 600 cfs down to 300 cfs following standard Project downramping protocols. Permanent photo stations will document important hydraulic controls and other areas of interest during downramping, and will be marked for future monitoring.

Flow releases for the study will be based on readings obtained from USGS Gage No. 12138160 (Sultan River below Powerplant). Immediately prior to, during, and after the downramping event, river stage data will be recorded at 5-minute intervals in each side channel to document the downramping rate in inches/hour. Following the downramping event (gage stabilization), the surface area of stranding habitat below the initial high-water line in each side channel will be estimated. This dewatered stranding habitat will then be photographed and visually examined for stranded fish. Observations will be made by two biologists slowly walking back and forth in the dewatered zone from end to end and then back again. Special attention will be given to areas containing previously submerged vegetation (aquatic and terrestrial) and any depressions or isolated water pockets. The number, species, and condition of any observed fish will be documented in field notebooks.

The change in stage over time data collected from the temporary staff gages in the side channels will be used to calculate the ramping rate associated with each downramping event at each side channel site. These data will also be used to determine the time it takes for the flow to reach the study sites from the powerhouse, and to determine the degree of the stage-change attenuation, if any, between the USGS gage below the powerhouse and the study sites.

3. REPORTING

Following the field surveys, the District will analyze the data collected during the study and prepare a draft report that includes plots of the channel cross sections at each evaluation flow, detailed descriptions and photographs of the transect and benchmark locations, plots of the rate in change in flow associated with each downramping event, a description of any areas that are particularly sensitive to ramping, and an account of the number and species of any stranded fish observed during the study.

The District will provide a draft of the report to the ARC for a 30-day review and comment period. If the District does not adopt a recommendation, the report will include the reasons based on Project-specific information. The final report will take in consideration comments from the ARC and will be prepared using a standard scientific format including a description of the study's objectives and results, and a discussion/list of recommendations.

The District will file with the FERC a Supplemental SCE Ramping Rate Report within one year of plan approval. The Supplemental SCE Ramping Rate Report will include:

1. summary of evaluation methods and results
2. visual documentation of flow conditions during each site visit
3. physical measurements collected during each site visit
4. any specific proposals for more restrictive ramping rates based on the outcome of this ramping rate evaluation
5. documentation of consultation with the ARC
6. copies of comments and recommendations on the completed report after it has been prepared and provided to the Aquatic Resource Committee and specific descriptions of how the ARC's comments are accommodated by the report

4. REFERENCES

District. 2013a. Side Channel Enhancement and Large Woody Debris Placement Construction Report (License Article 404) for the Jackson Hydroelectric Project, FERC No. 2157. April 2013.

District. 2013b. Side Channel Enhancement Ramp Rate Evaluation Plan (License Article 405) for the Jackson Hydroelectric Project, FERC No. 2157. January 2013.

District. 2013c. Side Channel Enhancement Ramp Rate Evaluation Report (License Article 405) for the Jackson Hydroelectric Project, FERC No. 2157. October 2013.

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

Appendix 1

FERC's Letters Regarding RREP Supplement

**FEDERAL ENERGY REGULATORY COMMISSION
Washington D.C. 20426**

OFFICE OF ENERGY PROJECTS

Project No. 2157-213 -- Washington
Henry Jackson Hydroelectric Project
Snohomish County Public Utility District No. 1

January 30, 2014

Mr. Kim Moore
Snohomish County Public Utility District No. 1
P.O. Box 1107
Everett, WA 98206

Subject: Side Channel Enhancement Ramping Rate Evaluation Report

Dear Mr. Moore:

This is in response to your side channel enhancement ramping rate evaluation report, filed with the Commission on October 31, 2013, pursuant to your approved ramping rate evaluation plan (plan)¹ and Article 405 of the Henry Jackson Hydroelectric Project license.² Specifically, your approved plan requires you to develop a ramping rate report upon completing the side channel enhancements and ramping rate evaluation in the lower Sultan River, as described in your plan. The report must contain a summary of evaluation methods, visual documentation of flow conditions during each site visit, flow discharge measurements, and specific proposals for more restrictive ramping rates, if needed. Further, the report must include documentation of consultation with the Aquatic Resource Committee³ (Committee), along with specific descriptions of how the Committee's comments are accommodated by the report. The plan provided that your report would be filed with the Commission by October 31, 2013.

¹ Order Approving Ramping Rate Evaluation Plan Pursuant to Article 405 (issued March 19, 2013). 142 FERC ¶ 62,223.

² Order Issuing New License (issued September 2, 2011). 136 FERC ¶ 62,188.

³ The Aquatic Resource Committee is comprised of representatives from: the licensee; National Marine Fisheries Service; U.S. Forest Service; U.S. Fish and Wildlife Service; Washington Department of Fish and Wildlife; Washington Department Ecology; Tulalip Tribes of Washington; Snohomish County, Washington; City of Everett, Washington; City of Sultan, Washington; and American Whitewater.

According to your report, both qualitative and quantitative surveys were conducted in 2013 to assess flow behavior and distribution over a range of flow conditions, and to determine whether additional ramping rate restrictions were necessary to prevent juvenile fish stranding within existing and newly-constructed side channel habitats. Based on your monitoring data, you drew several conclusions. First, you concluded that connectivity between the mainstem and side channel habitat is maintained over the range of normal operational flow conditions. Second, you concluded that there is sufficient flow volume over the range of normal operational conditions, although within channel flow splits warrant additional monitoring related to the racking of woody debris. Third, you concluded through low flow habitat surveys along the length of each channel that adequate flow volumes are being delivered. Given all of this, you surmise that the potential for fish stranding and pothole entrapment under the range of conditions surveyed is limited. Because none of the surveys were conducted during flows greater than 2,300 cubic feet per second (cfs) and because several side channels, particularly side channels (SC) 1 and 4, are still undergoing adjustments to the Sultan River flow regime, you recommend that all side channels be revisited after a significant high flow event; however, you did not define what constitutes “revisiting.” Therefore, it is unclear whether you are proposing additional monitoring activities or other measures that are intended to re-evaluate the side channels.

With regard to recommending specific ramping rates, you state that the current ramping rate program is adequate in ensuring the protection of aquatic resources during downramping operations with one exception. Because surveys were not conducted at flows below 300 cfs,⁴ which would signify drought conditions, you are recommending a downramping rate of 1 inch per hour when minimum flows are reduced below 300 cfs. Appendix G of your license stipulates a ramping rate of 2 inches per hour when flows are reduced below 300 cfs.⁵

You provided your report to the Committee for a 30-day review and comment period prior to filing it with the Commission. You received over 20 comments from various representatives of the Committee, including Snohomish County, Tulalip Tribes of Washington (Tribe), and the Washington Department of Fish and Wildlife (DFW). A majority of these comments were editorial in nature or requested clarification on various aspects of the report, which you addressed in your final report. However, the remaining comments expressed by the agencies and Tribe indicate dissatisfaction with the evaluation. By in large, there appears to be concern as to whether the evaluation

⁴ The approved plan did not require that the licensee conduct surveys at flows under 300 cfs.

⁵ Appendix G incorporates portions of the October 14, 2009 Settlement Agreement into the project license via ordering paragraphs (D) and (E).

Project No. 2157-213

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adequately assessed the potential for juvenile fish stranding within side channel habitats during downramping events, and whether your conclusion regarding the suitability of the downramping rates was premature. Both the Tribe and DFW concur with your determination regarding connectivity of the side channels with the mainstem during downramping; however, both parties stated that further assessment is needed to better understand the behavior of hydraulic controls within the side channels during downramping in order to determine the effects of downramping on fish stranding potential. The parties recommended specific monitoring activities that are designed to better assess the suitability of the downramping rates, as well as considerations that should be made when evaluating the risk of stranding within side channel habitats. In response to these comments, you affirmed that the study was conducted as approved by the Committee and that the study was conclusive.

Upon review of your report, Commission staff agrees that additional monitoring and evaluation of the suitability of the downramping rates is warranted. There appears to be a data gap for side channel behavior during various flow regimes that is limiting the conclusiveness of your initial evaluation, which you also recognized in your report. In order to better understand the behavior of side channel habitat during downramping as it relates to the potential for juvenile fish stranding, and assess the suitability of the current downramping rates, we request that you develop a supplemental plan that addresses the aforementioned data gaps and the agencies' concerns. You should consult the Committee when developing the supplemental plan and provide the Committee a 30-day review and comment period prior to filing the plan for Commission approval. For any agency comments that you do not incorporate into your plan, you should provide your reasons, using project-specific information. Please file the plan within **90 days** of the date of this letter, or **April 30, 2014**.

Also, in your supplemental filing, please explain further what you meant by "revisiting", with respect to all side channels after a significant high flow event. Please describe the type of monitoring and evaluation that would occur, how often it would occur, and how much flow would need to be present to trigger the evaluation. Also indicate how and when the results of the evaluation would be provided to the Committee for review and the Commission subsequently.

Project No. 2157-213

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Thank you for your October 31 report. We look forward to receiving your supplemental plan. If you have any questions pertaining to this letter, please contact Mr. Erich Gaedeke at (503) 552-2716.

Sincerely,

Thomas J. LoVullo
Chief, Aquatic Resources Branch
Division of Hydropower Administration
and Compliance

Document Content(s)

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FEDERAL ENERGY REGULATORY COMMISSION
Washington, D. C. 20426

OFFICE OF ENERGY PROJECTS

Project No. 2157-213-Washington
Jackson Hydroelectric Project
Snohomish County PUD

April 21, 2014

Kim D. Moore
Snohomish County PUD
P.O. Box 1107
Everett, WA 98206-1107

Re: Supplemental Ramping Rate Evaluation Plan Extension of Time, Article 405

Dear Mr. Moore:

This letter is in response to your extension of time request, filed with the Commission on March 10, 2014, for filing a supplemental ramping rate evaluation plan under license Article 405 for the Jackson Hydroelectric Project No. 2157. Our January 30, 2014 letter required that you file a supplemental plan by April 30, 2014 to address data gaps and resource agency concerns regarding your October 31, 2013 report filing.

According to your letter, you discussed your report deficiencies at the January 15, 2014 Aquatic Resources Committee meeting. You state that you recommended an on-site meeting with the resource agencies and Tribe to collaborate on the development of the supplemental plan for the evaluation of ramping rates for side channel habitats. However, you indicate that the most suitable time for a field visit would be in the summer. As a result, you are requesting an extension of time until August 29, 2014 to file the supplemental plan with the Commission.

Your reasons and information contained in your March 10, 2014 filing are reasonable and justify granting the extension. Therefore, you should file, for Commission approval, your supplemental ramping rate evaluation plan under Article 405 and our January 30, 2014 letter by August 29, 2014.

Project No. 2157-213

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We look forward to your timely and complete filing. If you have any questions regarding this matter, please contact me at (503) 552-2716 or via email at erich.gaedeke@ferc.gov.

Sincerely,

Erich G. Gaedeke
Fishery Biologist, Aquatic Resources Branch
Division of Hydropower Administration
and Compliance

Document Content(s)

P-2157-213.PDF.....1-2

Appendix 2

Field Visit Documentation

Presler, Dawn

From: Binkley, Keith
Sent: Monday, June 09, 2014 9:52 AM
To: 'Anne Savery (asavery@tulaliptribes-nsn.gov)'; 'Applegate, Brock A (DFW)'; 'Beecher, Hal (DFW) (Hal.Beecher@dfw.wa.gov)'; 'Leonetti, Frank' (frank.leonetti@snoco.org)
Cc: Presler, Dawn
Subject: RE: Rampng Rate Evaluation Plan - Field Visit - Sultan Side Channels
Attachments: Ramping Rate Evaluation Plan - ARC Side Channel Visit, June 10 2014.docx

Hi folks – I prepared the attached to guide our discussion tomorrow.

See you at 9:30 AM

Keith

From: Binkley, Keith
Sent: Monday, June 02, 2014 11:43 AM
To: Anne Savery (asavery@tulaliptribes-nsn.gov); 'Applegate, Brock A (DFW)'; Beecher, Hal (DFW) (Hal.Beecher@dfw.wa.gov); 'Leonetti, Frank' (frank.leonetti@snoco.org)
Cc: Presler, Dawn; Thomas O'Keefe (okeefe@americanwhitewater.org); 'Steven Fransen' (steven.m.fransen@noaa.gov); 'Tim_Romanski@fws.gov' (Tim_Romanski@fws.gov); 'Loren Everest - USFS' (leverest@fs.fed.us); 'Mick Matheson'; 'Jim Miller' (JMiller@ci.everett.wa.us); Maynard, Chris (ECY) (cmay461@ECY.WA.GOV)
Subject: Rampng Rate Evaluation Plan - Field Visit - Sultan Side Channels

Anne / Frank / Hal (Brock) – We are all set for our field visit on Tuesday June 10th. Let's meet at 9:30 AM at Sportsmen's Park at the confluence of the Sultan and Skykomish rivers. Bring waders, a life jacket, and lunch. Please call my cell number if you are running late.

Thanks

Keith

*Keith Binkley
Manager – Natural Resources
Snohomish County Public Utility District
Everett, WA
425 783 - 1769
425 293 – 6201 (cell)*

Side Channel Ramping Rate Evaluation Plan – Notes for Site Visit (June 10, 2014)

License Obligation: Within one (1) year of the completion of the side channel enhancement projects pursuant to A-LA 7, the Licensee shall file with the Commission a ramping rate report. The Licensee shall develop this report in consultation with the ARC. The report shall evaluate whether additional ramping rate restrictions are necessary to protect juvenile salmon from stranding.

Factors in evaluation: the interaction between project operations and side channel topography (morphology) relative to seasonal presence, size, and behavior of key salmonid species

Geographic area of study: side channels constructed during 2012 with emphasis on Side Channel 1 in Osprey Park and Side Channel 4 in Reese Park. Side channels 2 and 3 received in-channel enhancements that did not involve major earthwork.

Flow range for evaluation is 600 cfs to project minimum¹. 600 cfs inundates most streambed areas of concern up to the toe-of-bank (Olson 1990) and has been confirmed with District's Instream Flow Study conducted in 2009 (R2 2009)

Current ramping rates within flow range for evaluation are:

Season	Flow Range (cfs)	Day Rate (inches per hour)	Night Rate (inches per hour)
January 1 to May 31 ²	600 to 300	2	4
	300 to minimum	2 (see footnote 1)	2 (see footnote 1)
June 1 to September 15	600 to minimum	2	1
September 16 to October 31	600 to minimum	2	2
November 1 to December 31	600 to minimum	4	4

Previous ramping rate evaluations (Olson 1990) indicated that susceptibility to stranding was particularly evident for salmon fry less than 50 mm in length and for steelhead fry less than 40 mm. Olson (1990) also reported that Chinook fry were most susceptible to stranding during the day, whereas steelhead fry were more susceptible at night.

Stranding potential is determined based on species presence, fry emergence time, fish growth, and channel morphology.

Chinook: emergence – beginning in February. Growth – some still of vulnerable size through June.

Notes: more vulnerable during day. Ramping frequency limitation applies when flows are below 750 cfs and restricts downramping at a rate greater than 1" per hour to a total of 48 hours between January 1 and May 31.

Steelhead: emergence – beginning in June. Growth – exceed 40 mm by August

Notes: more vulnerable at night. Most restrictive ramping rate of 1" per hour in place until September 15.

In light of this knowledge, the focus of the side channel ramping rate evaluation and plan should be on whether a change from the 2" per hour rate is warranted for the daylight hours between June 1 and September 15. Furthermore, the focus of this evaluation is on the constructed side channels (Side Channel 1 and Side Channel 4). The evaluation can be based on the rapid site specific assessment of the channel topography during a field visit. Alternatively, if the consensus by the ARC that a more detailed assessment is actually warranted, it could be conducted as part of the detailed physical habitat survey of the lower river that is scheduled during summer 2014.

¹ Project minimum is 300 cfs unless operating under a drought scenario. Under that scenario, the District will adopt the most conservative ramping rate of 1" per hour as flows are reduced below 300 cfs.

² Frequency of downramping is limited to a total of 48 hours in flow range below 750 cfs during the January 1 to May 31 time period.

Presler, Dawn

To: Presler, Dawn
Subject: FW: side channel ramping and habitat
Attachments: ARC recommendations_side channel ramping and habitat_06132014.docx

-----Original Message-----

From: Anne Savery [<mailto:asavery@tulaliptribes-nsn.gov>]
Sent: Friday, June 13, 2014 4:45 PM
To: Binkley, Keith
Cc: hal.beecher@dfw.wa.gov; brock.applegate@dfw.wa.gov; frank leonetti
Subject: RE: side channel ramping and habitat

Keith

Attached is our input on the habitat surveys and the side channel ramping evaluation. Please review our thoughts on the habitat survey and analyses requested, these should synch up quite well with the Stillwater contract. Not only is there a comparison from pre to post process flow, but an opportunity for comparison of pre to post side channel habitat which should not be missed.

We have recommended some data collection on substrate, which should not be too onerous and will inform the habitat study as well as the ramping study.

Please be in contact as you develop the ramping study plan.

Thanks

Anne

From: Binkley, Keith [KMBinkley@SNOPUD.com]
Sent: Friday, June 13, 2014 12:41 PM
To: Anne Savery
Cc: hal.beecher@dfw.wa.gov; brock.applegate@dfw.wa.gov; frank leonetti
Subject: RE: side channel ramping and habitat

Thanks Anne - I agree that it was a productive meeting / discussion.

Regarding our contract with Stillwater, we have finalized that scope as the replication of the 2008 survey with the addition of new side channel habitats. After internal discussion, we have elected to follow this path because it is a discrete and distinct obligation that is well-defined under the license.

Conversations about other investigations that are supplemental to Stillwater work including the focused effort to evaluate ramping rates within the side channels are still ongoing and in the planning stage. That work will be carried out under another separate contract. Finally, interest has also been expressed in monitoring to evaluate performance of side channels and the engineered log jams over time. This effort may be something above and beyond the other efforts but there are likely opportunities for efficiencies between investigations.

I know this can be confusing and the attached table will help clarify.

Thanks for your help and have a good vacation.

Keith

-----Original Message-----

From: Anne Savery [<mailto:asavery@tulaliptribes-nsn.gov>]

Sent: Friday, June 13, 2014 10:33 AM

To: Binkley, Keith

Cc: hal.beecher@dfw.wa.gov; brock.applegate@dfw.wa.gov; frank leonetti

Subject: side channel ramping and habitat

Hi Keith

Thanks for the productive meeting on Tuesday. I sent a draft around yesterday and am receiving comments. I plan to send out the last/latest a little before 5 today so you can move forward.

We would like to be wrapped into the conversations with Stillwater about the scope of work.

I am on vacation June 14-23 and won't be checking my Tulalip email account. If you are trying to move forward, you can call my cell 503-984-0667.

Thanks

Anne

Side channel ramping rate study and habitat study

The following recommendations for a side channel ramping rate study and habitat survey of lower Sultan River including the new side channels. These recommendations are the result of a field meeting between Snohomish PUD and Aquatic Resources Committee (ARC) representatives - Washington Department of Fish and Wildlife, Snohomish County Surface Water Management and the Tulalip Tribes. In attendance were Keith Binkley (PUD), Hal Beecher (WDFW), Frank Leonetti (SCSWM) and Anne Savery (TTT).

The ARC representatives view the side channel ramping study and the lower Sultan River habitat study as being tightly linked. Absent from the Settlement Agreement were performance metrics for the side channels in terms of habitat quantity and quality, water quality, flow distribution between the river and side channels, regular monitoring and adaptive management. PUD has committed to maintaining the upstream connectivity of the side channels to the mainstem.

The side channel ramping rate study is required within the license. The purpose is to ascertain the appropriate ramping rates within the newly built side channels. The PUD was directed by FERC to resubmit a ramping rate study after the initial study was reviewed by the ARC and by FERC.

FERC highlighted issues:

- No justification for 1"/hr ramping rate under 300 cfs; license states 2" – this needs to be assessed
- Additional monitoring and evaluation of suitability of down ramping rates warranted and must be described
- Data gap for side channel behavior during various flow regimes
- Define 'revisit' of side channels after process flow

ARC highlighted issues:

- Oversimplification of ramping rates by focusing on connectivity with the mainstem channel at the head of side channels over normal range of operations.
- Ramping rates not assessed in situ.
- Lack of assessment of hydraulic controls within each side channel is a data gap.
- Data gap: ramping rates as they relate to the side channel and hydraulic controls within, as opposed to the mainstem.
- Changes in the wood loading and aggradation can affect local drawdown need to be understood.
- Perform a downramp event at various flows and measure response in specific transects within each side channel to the event. This may not be necessary if cross-section surveys and cross-section-specific stage-discharge relationships cross-linked to staff-gauge or other flow measurement device on which flow management is based. However, it seems plausible that the rate of change at the flow management gauge is different and not necessarily parallel with the rate in the side channels.

- Identify monitoring locations and other action when down ramping occurs in future events.
- Documentation of LWD in the side channels is not sufficient; description of SC LWD (12 inch diam) being "absent", "sparse", or "well-distributed" doesn't mean much quantitatively for future comparison. Include more specific documentation of LWD for *placed and naturally recruited* (piece count at a minimum). Over the long term (10-30 years), LWD will likely influence scour and sediment retention, as well as side channel thalweg and streambank adjustment, so LWD info is relevant to adaptive management of side channel performance. In the appendix, its not clear whether the LWD count at each station is the sum total of all wood in the SC or is simply the number of pieces in alignment with that station. Count all wood >2m, >10cm diameter, not just 12 inch diameter pieces. Need to align wood counts with TFW and Stillwater work. Side channel wood inventory needs to id placed wood versus racked wood. Wood loading needs to be associated with habitat units.

Suggested approach to assess down ramping rates in the four Side Channels

The process recommended below will assess the long profile and cross sections of the side channels. To the extent possible, the transects will re-occupy original transects within the side channels. The surveys will be tied to the habitat units identified in the habitat survey of the lower Sultan River. Water depths will be monitored remotely and manually during a ramping exercise at flows identified by the ARC and PUD. This effort will help identify areas sensitive to ramping and provide the basis for any changes to ramping rates below the Powerhouse.

1. Perform a longitudinal profile of each side channel thalweg elevations (channel bed and water depth), maximum depth and hydraulic controls (any area in the channel bed where water flow is constricted/shallow). Measure every 3-7 meters and in addition measure areas that are hydraulic controls or maximum depths that do not fall within the prescribed interval. A more densified survey will allow for the identification of the hydraulic controls.
2. Channel transects: Measure channel transects at fixed stations throughout each side channel; these locations must be repeatable over the years. Transects should be placed at hydraulic controls and habitat units of interest that may affect stranding or available habitat area within the side channels. Greatest potential for fry stranding is where the bed is wide and gently sloping from bank to thalweg (or at least toward the thalweg). A cross-section through a pool may nevertheless have a potential for fry stranding over some range of flows if the lateral extent of the cross-section is relatively flat and shallow. In some cases (most that I saw in the side channels) one bank may pose no risk for stranding while the opposite bank has stranding potential.
3. Review and re-place inlet transects from original surveys at current inlet hydraulic controls of all side channels with commitment to later "re-place" transects at future hydraulic control elevations (given these may shift upstream/downstream) . Transects at the head of channels should include the mainstem Sultan River in order to monitor head cutting. All transects must be repeatable over the years. Define transects as a zone if the hydraulic control moves up or down.

4. Absolute surveys could be tied in to relative monuments during the survey. Monument elevation should be made absolute over time. Aggradation and degradation will be revealed with respect to relative elevation. The ARC requires absolute elevation in order to re-survey over the course of the license.
5. Analysis of surveys: Plot the long profile of side channel thalweg elevations (water depth) and transects including hydraulic controls- it's imperative that these profiles target thalweg max depths and hydraulic controls. Identify habitat units within the long profile and LWD within the long profile.
6. Analysis of surveys: Calculate local channel slope, width to depth ratios (w:d) – areas of high slope or w:d ratio will respond more rapidly to changes in stage (generally, but some pools can have wide lateral shelf). Plot w:d ratio by station number. The work will provide information on the area of rearing habitat available at various flows. These areas will help identify monitoring sites for the ramping study.
7. Ramping study: Select flows at which ramping rates in side channels should be evaluated – Suggested range 300-600 cfs, prefer lower range. Determine flow at main management gauge that corresponds to water's edge meeting toe of bank in each side channel at most sensitive (flattest) wetted channel area. This flow will be the upper critical flow (or critical flow stage); ramping rates apply when downramping beginning at or below this flow. If downramping begins at a higher flow, ramping rates only apply when water level reaches critical flow stage. Measure range of flows at identified habitat units, channel heads and hydraulic controls within side channels.
 - a. Determining flow proportions among the side channels and the main stem at each stage.
 - b. Down ramp the system at currently allowed rates for season 1", 2" etc. Measure water levels and flow rates within side channel at hydraulic controls and other areas of concern within each side channel.
 - i. Incorporate water level monitoring on side channels to evaluate a range in stage relative to the mainstem. Can calibrate side channel to mainstem over time. Not a linear relationship. Install loggers in a stand pipe in all side channels to measure stage. The inches per hour must be side channel stage, but this can be related to the mainstem management gauge.
 - c. Set up photo stations and other monitoring stations at hydraulic controls and other areas of interest for monitoring when down ramping occurs in the system. Identify personnel and stations for monitoring and recording side channel water depth, flow rates etc at hydraulic controls.
 - i. ID these sites permanently for monitoring future ramping events
8. Analysis of down ramping data: (see inserts above)
 - a. Relate stage to flow (at mainstem flow management gauge) at each flow range – this is a nonlinear relationship. Not only will the relationship be nonlinear, but there will also be a lag time that will vary with discharge, and the lag time between the mainstem management gauge must be known in order to determine suitable

ramping at the side channels. (Flow at side channel is interesting but will not be how ramping rate is actually managed.)

- b. Quantitatively describe changes in area of available habitat in areas of concern. (It is probably satisfactory to do linear habitat along a transect rather than area.)
- c. This protocol should be used to recalibrate ramping rates after significant habitat changes, whether caused by excavation, placement of wood, natural input of wood (including tree fall), or high flow events.

Habitat Survey

The purpose of the habitat survey is to resurvey the lower Sultan River and all side channels after the process flow. The habitat survey in the side channels is closely linked to the long profile and transect work.

Habitat survey to include

- 1) Habitat units to be tied to longitudinal profile and transects. Habitat unit classification for side channels matches main Sultan River survey habitat classification and naming convention
- 2) Identification of fish habitat using TFW protocol and survey methods used by Stillwater in original study. Identify residual habitat unit standard depth value (TFW) that identifies unit as “pool” vs. run/glide.
- 3) Record habitat depths – max and min for “pools,” every 3-7 meters otherwise, plus hydraulic control points
- 4) Substrate size class – collect in categories of size
- 5) Estimates of cover over wetted area at recorded flow – use large category intervals such as 0%, 1-10%, 11-40%, 41-75%, and >75% cover
- 6) Collect data with gps (point locations by station) to match with field sheets
- 7) Count all wood >2m length, >10cm diameter (TFW protocols). Be sure method is consistent with Sultan River re-survey (assume this is based on TFW?) Record wood counts by sequential long profile station and identify habitat unit affiliation. Side channel wood inventory needs to id placed wood versus racked wood.
- 8) Collect temperature within side channels and mainstem over summer. Thermistor needs to be placed deep enough so as to not go dry, but in well (enough) mixed zone.
- 9) For each station, identify bank erosion (Yes/No) in side channel due to channel deformation.

Analysis: A comparison of original habitat survey to current habitat. Break out side channel habitat by each side channel. Some aggregation of side channel habitat may be useful. What if anything did the process flow achieve? Have habitat improvements in the lower river increased habitat for adult/juvenile fish and in what ways. How can monitoring continue in order to improve understanding of habitat function and to determine if additional work needs to be done.

- 1) Calculate habitat ratios for mainstem and each side channel. between sample times. Dependent on variable flows.

- 2) Estimate pool area using long profile and habitat survey data. Summarize pool count and affiliation with habitat forming features (placed wood, natural wood, lateral bank resistance, beaver, other)
- 3) ID of dominant/subsubdominant substrate size class. For all side channel stations, plot frequency of occurrence by substrate size category. Assign intermediate size values for classes to generate cumulative frequency distribution, and generate a geometric mean for channel. Can use non-parametric tests of frequency distribution homogeneity to compare current and evaluate future surveys. Finer material suggests sediment loading and lack of transport potentially affecting habitat quantity/quality/ and in-channel flow response to ramping. Coarser material may reflect channel adjustment to equilibrium supply-transport of sediment after project construction. Continued coarsening with channel expansion may represent increasing avulsion potential.
- 4) Is wood associated with habitat, forcing mechanism?
- 5) Temperature in sidechannel versus mainstem. Temp could be a buffer in a down ramping event. During downramping (in summer) the decrease in mainstem flow volume will lead to temperature increase (partially). In response, side channels may also increase in temperature with reduction in flow volume or may be buffered by shading, by groundwater inflow, or other factor.
- 6) Quantitatively assess side channel habitat between original survey by Stillwater and present. Start some performance metrics on the side channels.
- 7) Adaptive management: document the likely AM issues relevant to SC performance and downramping (they are linked and may differ by SC 1-4) - channel inlet blockage, sediment aggradation and higher elevation hydraulic control, LWD recruitment and storage of sediment (from large tree fall) creating unanticipated hydraulic controls within the channel, side channel widening/narrowing, higher width/depth ratio.

Presler, Dawn

From: Binkley, Keith
Sent: Monday, June 30, 2014 4:10 PM
To: 'Anne Savery'
Cc: hal.beecher@dfw.wa.gov; brock.applegate@dfw.wa.gov; frank leonetti; Presler, Dawn; Spangler, Brad
Subject: RE: side channel ramping and habitat

Sorry for the delayed response Anne - I was out of the office last week. Yes, I have reviewed your comments.

Since our field visit, we have conducted the aerial photography flight and finalized the contract with Stillwater to repeat the past habitat survey including the new side channels. While this license requirement is tied to the Process Flow Plan, the data will be informative to the ramping rate plan. I will be working on the specifics of the plan this week and circulating shortly. I am cognizant of giving the ARC a 30 day review before sending to FERC by late August.

Thanks for your patience

Keith

-----Original Message-----

From: Anne Savery [<mailto:asavery@tulaliptribes-nsn.gov>]
Sent: Wednesday, June 25, 2014 2:27 PM
To: Binkley, Keith
Cc: hal.beecher@dfw.wa.gov; brock.applegate@dfw.wa.gov; frank leonetti
Subject: RE: side channel ramping and habitat

Keith

Have you had time to review our comments and study suggestions for the habitat study and the side channel ramping study?

Thanks

Anne

From: Anne Savery
Sent: Friday, June 13, 2014 4:45 PM
To: Binkley, Keith
Cc: hal.beecher@dfw.wa.gov; brock.applegate@dfw.wa.gov; frank leonetti
Subject: RE: side channel ramping and habitat

Keith

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Thanks
Anne

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Sent: Friday, June 13, 2014 12:41 PM
To: Anne Savery
Cc: hal.beecher@dfw.wa.gov; brock.applegate@dfw.wa.gov; frank leonetti
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Conversations about other investigations that are supplemental to Stillwater work including the focused effort to evaluate ramping rates within the side channels are still ongoing and in the planning stage. That work will be carried out under another separate contract. Finally, interest has also been expressed in monitoring to evaluate performance of side channels and the engineered log jams over time. This effort may be something above and beyond the other efforts but there are likely opportunities for efficiencies between investigations.

I know this can be confusing and the attached table will help clarify.

Thanks for your help and have a good vacation.

Keith

-----Original Message-----

From: Anne Savery [<mailto:asavery@tulaliptribes-nsn.gov>]
Sent: Friday, June 13, 2014 10:33 AM
To: Binkley, Keith
Cc: hal.beecher@dfw.wa.gov; brock.applegate@dfw.wa.gov; frank leonetti
Subject: side channel ramping and habitat

Hi Keith

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We would like to be wrapped into the conversations with Stillwater about the scope of work.

I am on vacation June 14-23 and won't be checking my Tulalip email account. If you are trying to move forward, you can call my cell 503-984-0667.

Thanks
Anne

Appendix 3

Consultation Documentation Regarding Draft Plan

Presler, Dawn

From: Maynard, Chris (ECY) <cmay461@ecy.wa.gov>
Sent: Friday, July 18, 2014 1:23 PM
To: Presler, Dawn; 'Tom O'Keefe'; 'Jim Miller' (JMiller@ci.everett.wa.us); 'Mick Matheson'; 'Steven Fransen' (steven.m.fransen@noaa.gov); 'Leonetti, Frank' (frank.leonetti@snoco.org); 'Anne Savery'; 'Tim_Romanski@fws.gov' (Tim_Romanski@fws.gov); 'Loren Everest - USFS' (leverest@fs.fed.us); Applegate, Brock A (DFW)
Cc: Binkley, Keith
Subject: RE: JHP (FERC No. 2157) - draft Supplemental RREP for 30-day review/comment period

Hi Dawn,

I have only two comments to the DRAFT Side Channel Enhancement Supplemental Ramping Rate Evaluation Plan:

1. Suggest committing to identify both an incoming flow change threshold and a channel change threshold for redoing ramping rate evaluations should a flood or some other event change either the incoming flow regime to a channel or change the side channel areas that could be dewatered during downramping.
2. 2.3 Suggest taking pictures at the 5-minute intervals from the same point of view during each of the measurements during the downramp test.

Chris

Chris Maynard | Hydropower & Instream Flows | Water Resources | WA Department of Ecology | 360.407.6641 cmay461@ecy.wa.gov

From: Presler, Dawn [<mailto:DJPresler@SNOPUD.com>]
Sent: Friday, July 18, 2014 9:32 AM
To: 'Tom O'Keefe'; 'Jim Miller' (JMiller@ci.everett.wa.us); 'Mick Matheson'; 'Steven Fransen' (steven.m.fransen@noaa.gov); 'Leonetti, Frank' (frank.leonetti@snoco.org); 'Anne Savery'; 'Tim_Romanski@fws.gov' (Tim_Romanski@fws.gov); 'Loren Everest - USFS' (leverest@fs.fed.us); Maynard, Chris (ECY); Applegate, Brock A (DFW)
Cc: Binkley, Keith
Subject: JHP (FERC No. 2157) - draft Supplemental RREP for 30-day review/comment period

Dear ARC Members,

Attached is the DRAFT Side Channel Enhancement Supplemental Ramping Rate Evaluation Plan for your review. Please take the next 30 days to review and email comments, if any, to me (with cc: to Keith) regarding the draft Plan by Monday August 18. If you have any questions about the Supplemental Plan please contact Keith directly.

Have a great weekend!

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

Public Utility District No. 1 of Snohomish County
PO Box 1107

Presler, Dawn

From: Mick Matheson <mick.matheson@ci.sultan.wa.us>
Sent: Friday, July 18, 2014 9:45 AM
To: Presler, Dawn; 'Tom O'Keefe'; 'Jim Miller'; 'Steven Fransen'; 'Leonetti, Frank'; 'Anne Savery'; Tim_Romanski@fws.gov; 'Loren Everest - USFS'; 'Maynard, Chris (ECY)'; brock.applegate@dfw.wa.gov
Cc: Binkley, Keith
Subject: RE: JHP (FERC No. 2157) - draft Supplemental RREP for 30-day review/comment period

Dawn,

I have reviewed the DRAFT document 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

NOTICE: All emails and attachments sent to and from the City of Sultan are public records and may be subject to disclosure pursuant to the Public Records Act (RCW 42.56)

From: Presler, Dawn [<mailto:DJPresler@SNOPUD.com>]
Sent: Friday, July 18, 2014 9:32 AM
To: 'Tom O'Keefe'; 'Jim Miller' (JMiller@ci.everett.wa.us); 'Mick Matheson'; 'Steven Fransen' (steven.m.fransen@noaa.gov); 'Leonetti, Frank' (frank.leonetti@snoco.org); 'Anne Savery'; 'Tim_Romanski@fws.gov' (Tim_Romanski@fws.gov); 'Loren Everest - USFS' (leverest@fs.fed.us); 'Maynard, Chris (ECY)' (cmay461@ecy.wa.gov); 'brock.applegate@dfw.wa.gov' (brock.applegate@dfw.wa.gov)
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Subject: JHP (FERC No. 2157) - draft Supplemental RREP for 30-day review/comment period

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Dawn Presler

Presler, Dawn

From: Anne Savery <asavery@tulaliptribes-nsn.gov>
Sent: Friday, August 08, 2014 12:35 PM
To: Presler, Dawn; 'Tom O'Keefe'; 'Jim Miller' (JMiller@ci.everett.wa.us); 'Mick Matheson'; 'Steven Fransen' (steven.m.fransen@noaa.gov); 'Leonetti, Frank' (frank.leonetti@snoco.org); 'Tim_Romanski@fws.gov' (Tim_Romanski@fws.gov); 'Loren Everest - USFS' (leverest@fs.fed.us); 'Maynard, Chris (ECY)' (cmay461@ecy.wa.gov); 'brock.applegate@dfw.wa.gov' (brock.applegate@dfw.wa.gov)
Cc: Binkley, Keith
Subject: RE: JHP (FERC No. 2157) - draft Supplemental RREP for 30-day review/comment period
Attachments: Article 405 DRAFT Ramping Rate Evaluation Plan Supplement 2014_TTT comments.docx; ARC recommendations_side channel ramping and habitat_06132014.docx

Attached are my comments and the original memo that Hal, Frank and I wrote to Keith following our field meeting - which Keith intends to include as Appendix 1.

Thanks

Anne

From: Presler, Dawn [DJPresler@SNOPUD.com]

Sent: Friday, July 18, 2014 9:31 AM

To: 'Tom O'Keefe'; 'Jim Miller' (JMiller@ci.everett.wa.us); 'Mick Matheson'; 'Steven Fransen' (steven.m.fransen@noaa.gov); 'Leonetti, Frank' (frank.leonetti@snoco.org); Anne Savery; 'Tim_Romanski@fws.gov' (Tim_Romanski@fws.gov); 'Loren Everest - USFS' (leverest@fs.fed.us); 'Maynard, Chris (ECY)' (cmay461@ecy.wa.gov); 'brock.applegate@dfw.wa.gov' (brock.applegate@dfw.wa.gov)

Cc: Binkley, Keith

Subject: JHP (FERC No. 2157) - draft Supplemental RREP for 30-day review/comment period

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Have a great weekend!

Dawn Presler

Sr. Environmental Coordinator

Generation Resources

(425) 783-1709

Public Utility District No. 1 of Snohomish County PO Box 1107 Everett, WA 98206-1107

The results of the District's surveys indicated that connectivity between the mainstem and side channel habitat was maintained over the range of normal operational flow conditions (District 2013c). The surveys also documented sufficient flow volume under normal operational conditions and the presence of suitable and diverse physical habitat conditions in terms of wetted width, depth, and flow exchange at the heads of the side channels. While the District concluded that stranding potential was extremely limited under the existing range of flows, the side channel surveys were conducted prior to the occurrence of a significant high flow event as river flows had not exceeded 2,300 cfs by the time the survey was conducted. The District also noted that several side channels, most notably SC4 and SC1, were still undergoing post-construction adjustments to the Sultan River flow regime. These two areas underwent significant earthwork as new side channel habitats were created.

Consistent with Article 405, the District's 2013 study report was prepared in consultation with the members of the Project's ARC, and the ARC was provided a copy of the draft report for a 30-day review and comment period prior to filing it with the Commission. While the majority of the comments received from the ARC were editorial or requested further clarification, some comments from Washington Department of Fish and Wildlife (WDFW), the Tulalip Tribes, and Snohomish County Surface Water Management were focused on perceived data gaps and the need for additional information to better understand the behavior of hydraulic controls during downramping.

On October 21, 2013, the District filed its report with the FERC. Upon review, FERC staff agreed that additional monitoring and evaluation of the suitability of the downramping rates was warranted and requested the District develop a supplemental plan designed to address some of the aforementioned data gaps and concerns. The District held a field meeting on June 10 with two members of the ARC and a representative from the Washington Department of Fish and Wildlife (WDFW). These individuals subsequently recommended the implementation of additional monitoring activities to better ascertain the appropriate ramping rates and fish stranding potential within the newly built side channels (see Attachment 1).

This proposed Supplemental Ramping Rate Evaluation Plan (Supplemental RREP) expands on the District's original study (District 2013) and incorporates several recommendations received from the ARC and FERC to specifically address gaps and concerns relative to the need for adoption of more conservative ramping rates.

1.2. Purpose

License Article 405 requires, *"Within 6 months of completing the side-channel enhancement projects required by Appendix A, condition 5.2 (A-LA 7), the licensee shall file, for Commission approval, a Ramping Rate Evaluation Plan. The plan shall include: 1) the methods and schedule for conducting an evaluation to determine whether additional ramping rate restrictions are necessary to protect juvenile fish from stranding in the reconnected side channels required by Appendix A, condition 5.2 (A-LA 7); and 2) a provision to file a ramping rate report within one year of completing the side channel enhancements, with any specific proposals for more restrictive ramping rate based on the outcome of the ramping rate evaluation."*

The objective of this proposed Supplemental RREP is to further describe aquatic habitat and channel conditions, and evaluate downramping rates in the four side channels in Reach 1 of the

Comment [O1]: THE TULALIP TRIBES understands this is the 'ARC recommendations_side channel ramping and habitat_06132014'

Sultan River beyond what was already completed for the RREP. More specifically, the proposed study approach outlined in this plan includes the following tasks:

1. Conduct initial field reconnaissance with ARC members to identify monitoring site.
2. Measure channel transects at fixed monitoring stations within each side channel.
3. Conduct a ramping rate evaluation from 600cfs to 300 cfs to assess the adequacy of existing downramping criteria.

Comment [02]: Prefer closer to 300 cfs.

This Supplemental RREP covers the “revisit after high flows” activities that were mentioned in the District 2013 report, and of which the FERC requested clarification in its April 21, 2014 letter.

Comment [03]: The Tulalip Tribes – the locations of the original ‘visit/ramping study’ were focused on the upstream ends of the channel and documented very little of the remainder of the channels. It is important that this ‘visit’ document the changes in plan and profile of the side channels over time. The PUD should repeat the measurements of channel depth at each ‘station’ reported in Appendix 2 of the original RREP study to compare the changes in channel shape and depth.

1.3. Consultation

The draft of this Plan was provided to members of the ARC for a 30-day review and comment period. Consultation documentation is included in Appendix 1, and the District’s responses to written comments received are included in Appendix 2.

2. METHODS

In this supplement, the District proposes to further evaluate patterns of flow behavior in four distinct side channels in the lower Sultan River. These side channels: SC1, SC2, SC3, and SC4 each underwent restoration in summer 2012 (Figure 1). With the exception of SC1, all side channels have one inlet and one outlet. SC1 has two inlets and two outlets. While this supplemental evaluation and post high-flow revisiting of the side channels would complement previous surveys, it is considered to be a comprehensive and quantitative stand-alone evaluation to address the license requirements related to ramping rates.

The District proposes focused quantitative surveys within each of the side channels. These surveys would be conducted when mainstem flows drop below 600 cfs, as measured at United States Geological Survey (USGS) Streamflow Gage No. 12138160. The flow range below 600 cfs was selected for this evaluation to be consistent with prior survey efforts related to project downramping (CH2MHill 1990, District 2013). Table 1 depicts the applicable downramping schedule in Reach 1 when the flow range is between 600 and 300 cfs (minimum instream flow), as measured at USGS Streamflow Gage No. 12138160.

Comment [04]: The downramping study needs to evaluate the lower end of the flow range at least at the hydraulic controls. The study could assess the 600 cfs range to be in keeping with the 1990 study, but needs to assess close to 300 cfs.

Comment [05]: What are the hydraulic controls within the sidechannels at flows higher than 600 cfs? This would be important to determine during months when the ramping rate is set for 4” per hour – at times when Coho are rearing in side channels – Nov-Dec and January – May. See yellow highlights in Table 1.

Table 1. Downramping Rate Schedule, 600 to 300² cfs flow range, Reach 1, Lower Sultan River (per License Appendix G, A-LA 5).

Season	Day Rate	Night Rate
January 1 to May 31 ³	2 inches per hour	4 inches per hour
June 1 to September 15	2 inches per hour	1 inch per hour
September 16 to October 31	2 inches per hour	2 inches per hour
November 1 to December 31	4 inches per hour	4 inches per hour

Comment [O6]: The Tulalip Tribes
If there are general operational flow ranges during these time frames, it would be helpful to have them attached to this table to understand what flows might be in the side channels at the various time periods. There may be a need to assess the higher night rates if flows are within a range that would activate a hydraulic control within the side channels.

Specific study plan tasks are described below.

2.1 Task 1: Identify Representative Permanent Monitoring Sites

Per the Fisheries and Habitat Monitoring Plan (License Article 410), the District is conducting a comprehensive Riverine Habitat Survey during summer 2014. The license requirement was triggered by the occurrence of a significant high flow event of 3,800 cfs (mean daily flow) on March 17, 2014. Upon completion of this habitat survey, District staff and members of the ARC (if interested) will review the survey results and conduct a field reconnaissance of the four newly enhanced side channels to identify potential high risk stranding areas (such as low gradient gravel bars) and identify permanent representative monitoring sites.

Comment [O7]: Tulalip is interested in setting monitoring sites and identifying stranding areas.

² If the District determines, in consultation with the ARC, that a drought event resulting in advisory reductions in domestic water consumption (as described by the 2007 City of Everett's Drought Response Plan as a Stage 1 response to a drought event) is occurring, the most conservative downramping rate of 1 inch per hour will be used as minimum flows are reduced below 300 cfs.

³ Due to the presence of salmon fry, the frequency of downramping at rate greater than 1 inch per hour during the January 1 to May 31 season is limited to a total of 48 hours with no more than 16 hours occurring in any single month. Per A-LA 5, this limitation applies at river flows below 750 cfs.

2.2 Task 2: Establish and Survey Channel Transects

Within each side channel, the District will establish and monument a permanent representative monitoring site and measure a series of channel cross sections at fixed stations. Transects will be placed at hydraulic controls and/or habitat units of interest that may affect stranding or available habitat area during downramping events (e.g., where the bed is wide and gently sloping from bank to thalweg). It is anticipated that between 6 and 10 transects will be established and measured in each side channel using a crew of two experienced surveyors. The location of each transect will be determined during the initial reconnaissance using input from ARC members.

At each side channel transect, surveyors will establish a benchmark, set end posts (rebar or spike), stretch the survey tape between the end posts, and set up the tripod and level transit. Surveyors will then begin taking channel profile water surface elevation, water depth, and water velocity/flow data using a stadia rod and Swiffer velocity meter (or equivalent) following standard USGS procedures. Data will include the station number, substrate the rod is resting upon, the reading on the rod as seen through the transit, water depth, and water velocity. Surveyors will also record the edge of channel (EOC) and edge of water (EOW) on each side of the cross section. The surveyors will continue this procedure until they reach the stake on the opposite side of the channel. For side channels with non-uniform bottoms, additional measurements may be required at points of significant slope changes, and at enough intermediate points to adequately represent the cross-section. All transects will be monumented (benchmarked); and clearly documented using field notes, GPS, survey flagging, and photographs.

Each side channel transect will be surveyed two times. The first survey will collect the full set of data described above at the lowest initial ramping rate flow (300 cfs). The second survey (600 cfs) will determine the flow rates and change in water surface elevation in inches (relative to the established benchmark), EOC, and EOW. A total of 20 measurements will occur at each transect to accurately portray the applicable channel attributes.

To visually present these data, the District will prepare plots of the individual cross sections that include bankfull width, depth/water surface elevation, and area versus distance along the center line. These plots will provide a simple way of determining if changes in channel characteristics are statistically significant, and to determine if the changes are due to large changes in a small section of the channel or if they are spread over the entire reach. These plots, photographs, transect location and benchmark location data will be included in the draft and final ramping rate evaluation reports.

In addition to the survey of channel cross sections, a longitudinal survey of the channel thalweg will be performed within each of the established representative monitoring sites.

2.3 Task 3: Conduct a Ramping Rate Evaluation at Three Study Flows

According to WDFW and Washington Department of Ecology (Beecher and Caldwell 2007), information needed for ramping rate determinations includes: (1) identification of critical stranding sites, (2) determination of stage-discharge relationship at critical sites, (3) determination of travel time for a block of water traveling through a reach of interest, and (4)

Comment [O8]: The Tulalip Tribes the original transects at the inlet to the side channels should be resurveyed and made part of the permanent transects. The inlet transects should extend across the river in order to id changes over time with headcutting.

Comment [O9]: The Tulalip Tribes - This number is very low, based upon the length of the side channels and our previous comments and input from Agencies at the field meeting. SC 1 should have many more transects than SC 4 due to the difference in length. The number of hydraulic controls identified should be a determinant in the number of transects. A higher frequency would provide more information if the hydraulic control shifts up or downstream from present location. The transects should be placed near hydraulic controls. Longitudinal profile points should be taken between the transects about 3-7 meters apart (maximum) – water depth, channel elevation, water surface elevation. The repeatability of the survey is important as well as properly capturing the hydraulic controls.

Comment [O10]: The Tulalip Tribes The transect and long profile surveys need to document the amount, size, etc. of LWD within the channel – tie to habitat survey – in order to understand/document the impacts of LWD on the hydraulic controls within the side channels.

Comment [O11]: Yay

Comment [O12]: The Tulalip Tribes Create a table with flow data that shows 1) the proportion of flow within each side channel and the mainstem 2) flow at each transect within a side channel – will show is side channel is gaining or losing or neutral

Comment [O13]: The Tulalip Tribes A general characterization of substrate within the transect would be useful – tied to habitat survey?

Comment [O14]: The Tulalip Tribes create a table that shows the flow rates and WSE changes for each transect.

Comment [O15]: The Tulalip Tribes Plot long profile with transects identified. Long profile will show the gradient breaks/hydraulic controls.

Comment [O16]: Yay

Comment [O17]: The Tulalip Tribes A long profile within representative monitoring sites is not sufficient to track the changes in side channel hydraulic controls and adjustment to river operations by the PUD. The long profile should run from the downstream end of each side channel all the way up to the upstream end and at least one point in the mainstem. The transects need to be connected (id transect # in long profile record) and there needs to be greater density of long profile measurements – every 3-7 meters.

Comment [O18]: The Tulalip Tribes These sites will be identified after the long profile and thalweg data are analyzed and plotted and reviewed in a meeting with the ARC. Initial id will during review of report, followed by a field meeting.

Comment [O19]: The Tulalip Tribes Even between transects – critical hydraulic controls or areas of potential stranding

determination of attenuation of stage change over distance at different flows. To address these needs, the District will install a series of temporary staff gages and/or Hobo Water Level instruments for recording water level (stage) within each of the four side channels in or near areas of potential stranding habitat identified during the reconnaissance survey. The gages will be located near the monumented cross-sections, making sure the lower end of the gage is within the channel at low flow.

Comment [O20]: The Tulalip Tribes Consider leaving in place over long term in order to establish stage/relationship curves with the river and flow at gage.

The downramping evaluation will occur at flows ranging from 600 cfs down to 300 cfs following standard Project downramping protocols. Permanent photo stations will document important hydraulic controls and other areas of interest during downramping, and will be marked for future monitoring.

Comment [O21]: The Tulalip Tribes Is there a need to evaluate flows over 600 cfs?

Flow releases for the study will be based on readings obtained from USGS Gage No. 12138160 (Sultan River below Powerplant). Immediately prior to, during, and after the downramping event, river stage data will be recorded at 5-minute intervals in each side channel to document the downramping rate in inches/hour. Following the downramping event (gage stabilization), the surface area of stranding habitat below the initial high-water line in each side channel will be estimated. This dewatered stranding habitat will then be photographed and visually examined for stranded fish. Observations will be made by two biologists slowly walking back and forth in the dewatered zone from end to end and then back again. Special attention will be given to areas containing previously submerged vegetation (aquatic and terrestrial) and any depressions or isolated water pockets. The number, species, and condition of any observed fish will be documented in field notebooks.

Comment [O22]: The Tulalip Tribes Is this an adequate number of staff for the large amount of habitat? Side channel 1 alone is quite long with several sites that would require observation at the same time.

The change in stage over time data collected from the temporary staff gages in the side channels will be used to calculate the ramping rate associated with each downramping event at each side channel site. These data will also be used to determine the time it takes for the flow to reach the study sites from the powerhouse, and to determine the degree of the stage-change attenuation, if any, between the USGS gage below the powerhouse and the study sites.

Comment [O23]: The Tulalip Tribes Identify lag time of flow/ramping between the gage and the side channels.

3. REPORTING

Following the field surveys, the District will analyze the data collected during the study and prepare a draft report that includes plots of the channel cross sections at each evaluation flow, detailed descriptions and photographs of the transect and benchmark locations, plots of the rate in change in flow associated with each downramping event, a description of any areas that are particularly sensitive to ramping, and an account of the number and species of any stranded fish observed during the study. The District will provide a draft of the report to the ARC for a 30-day review and comment period. If the District does not adopt a recommendation, the report will include the reasons based on Project-specific information.

Comment [O24]: The Tulalip Tribes Quantitatively describe changes in habitat available over course of downramping event. Tie transect information to **habitat survey** to create a complete picture of downramping in each side channel. Greatest potential for fry stranding is where the bed is wide and gently sloping from bank to thalweg (or at least toward the thalweg). A cross-section through a pool may nevertheless have a potential for fry stranding over some range of flows if the lateral extent of the cross-section is relatively flat and shallow. In some cases bank may pose no risk for stranding while the opposite bank has stranding potential.

The final report will take in consideration comments from the ARC and will be prepared using a standard scientific format including a description of the study's objectives and results, and a discussion/list of recommendations.

Appendix 4

Response to Comments Regarding Draft Plan

No.	Comment	District Response
1	Ecology, emailed 7/18/2014 Suggest committing to identify both an incoming flow change threshold and a channel change threshold for redoing ramping rate evaluations should a flood or some other event change either the incoming flow regime to a channel or change the side channel areas that could be dewatered during downramping.	The engineering design, modeling, and construction methods all indicate that significant changes to side channel topography are highly unlikely. The District will monitor for channel changes during ongoing habitat surveys.
2	Ecology, emailed 7/18/2014 2.3 Suggest taking pictures at the 5-minute intervals from the same point of view during each of the measurements during the downramp test.	The District will capture time lapse photos by positioning "Gamefinder" photographic equipment at a strategic location within each side channel.
3	Tulalip Tribes, emailed 8/8/2014 Section 1.1. Add "at the heads of the side channels" to the following sentence...The surveys also documented sufficient flow volume under normal operational conditions and the presence of suitable and diverse physical habitat conditions in terms of wetted width, depth, and flow exchange at the heads of the side channels.	The District's surveys documented sufficient flow volume and flow exchange at both the inlets and outlets to each of the side channels. The Plan was updated to state inlets and outlets.
4	Tulalip Tribes, emailed 8/8/2014 Section 1.1. Attachment 1. THE TULALIP TRIBES understands this is the 'ARC recommendations_side channel ramping and habitat_06132014'	That document is included in the final report in Appendix 2.
5	Tulalip Tribes, emailed 8/8/2014 Section 1.2. Task 3. Prefer closer to 300 cfs.	The District will strive to collect measurements as close to 300 cfs as possible recognizing the importance of maintaining minimum instream flow levels.
6	Tulalip Tribes, emailed 8/8/2014 Section 1.2. Last paragraph. The Tulalip Tribes – the locations of the original 'visit/ramping study' were focused on the upstream ends of the channel and documented very little of the remainder of the channels. It is important that this 'visit' document the changes in plan and profile of the side channels over time. The PUD should repeat the measurements of channel depth at each 'station' reported in Appendix 2 of the original RREP study to compare the changes in channel shape and depth.	The District's prior survey did, in fact, occur along the entire length of each side channel. During 2014, a subsequent detailed habitat survey was conducted of the entire lower river including side channels. This license obligated survey was tied to the occurrence of a significant high flow event in March 2014. The results of this survey will be used to identify representative areas within each side channel for detailed monitoring of changes in water surface elevation tied to the evaluations of ramping rates.
7	Tulalip Tribes, emailed 8/8/2014 Section 2. Second paragraph.	Agreed, the flow range for the evaluation of ramping rates is 600 to 300 cfs (minimum instream flow).

	The downramping study needs to evaluate the lower end of the flow range at least at the hydraulic controls. The study could assess the 600 cfs range to be in keeping with the 1990 study, but needs to assess close to 300 cfs.	
8	<p>Tulalip Tribes, emailed 8/8/2014 Section 2. Second paragraph. What are the hydraulic controls within the sidechannels at flows higher than 600 cfs? This would be important to determine during months when the ramping rate is set for 4" per hour – at times when Coho are rearing in side channels – Nov-Dec and January – May. See yellow highlights in Table 1.</p>	<p>The toe width is completely wetted at flows well below 600 cfs. As such, the wetted width (wetted perimeter) within the side channels does not increase at flows above 600 cfs flows exceed channel storage and spill into the floodplain. This occurs during high flow events well above 1,500 cfs, the upper bound for the application of ramping rates.</p> <p>The logic behind the 4" per hour rate during the months of November and December is that both coho salmon and steelhead trout are of a size where they are not vulnerable under these rates.</p> <p>For young-of-the-year salmon present during the months of January through May, ramping at river flows less than 750 cfs is restricted to a total of 48 hours during this time frame, with no more than 16 hours in any given month.</p>
9	<p>Tulalip Tribes, emailed 8/8/2014 Section 2. Table 1. If there are general operational flow ranges during these time frames, it would be helpful to have them attached to this table to understand what flows might be in the side channels at the various time periods. There may be a need to assess the higher night rates if flows are within a range that would activate a hydraulic control within the side channels.</p>	Flow conditions in the lower river are highly variable and there are no general operational flow ranges. Wetted width in the side channels, fish size, and species behavior are the key variables involved with existing rates.
10	<p>Tulalip Tribes, emailed 8/8/2014 Section 2.1. First paragraph. Tulalip is interested in setting monitoring sites and identifying stranding areas.</p>	Thank you for your interest.
11	<p>Tulalip Tribes, emailed 8/8/2014 Section 2.2. First paragraph, "Transects". the original transects at the inlet to the side channels should be resurveyed and made part of the permanent transects. The inlet transects should extend across the river in order to id changes over time with headcutting.</p>	<p>The "transects" referred to are to be located within the representative survey area established for monitoring of ramping rates.</p> <p>Monitoring at inlets and the extension of transects across the river is not part of this evaluation.</p>
12	<p>Tulalip Tribes, emailed 8/8/2014 Section 2.2. First paragraph, "between 6 and 10".</p>	The approach to this evaluation is based on a representative reach similar to that typically for an

	<p>This number is very low, based upon the length of the side channels and our previous comments and input from Agencies at the field meeting. SC 1 should have many more transects than SC 4 due to the difference in length. The number of hydraulic controls identified should be a determinant in the number of transects. A higher frequency would provide more information if the hydraulic control shifts up or downstream from present location. The transects should be placed near hydraulic controls. Longitudinal profile points should be taken between the transects about 3-7 meters apart (maximum)– water depth, channel elevation, water surface elevation. The repeatability of the survey is important as well as properly capturing the hydraulic controls.</p>	<p>instream flow study. The representative reach will be identified from information gathered during the comprehensive lower river habitat survey conducted in 2014. The representative reach will be an area where topographic features indicate the possibility of stranding potential. The District believes that 6 to 10 transects within this representative reach is adequate for this evaluation.</p>
13	<p>Tulalip Tribes, emailed 8/8/2014 Section 2.2. Second paragraph, “channel transect”. The transect and long profile surveys need to document the amount, size, etc. of LWD within the channel – tie to habitat survey – in order to understand/document the impacts of LWD on the hydraulic controls within the side channels.</p>	<p>This type of information is not the focus of the ramping rate evaluation. However, this information was collected during the comprehensive habitat survey conducted in 2014. That report will be completed by the end of the year.</p>
14	<p>Tulalip Tribes, emailed 8/8/2014 Section 2.2. Add “water surface elevation, water depth,” after “Surveyors will then begin taking channel profile”.</p>	<p>Added as recommended.</p>
15	<p>Tulalip Tribes, emailed 8/8/2014 Section 2.2. Second paragraph, “Swoffer velocity”. Create a table with flow data that shows 1)the proportion of flow within each side channel and the mainstem 2) flow at each transect within a side channel – will show is side channel is gaining or losing or neutral</p>	<p>This will be completed as part of the report.</p>
16	<p>Tulalip Tribes, emailed 8/8/2014 Section 2.2. Second paragraph, “substrate the rod is resting upon”. A general characterization of substrate within the transect would be useful – tied to habitat survey?</p>	<p>Agreed – this will be included as part of the data collection effort.</p>
17	<p>Tulalip Tribes, emailed 8/8/2014 Section 2.2. Third paragraph. Add “rates” and “in inches?”.</p>	<p>“rates” added.</p> <p>Water surface elevation will be measured in hundredths of feet per standard survey protocol. This information will be converted to inches.</p>
18	<p>Tulalip Tribes, emailed 8/8/2014 Section 2.2. Third paragraph, “total of 20</p>	<p>Agreed – data will be presented in tabular format.</p>

	measurements". create a table that shows the flow rates and WSE changes for each transect.	
19	Tulalip Tribes, emailed 8/8/2014 Section 2.2. Fourth paragraph, "evaluation reports". Plot long profile with transects identified. Long profile will show the gradient breaks/hydraulic controls.	Agreed.
20	Tulalip Tribes, emailed 8/8/2014 Section 2.2. Last paragraph, "monitoring sites". A long profile within representative monitoring sites is not sufficient to track the changes in side channel hydraulic controls and adjustment to river operations by the PUD. The long profile should run from the downstream end of each side channel all the way up to the upstream end and at least one point in the mainstem. The transects need to be connected (id transect # in long profile record) and there needs to be greater density of long profile measurements – every 3-7 meters.	See prior comments on representative reach approach.
21	Tulalip Tribes, emailed 8/8/2014 Section 2.3. First paragraph, "critical sites". these sites will be identified after the long profile and thalweg data are analyzed and plotted and reviewed in a meeting with the ARC. Initial id will during review of report, followed by a field meeting.	The District and/or its consultants will share data with interested ARC members.
22	Tulalip Tribes, emailed 8/8/2014 Section 2.3. First paragraph, "reach". Even between transects – critical hydraulic controls or areas of potential stranding	Understood and agreed.
23	Tulalip Tribes, emailed 8/8/2014 Section 2.3. First paragraph, "or Hobo Water Level". Consider leaving in place over long term in order to establish stage/relationship curves with the river and flow at gage.	The District will consider this recommendation if vandalism does not present a problem.
24	Tulalip Tribes, emailed 8/8/2014 Section 2.3. Second paragraph, "from 600 cfs". Is there a need to evaluate flows over 600 cfs?	No – see prior comments on this subject.
25	Tulalip Tribes, emailed 8/8/2014 Section 2.3. Third paragraph, "two biologists slowly". Is this an adequate number of staff for the large	The District will use consultants to ensure thorough evaluation within the representative reaches of each side channel. Flow tests may occur over several

	amount of habitat? Side channel 1 alone is quite long with several sites that would require observation at the same time.	days.
26	Tulalip Tribes, emailed 8/8/2014 Section 2.3. Last paragraph, "study sites from the powerhouse,". Identify lag time of flow/ramping between the gage and the side channels.	Understood and included in the plan.
27	Tulalip Tribes, emailed 8/8/2014 Section 3. First paragraph, first sentence. Quantitatively describe changes in habitat available over course of downramping event. Tie transect information to habitat survey to create a complete picture of downramping in each side channel. Greatest potential for fry stranding is where the bed is wide and gently sloping from bank to thalweg (or at least toward the thalweg). A cross-section through a pool may nevertheless have a potential for fry stranding over some range of flows if the lateral extent of the cross-section is relatively flat and shallow. In some cases bank may pose no risk for stranding while the opposite bank has stranding potential.	Agreed – this type of information will be captured in the evaluation conducted in each of the representative reaches.