Commissioners:
RONALD E. SKAGEN
MOLLY SIMPSON
AARON J. VIEBROCK

General Manager:
WILLIAM C. DOBBINS

Public Utility District No. 1 of Douglas County

1151 Valley Mall Parkway • East Wenatchee, Washington 98802-4497 • 509/884-7191 • FAX 509/884-0553 • www.douglaspud.org

Via Electronic Filing

Honorable Kimberly D. Bose
Secretary
Federal Energy Regulatory Commission
888 1st Street N.E.
Washington, D.C. 20426

February 23, 2017

Subject: Wells Hydroelectric Project Total Dissolved Gas Abatement Plan 2016 Annual Report – License Article 401 (b)

Dear Secretary Bose:

Pursuant to Article 401(b) of the Federal Energy Regulatory Commission (FERC) license for the Wells Hydroelectric Project (Wells Project), the Public Utility District No. 1 of Douglas County (Douglas PUD) hereby submits the final Total Dissolved Gas Abatement Plan 2016 Annual Report (TDG Report) for calendar year 2016. Article 401(b) requires Douglas PUD to file an annual TDG Report with the FERC by February 28th during each year of the new license.

The final 2016 TDG Report is attached as Appendix A to this letter. A draft version of this 2016 TDG report was distributed to the Washington State Department of Ecology (Ecology) and all of the other parties to the Aquatic Settlement Agreement (ASA) including the United States Fish and Wildlife Service (USFWS), U.S. Bureau of Land Management (BLM), Washington State Department of Fish and Wildlife (WDFW), the Confederated Tribes of the Colville Reservation (CCT) and the Confederated Tribes and the Bands of the Yakama Nation (YN). No comments were received during the 30 day comment period. Following review all parties present during the February 8, 2017 Aquatic SWG conference call approved the 2016 TDG Report. The pre-filing consultation record supporting the review and approval of the 2016 TDG Report can be found in Appendix B.

The enclosed 2016 TDG Report is consistent with (1) the Water Quality Management Plan that is contained within the ASA, (2) Condition 6.7(2)(c)(iii) of Ecology's Clean Water Act section 401 Water Quality Certification (401 Certification), and (3) the National Marine Fisheries Service Endangered Species Act Incidental Take Statement (ITS) Reasonable and Prudent Measure No. 2 for the Wells Project.

If you have any questions or require further information regarding the enclosed report, please feel free to contact Andrew Gingerich at (509) 881-2323, andrewg@dcpud.org.

Sincerely,

Shane Bickford
Natural Resources Supervisor

Enclosure:

1) Appendix A – Wells Hydroelectric Project Total Dissolved Gas Abatement Plan 2016 Annual Report

2) Appendix B – Pre-filing consultation record for the Wells Hydroelectric Project Total Dissolved Gas Abatement Plan 2016 Annual Report

Copy:

Breean Zimmerman – Ecology, Union Gap
Scott Carlon – NMFS, Portland
Wells Aquatic Settlement Work Group
Tom Kahler – Douglas PUD
Andrew Gingerich – Douglas PUD

Appendix A:

Wells Hydroelectric Project Total Dissolved Gas Abatement Plan 2016 Annual Report

Wells Hydroelectric Project
Total Dissolved Gas Abatement Plan

2016 Annual Report

Public Utility District No. 1 of Douglas County
1151 Valley Mall Parkway
East Wenatchee, WA 98802-4331

Prepared for:

Washington Department of Ecology
15 W. Yakima Avenue, Suite 200
Yakima, WA 98902-3452

January 2017

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1 INTRODUCTION

The 2016 Wells Hydroelectric Project (Wells Project) Gas Abatement Plan (GAP) was approved by the Washington State Department of Ecology (Ecology) on February 18, 2016 and subsequently approved by the FERC on April 12, 2016. The GAP and its associated measures represent a long-term strategy to achieve compliance with the Washington State Water Quality Standard (WQS) criteria for total dissolved gas (TDG) in the Columbia River at the Wells Project while continuing to provide safe passage for downstream migrating juvenile salmonids. This annual report concludes the 2016 monitoring season and describes the background, operations, and results of GAP implementation at the Wells Project in 2016. In addition, this report contains TDG performance for the Wells Project during the 2016 fish passage season, and TDG performance outside of the fish passage season. Data summarized in this report includes monitoring from January 1, 2016 to December 31, 2016.

1.1 Project Description

The Wells Project is owned and operated by Public Utility District No. 1 of Douglas County (Douglas PUD) and is located at river mile (RM) 515.6 on the Columbia River in the State of Washington (Figure 1). Wells Dam is located approximately 30 river miles downstream from the Chief Joseph Hydroelectric Project, owned and operated by the United States Army Corps of Engineers (USACE), and 42 miles upstream from the Rocky Reach Hydroelectric Project, owned and operated by Public Utility District No. 1 of Chelan County. The nearest town is Pateros, Washington, which is located approximately 8 miles upstream of Wells Dam.

The Wells Project is the chief generating resource for Douglas PUD. It includes ten generating units with a nameplate rating of 774,300 kW and a peaking capacity of approximately 840,000 kW. The design of the Wells Project is unique in that the generating units, spillways, switchyard, and fish passage facilities were combined into a single structure referred to as the hydrocombine. The hydrocombine is 1,130 feet long, 168 feet wide and has a top of dam elevation of 795 feet above mean sea level (msl). Upstream fish passage facilities are located on both sides of the hydrocombine.

The Methow and Okanogan rivers are tributaries of the Columbia River within the Wells Reservoir. The Wells Project boundary extends 1.5 miles up the Methow River and 15.5 miles up the Okanogan River. The surface area of the reservoir is 9,740 acres with a gross storage capacity of 331,200 acre-feet and usable storage of 97,985 acre-feet at the normal maximum water surface elevation of 781 feet msl.

1.2 Fixed Monitoring Site Locations

Fixed monitoring stations (FMS) for TDG are located above and below Wells Dam. The forebay station (WEL) is located midway across the deck of Wells Dam (47° 56’ 50.28” N, 119° 51’ 54.78” W). The tailrace station (WELW) is located on the left bank of the Columbia River 2.6 miles downstream of Wells Dam (47° 54’ 46.86” N, 119° 53’ 45.66” W). In the spring of 2014, Douglas PUD installed a third FMS at Washburn Island (WSBW; 48° 5' 17.15" N, 119°40' 33.82" W), located approximately 7 miles downstream of Chief Joseph Dam. Hach® or Hydrotech HYDROLAB MiniSonde (MS5) instruments

equipped with TDG and temperature probes are deployed approximately 15 feet below normal surface water elevation and are calibrated monthly. Data from the three stations are automatically transmitted by radio to Wells Dam, stored, forwarded to the USACE, and posted to the Douglas PUD public webpage (www.dcpud.org). Weather data are recorded by Global Water, Inc. instrumentation, including an electronic barometer located on the deck of Wells Dam at 810 feet elevation. All three FMS are geographically represented by yellow pins in Figure 1.

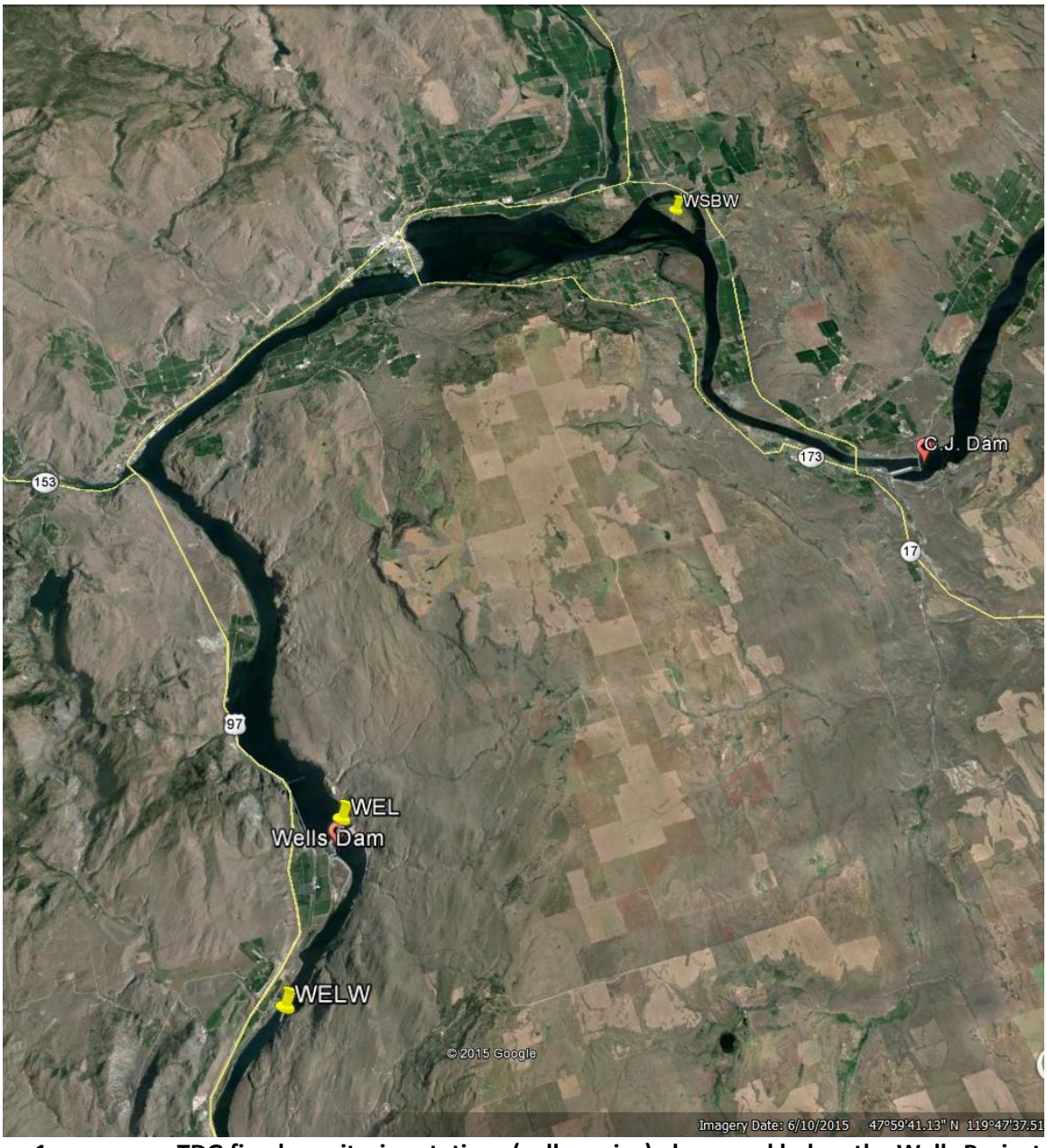

Figure 1. TDG fixed monitoring stations (yellow pins) above and below the Wells Project

1.3 Regulatory Framework

Washington Administrative Code (WAC) Chapter 173-201A identifies the WQS for surface waters in Washington State. Per the WQS, TDG measurements shall not exceed 110% saturation at any point of measurement in any state water body. The WQS provide for two exceptions to this rule: (1) for spill over dams to increase survival of downstream migrating juvenile salmon; and (2) during natural flood flows.

Ecology may approve an adjustment to the 110% upper criterion for TDG saturation during the outmigration of juvenile salmon; provided that spill aids in the survival of migratory fish. The TDG adjustment is considered by Ecology on a per-application basis and must be accompanied by an approved Gas Abatement Plan and biological monitoring plan (WAC 173-201A-200(1) (f) (ii)). On the Columbia and Snake rivers, the TDG exception for fish passage has three standards during the fish passage season: (1) TDG shall not exceed 125% saturation in the tailrace of the project as measured in any one-hour period; (2) TDG shall not exceed 120% saturation in the tailrace of the project based on the average of the twelve highest consecutive hourly readings (12C-High); and, (3) TDG shall not exceed 115% saturation in the forebay of the next downstream project based on the average of the twelve highest consecutive hourly readings. Natural flood flows are identified by periods in which river flow volume exceeds the highest seven consecutive day average observed during a ten-year period, called the 7Q-10 flow. The 7Q-10 flow for the Wells Project is 246,000 cubic feet per second (cfs), based on the hydrologic records from 1930 to 1998 and the USGS Bulletin 17B, "Guidelines for Determining Flood Flow Frequency" (Pickett et al. 2004). When river flow volume exceeds 7Q-10 flows, the WQS established in the WAC do not apply.

1.4 2016 Gas Abatement Plan Approach

1.4.1 Operational

Based on the success of 2009 and 2010 operations associated with implementation of the Wells Project Spill Playbook (Spill Playbook), those operations were implemented again between 2011 and 2016 with minor modification as described below.

In February 2011, Douglas PUD conducted an additional technical analysis of the 2010 Spill Playbook (after in-season changes) and confirmed that continued implementation would be appropriate for 2011 with additional minor modifications. Additional recommendations for 2011-2016 operations, from a TDG management perspective, included:

1. Minimize spill.
2. Forced Spill (≤ 53.0 kcfs). Switch the priority for forced spill less than 53 kcfs from spillbay 7 to spillbay 5 during the rebuild of turbine unit 7. Turbine units 4 and 5 were operational and should be operated to support spill from spillbay 5.

3. If spill exceeds 53 kcfs, or is predicted to exceed 40 kcfs for more than 8 hours, remove the Juvenile Bypass System (JBS) barriers in spillbay 6.

4. When spill exceeds 30 kcfs in spillbay 5 and JBS barriers have been removed in spillbay 6, shift at least 15.0 kcfs from spillbay 5 to spillbay 6 (i.e., 27.2 kcfs and 15.0 kcfs through spillbays 5 and 6, respectively). Support spill through spillbays 5 and 6 by operating turbine units 4, 5 and 6.

5. Reinstall the JBS barriers if total spill is predicted to remain below 40 kcfs for more than four days.

Modifications were based on previous adaptive operational results, model predictions, and operational contingencies, including the prolonged rebuild of turbine unit 7 at Wells Dam. In 2016, the GAP recommended moving spill back to the spillbays above turbine unit 7 when forced spill exceeded 53 kcfs, since turbine unit 7 was returned to commercial operation and deemed sufficiently reliable to be operating throughout the 2016 juvneile fish bypass season. Using these modifications, Wells Dam has demonstrated high TDG compliance with the WAC and WQS.

1.4.2 Structural

No permanent structural modifications were proposed or conducted in the 2015 monitoring season. No bypass barriers were removed in 2016 since flows were moderate and did not require prolonged periods of forced spill at or above 40 kcfs for more than 8 hours. In each year, the removal and reinstallation of the JBS barriers follows the requirements of the Federal Energy Regulatory Commission (FERC) approved Spill Playbook, Bypass Operating Plan and Wells Dam Emergency Action Plan (EAP).

1.4.3 Consultation

In early 2016 the Washington Department of Ecology designated a new 401 Certification and Hydro-project Manager for the Wells Project. In previous years, Douglas PUD directed all correspondence related to TDG compliance to the Washington Department of Ecology's Hydropower Projects Manager located in the Central Region Office (Yakima, Washington 98902). Beginning with the 2016 Annual Report, Douglas PUD will direct correspondence related to TDG compliance to the Hydropower Projects Manager in Union Gap, Washington (98903). In addition, Douglas PUD annually consults with the Aquatic SWG and HCP Coordinating Committee for specific TDG and WQS documents per Douglas PUD's 401 Certification and FERC license requirements.

2 OPERATIONS

2.1 Description of Fish-Passage Season Flow

The Wells HCP, required Douglas PUD to provide juvenile fish bypass passage opportunities for greater than 95% of the downstream migrating juvenile fish covered by the HCP (Plan Species). The HCP defined juvenile fish passage season starts April 1st and runs through August 31st of each year. Douglas PUD annually reviews fish passage statistics and uses that information to tune operation during subsequent

years toward ensuring that greater than 95% of the juvenile outmigration is afforded a non-turbine passage route around Wells Dam. Based upon prior year information, the juvenile fish bypass was started on April 9 (0:00 hrs) and ended at midnight on August 19th. As required, TDG performance was monitored during this period and transmitted to the USACE, Northwest Division on a real-time basis (www.nwd-wc.usace.army.mil) and made available on Douglas PUD's public webpage (http://dcpud.org/wells-project/total-dissolved-gas-and-temperature-monitoring). Historical data continues to be available for download at both of these websites.

Data from 1969 to 2016 show that average monthly flows between April and August ranged from 106.0 to 163.0 kcfs at the Wells Project (Table 1; Figure 2). During this time period, flows tend to be greater in June and lowest in August. Flows at the run-of-river Wells Project are determined by upstream storage releases at the Grand Coulee Hydroelectric Project, with typically less than 10% of the total river flow provided by the two rivers that flow into the Columbia River within the Wells Project (Okanogan and Methow Rivers).

Table 1. Monthly average river discharge (kcfs) from the Wells Project, 1969-2016.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
2016	94.7	98.5	111.5	152.9	131.0	129.1	111.9	96.6	66.8	75.1	99.8	116.1	107.0
Average since 1969	108.5	107.6	106.6	117.5	149.6	163.0	134.7	106.0	75.2	75.7	87.9	101.4	111.1
Minimum since 1969	67.4	69.9	56.0	51.9	55.2	73.7	53.4	63.9	53.5	56.0	63.8	72.6	
Maximum since 1969	159.2	180.7	193.9	184.9	262.6	348.7	253.8	181.3	123.0	108.9	110.0	149.0	
10YR mean (2007-2016)	105.6	95.1	101.6	130.0	158.4	175.5	147.8	109.1	65.2	67.3	86.3	99.1	111.8

Average monthly flows in 2016 were noticeably higher in April 2016 when compared to historic norms (Figure 2). A wet spring was followed by a reduction in average flows and the apparent absence of a normal freshet typically occurring in June of each year (Figure 2). Columbia River flows at Wells Dam in 2016 were well below averages in all months of the fish passage season except April when compared to historic monthly flows (1969-2016; Figure 2). Average flows during non-fish passage months in 2016 were observed to be close to normal for (January to March and September to December).

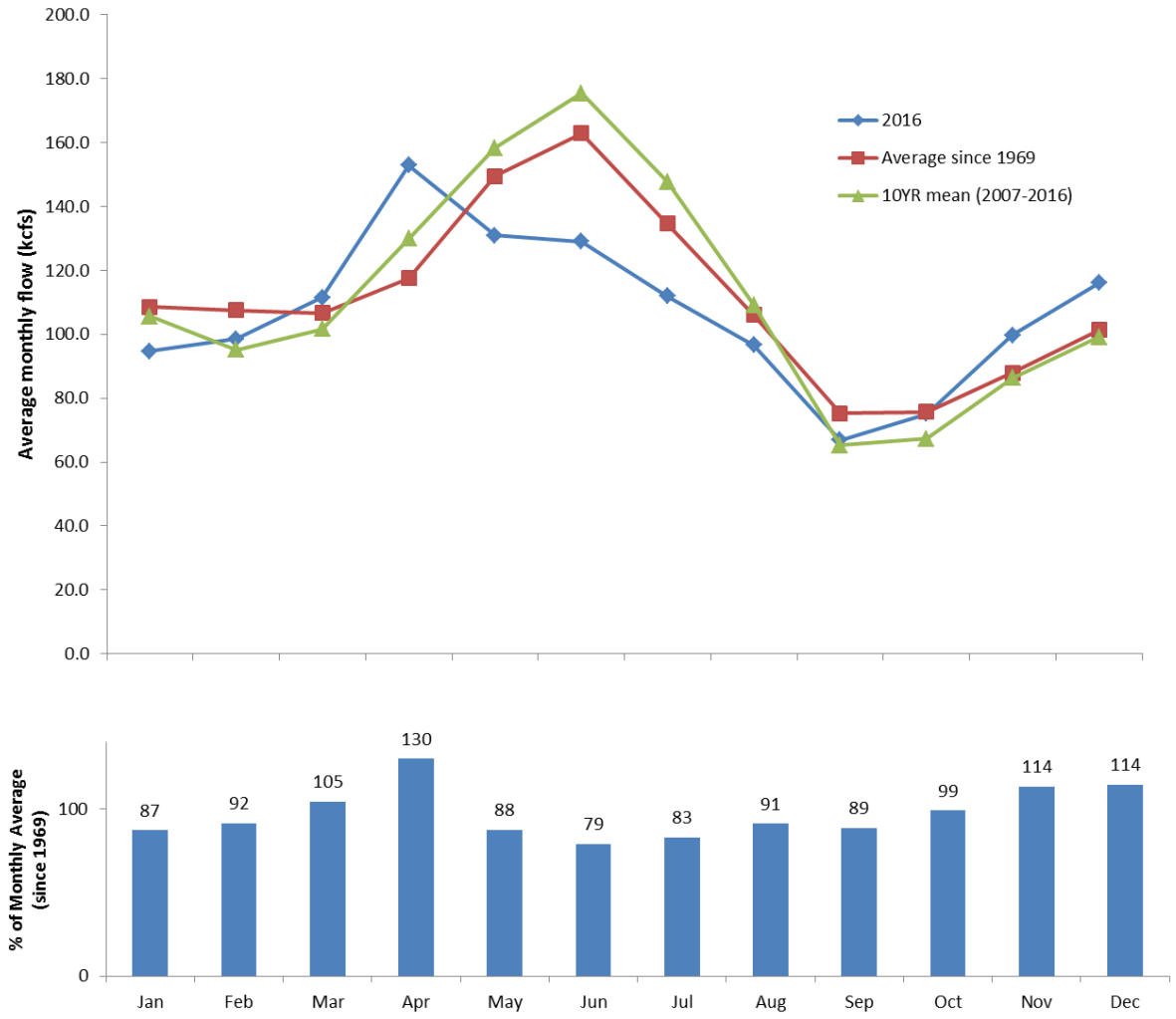

Figure 2. 2016 monthly flows compared to historic normal and averages (top). The blue bars in the figure represent the percent of average flows observed in 2016 relative to historic norms (bottom).

2.2 Fish Bypass Program

Wells Dam is a hydrocombine, where the spillbays are located directly above the turbine water passages. Research at Wells Dam in the mid-1980s demonstrated that a modest amount of spill could be used to effectively guide a high proportion of the downstream migrating juvenile salmon away from the turbines and into a surface oriented bypass system. A JBS was subsequently developed at Wells in the late 1980s. The Wells Dam JBS was engineered based on biological research and hydraulic modeling, and utilizes constricting flow barriers deployed in five of the eleven spillbays to effectively attract and safely guide fish through the project. The Wells Project JBS has since proven to be the most efficient system on the mainstem Columbia River, providing high levels of fish protection and survival that has met approval from various fisheries agencies and tribes (Skalski et al. 1996). The passage and survival

performance measures contained within the FERC approved Anadromous Fish Agreement and Habitat Conservation Plan (HCP) have been consistently exceeded, with a three-year survival average of 96.2% for juvenile steelhead and Chinook salmon (Bickford et al. 2001). The results from a fourth year of survival study at Wells Dam in 2010 (Bickford et al. 2011) confirmed past study results by documenting that survival through the entire Wells Project is in excess of 96.4% for juvenile spring migrating anadromous fish (see Section 3.1.2 below).

2.3 Fish Bypass Spill Quantities and Duration

The Wells Dam JBS uses up to 2,200 cfs of water for each of the five bypass/spillbay. Under normal conditions, the JBS will use roughly five to eight percent of the total river flow for fish guidance. The increased spill has a small influence on TDG production (~0-2%) while providing a safe and highly effective, non-turbine passage route for over 92% of the spring and 96% of the summer migrating juvenile salmonids. The HCP defined juvenile fish migration period runs from April 1st to August 31st of each year. From 2003 to 2011 the HCP Coordinating Committee (HCP) directed the District to operate the JBS on a fixed schedule between April 12 and August 26 in an effort to provide a non-turbine passage route for at least 95% of the spring and summer migration of juvenile salmonids. The HCP CC retains annual operating oversight that includes the potential to operate the JBS as early as April 1 and as late as August 31 to ensure that 95% of the spring and summer migration of juvenile salmonids are provided a safe, non-turbine passage route over Wells Dam. Any spill that occurs between April 1st and August 31st is deemed to have a beneficial effect on migrating juvenile salmonids.

In 2012, Douglas PUD evaluated past performance of the Wells Dam JBS operating dates relative to observed annual run timing (at the Rocky Reach Bypass) for both spring and summer migrants. With that data, a request was made to and granted by the HCP CC to revise the bypass operating dates in 2012 to start April 9 and end August 19. These dates were therefore used in 2012-2016 to operate the fish bypass system for migrating juvenile salmonids. Juvenile anadromous salmonids that pass Wells Dam before and after the bypass system is shut down for the year benefit from spill at the Project and therefore Douglas PUD annually develops a GAP and conducts biological and physical monitoring in order obtain an Ecology approved TDG adjustment for the entire juvenile salmonid migration period (April 1st to August 31st).

3 IMPLEMENTATION RESULTS

3.1 Fisheries Management

3.1.1 Fish Passage Efficiencies

No new fish passage efficiency studies were conducted at the Wells Project in 2016. However, three years of bypass efficiency studies have shown the Wells Dam JBS to be the most efficient juvenile salmonid collection system in the Columbia River with fish passage efficiencies up to 92% for spring

migrants and up to 96% for summer migrants (comprised of steelhead, spring Chinook, and sockeye salmon, and summer/fall Chinook salmon, respectively; Skalski et al. 1996).

3.1.2 Survival Studies

No survival studies were conducted at the Wells Project in 2016.

3.2 Biological Monitoring

The 2016 Wells Project GAP includes the National Marine Fisheries Service (NMFS) recommendation to sample for Gas Bubble Trauma (GBT) in juvenile salmon when hourly tailrace TDG levels exceed 125% saturation (NMFS 2000).

In 2016, there were no 125% exceedances and therefore no GBT monitoring occurred.

3.3 Water Quality Forums

Douglas PUD has actively participated in regional water quality forums with Ecology, WDFW, NMFS, Tribal Agencies, the US Fish and Wildlife Service, the USACE, and other Mid-Columbia PUDs (i.e., Grant and Chelan counties). Specific forums include the Trans-boundary Gas Group, Columbia Basin meetings with Ecology, and the Sovereign Technical Team Water Quality Work Group. These meetings allow for regional coordination for monitoring, measuring, and evaluating water quality in the Columbia Basin and support ongoing Upper Columbia Treaty review analyses that will provide a foundation for Treaty negotiations between Canada and the U.S. Douglas PUD will continue its involvement in water quality meetings for further coordination with other regional water quality managers towards meeting TDG standards.

3.4 Physical Monitoring

3.4.1 Overview

TDG monitoring at the Wells Project has occurred since 1984 when forebay stations were first established. TDG monitoring in the tailrace of Wells Dam began in 1997 by actively collecting data at four points across the width of the river. Based on these data, the location for a FMS was established in 1998. Subsequent analysis verified that both monitoring station locations are appropriate and representative of mixed river condition, particularly during high flows (EES et al. 2007; Politano et al. 2009). TDG monitoring at the Wells Project currently occurs year round as required by Douglas PUD's Wells Project 401 Water Quality Certification (401 Certification). As required by Douglas PUD's Quality Assurance Project Plan for TDG, FMS sensors are serviced and calibrated at least once per month or sooner if calibration issues are observed on the devices.

In 2014, an additional reservoir monitoring station was installed at Washburn Island (RM 537.5) to collect TDG data representative of water quality entering the Wells Project from Chief Joseph Dam. The current Chief Joseph Dam tailwater station (CHQW) minisonde TDG sensor is deployed along the right bank of the Columbia River, 0.75 miles downstream from the dam. The river right location of the U.S.

Army Corps of Engineers TDG sensor precludes it from collecting bulk flow data, and instead the sensor monitors spillbay water disproportionally. Under some conditions, water coming from Chief Joseph Dam spillbays is of lower TDG concentration than the powerhouse. For example, when the Chief Joseph Dam forebay has high concentrations of TDG (e.g. greater than 120 %) as a result of high spill volumes from Grand Coulee Dam and limited degassing through Rufus Woods Reservoir, water sent through the spillbays at Chief Joseph Dam may actually be stripped of gas via the spill deflectors. However, powerhouse TDG concentrations are essentially identical to those in the forebay and can be missed by the CHQW sensor since powerhouse flows orient to river left rather than river right where the TDG sensor resides. As a result of the CHQW location and the orientation of spill and powerhouse flows, bulk flows leaving the federal system and entering into the Wells Project are not accurately monitored. The Washburn Island location installed and operated by Douglas PUD allows water quality managers and the Aquatic Settlement Work Group Parties to:

1) Better understand TDG degassing in the Wells Project and expected TDG saturation in the Wells forebay.

2) Assure data quality at the Wells forebay TDG sensor since Washburn Island TDG values should correlate predictably with Wells forebay TDG values. Based on the comparison of the sensors at these two locations, technicians can ensure reliable data collection by scheduling sensor servicing when data appears to be erroneous.

3) More accurately assess TDG production from the federal power system upstream of Wells Dam, which may support improved management towards minimizing TDG production in the Columbia River.

3.4.2 Data Evaluation and Analyses

Hourly TDG monitoring data were retrieved from the USACE, Northwest Division for three monitoring locations: the forebay of Wells Dam (WEL), tailrace of Wells Dam (WELW), and forebay of Rocky Reach Dam (RRH). The data were partitioned to include only readings obtained during the fish passage season (April 1 to August 31). Data were stratified by monitoring site, ascending date, and ascending time. The Ecology-approved 12C-High method was used to obtain TDG measurements for comparison to numeric criteria and evaluation of compliance.

3.5 TDG Compliance

Outside of the fish passage season the TDG criterion in the Wells tailrace is 110% (January – March and September – December). Additionally, there were three compliance criteria for the 2016 fish passage adjustment that must be met in association with operation at the Wells Project as described in the 2016 GAP:

1) Average TDG in the tailrace cannot exceed 125% for one hour or

2) 120% for 12 continuous hours (12C-High), and

3) TDG in the downstream Rocky Reach forebay cannot exceed 115% (12C-High).

These compliance criteria are waived when flows exceed the 7Q-10 value for the Wells Project (246 kcfs). For more information refer to WAC 173-201A-200.

3.5.1 Non-Fish Passage Season Compliance (Wells Tailrace 110%)

Per the Douglas PUD FERC Operating License and 401 Certification, in August 2013 Douglas PUD started colleting TDG data during the non-fish passage season. Non-spill flows at Wells Dam (through the turbine units and fishways) generate little to no additional dissolved gas. Spill outside the fish passage adjustment period is uncommon. There were no hourly values above 110% recorded during non-fish passage season in 2016.

3.5.2 Fish Passage Season Compliance

Wells Tailrace 125% hourly standard

No exceedances of the 125% hourly tailrace criterion occurred in 2016 (Table 2).

Wells Tailrace 120% 12C-High standard

No exceedances of the 120% 12C –High tailrace criterion occurred in 2016 (Table 2).

Rocky Reach Forebay 115% 12C-High standard

Exceedances at this station were observed on April 18, 19 and 23 in 2016 (Table 2; Figure 3). These observations were the result of an unusually early spring snow melt that produced high flows in the Columbia, Okanogan and Methow two months earlier than normal. This high flow event in April forcing Wells Dam operators to spill for short periods in excess of 50 kcfs.

3.5.3 Yearly TDG Compliance Summary

The following table summarizes TDG compliance at the Well Project for the entire 2016 season.

Table 2. 2016 TDG compliance summary.

	Compliance
Wells Tailrace 125% hourly standard	
Days out of compliance	0
Fish passage season	153
DCPUD compliance	**100%**
Wells Tailrace 120% 12C-High standard	
Days out of compliance	0
Fish passage season	153
DCPUD compliance	**100%**

Rocky Reach Forebay 115% 12C-High standard	
Days out of compliance	3
Fish passage season	153
DCPUD compliance	**98%**
Wells Tailrace 110% (Non-fish passage season standard)	
Days out of compliance	0
Fish passage season	213
DCPUD compliance	**100%**

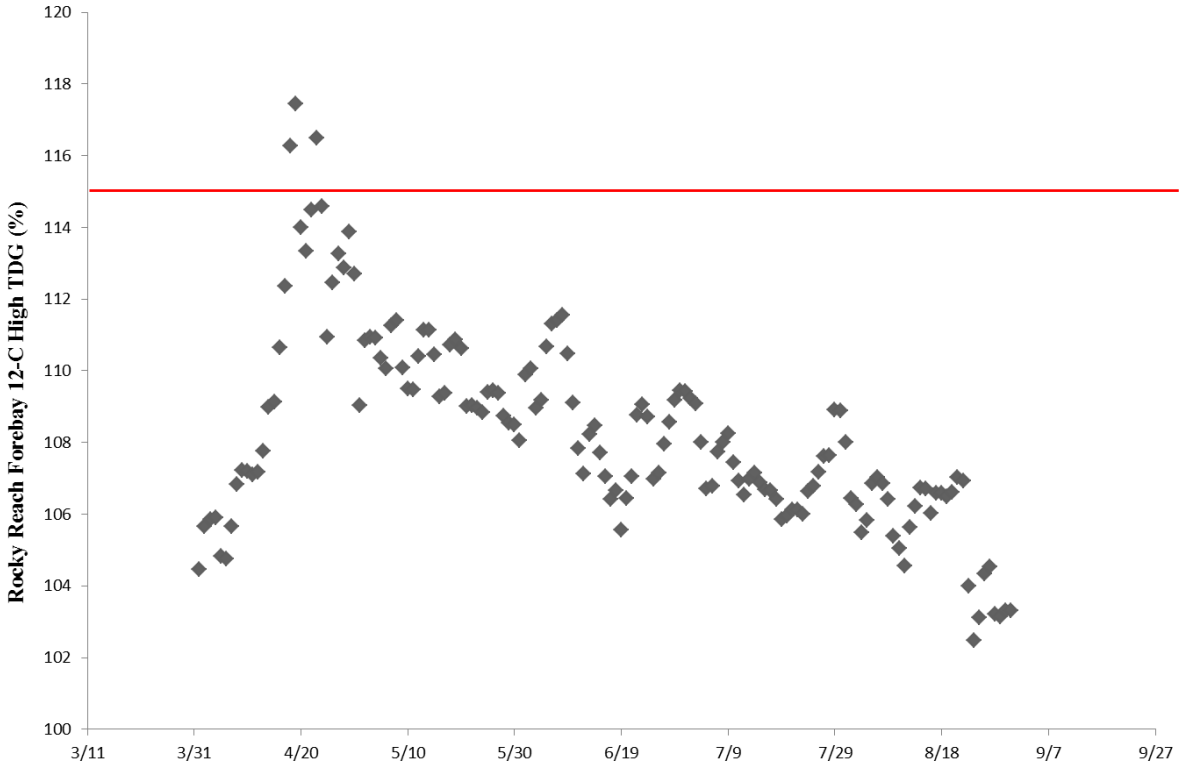

Figure 3. **12C-High values in the Rocky Reach forebay during the 2016 fish passage season. The 115% standard is represented by the solid red line. Data courtesy of Chelan PUD.**

4 DISCUSSION OF GAS ABATEMENT MEASURES

4.1 Water Quality Attainment Plan Activities

As required by the Wells Project 401 Certification, Douglas PUD developed a Water Quality Attainment Plan (WQAP). The WQAP was approved by Ecology and the FERC in 2013. The WQAP provides a detailed strategy for achieving compliance with the TDG state WQS within a required ten-year timeframe (i.e., compliance schedule). The compliance schedule outlines a step-wise approach toward meeting compliance with the TDG WQS. In 2016 (Year 3), the WQAP called for continued adaptive management and implementation of the Spill Playbook, biological monitoring (i.e., GBT monitoring in biota, as needed), and the identification of key Project operating parameters towards developing a database that would house fine scale operation data. In future year's data would be used to identify fine scale operations that might improve TDG compliance.

In the spring of 2016 Douglas PUD reviewed Wells Project Operations data collection with Wells Dam Hydro Operations staff and the Information Systems Department. The objective of this analysis was to conduct a comprehensive evaluation of both operational and structural data collection towards ultimately improving compliance with the TDG WQS criteria. A fine scale spill data collection database is currently under development. Development is expected to continue in 2017, with the first year data collection (pilot) expected to begin in the late of 2017. Adaptive management and implementation of the Spill Playbook and biological monitoring (i.e., GBT monitoring in biota, as needed) continued in 2016. Finally in 2016 technicians began to investigate the feasibility of purchasing and installing spill gate flow sensor that could collect and automatically record fine scale spill data in the Douglas County PUD SCADA (supervisory control and data acquisition) system.

4.2 Operational

Flows at Wells Dam were above normal (30> higher) in April 2016 but below normal during the balance of the fish passage season. High spring flows coupled with coordination challenges between BPA and Mid-C Central whereby Chief Joseph Dam daily discharge estimates were exceeded by large amounts without actionable notice to downstream projects. These unexpected high incoming flows led to the need to spill larger volumes of water at Wells Dam to avoid exceeding the FERC license maximum pool elevation of 781 msl. The result of this unusually early spill event was three days were TDG values were above the Rocky Reach Forebay standard of 115%. Improved coordination with the federal project operators, coupled with better estimates out of the FCRPS above Wells Dam and better training for Central coordination staff should improve TDG complaince in future years. Wells Dam demonstrated exceptional performance during 2016 with nine out of ten turbine units available during this period. All tailrace and downstream standard were met during the fish passage season.

Douglas PUD implemented the Ecology and FERC approved 2016 GAP during the entire 2016 fish passage season utilizing the lessons learned during previous years of spill study at the Wells Project. The

2016 Spill Playbook was an important element in managing TDG at Wells Dam during the fish passage season.

4.3 Structural

No permanent structural modifications were proposed or completed during the 2016 monitoring season.

5 CONCLUSIONS

TDG performance at Wells Dam during the 2016 season was very high. Results support the continued implementation of the Spill Playbook to manage TDG production through operational means, and suggest future operational performance should result in even higher rates of TDG standards compliance. Douglas PUD will put an emphasis on testing the Spill Playbook in years where ten units are available 95% of the time (normal reliability). The ongoing turbine rebuild project currently only provides 9 out of 10 units to operate during the peak hydrograph thereby reducing the amount of water that can be passed through the powerhouse by approximately 15 kcfs and therefore makes compliance more challenging, since this water must be spilled. Despite this challenge Douglas PUD has maintained high TDG compliance with WQS. Douglas PUD will work closely with the Washington Department of Ecology towards meeting year round TDG standards in subsequent years.

6 REFERENCES

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Appendix B:

Pre-filing consultation record for the Wells Hydroelectric Project Total Dissolved Gas Abatement Plan 2016 Annual Report

EMAIL TO AQUATIC SETTLEMENT WORK GROUP REGARDING 30-DAY REVIEW OF THE 2016 WELLS TDG ANNUAL REPORT

From: Kristi Geris <kgeris@anchorqea.com>
Sent: Thursday, January 05, 2017 2:21 PM
To: Andrew Gingerich; Bao Le; Bill Towey (bill.towey@colvilletribes.com); Bob Rose; 'Brad James'; 'Bret Nine'; 'Chad Jackson'; Chas Kyger; Chris Sheridan; Donella Miller (mild@yakamafish-nsn.gov); Fortier, Ryan T (DFW); Jason McLellan; Jeff Korth; John Ferguson; Keith Kirkendall (Keith.Kirkendall@noaa.gov); Kirk Truscott; Kristi Geris; Mark Peterschmidt (mape461@ecy.wa.gov); Mary Mayo; Patrick Verhey (Patrick.Verhey@dfw.wa.gov); Paul Ward (warp@yakamafish-nsn.gov); Ralph Lampman (lamr@yakamafish-nsn.gov); Shane Bickford; 'Steve Lewis'; Steve Parker; Zimmerman, Breean (ECY)
Cc: Keith Hatch (Keith.Hatch@bia.gov); Tom Kahler
Subject: FW: 2016 Annual TDG (GAP) Report and 2017 GAP/Bypass Operating Plan
Attachments: 2017_01_05 Douglas - Draft 2016 Wells Dam TDG Annual Report.doc; 2017_01_05 Douglas - Draft 2017 Wells Dam GAP and BOP.DOC

Hi Aquatic SWG: please see the email below from Andrew and the attached Draft 2016 Wells Dam TDG Annual Report and Draft 2017 Wells Dam GAP and BOP, for review. The attached draft documents are available for a 30-day review period, with edits and comments due to Andrew by **COB Monday, February 6, 2017**. Douglas PUD will request approval of the attached documents during the Aquatic SWG meeting on February 8, 2017.

The attached draft documents are also available for download from the Aquatic SWG Extranet site under: Documents > All by Mtg Date > 2/8/2017 (instructions below). Thanks! –kristi ☺

Instructions:

To gain access to the Aquatic SWG Extranet Homepage, please use the following procedure:

* Visit: https://extranet.dcpud.net/sites/nr/aswg/
* Login using "Forms Authentication" (for non-Douglas PUD employees)

You should now be at the Aquatic SWG homepage.

If you encounter problems, or need a login username and password to access the site:
Please feel free to contact me, Andrew Gingerich, or Julene McGregor [jmcgregor@dcpud.org; (509) 881-2236] and we will gladly assist you with questions or issues.

Kristi Geris

ANCHOR QEA, LLC
kgeris@anchorqea.com
T 509.491.3151 x104
C 360.220.3988

From: Andrew Gingerich [mailto:andrewg@dcpud.org]
Sent: Thursday, January 5, 2017 1:51 PM
To: Kristi Geris <kgeris@anchorqea.com>
Cc: Tom Kahler <tomk@dcpud.org>; Zimmerman, Breean (ECY) <bzim461@ECY.WA.GOV>
Subject: 2016 Annual TDG (GAP) Report and 2017 GAP/Bypass Operating Plan

Hi Kristi, tis the season, please distribute to the technical reps within the Aquatic SWG. Please make sure that we include BIA, and BLM. Tom Kahler (cc'd) will coordinate the HCP CC review of the 2017 GAP and BOP too.

Every year at this time Douglas PUD provides two documents to the Aquatic SWG for review, comment, and eventual approval. The first summarizes TDG compliance during the previous year (2016). The second document provides the methods used to provide safe and effective passage of juvenile salmonids, meet TDG criteria, and operate Wells Dam safely (2017 Gas Abatement Plan and Bypass Operating Plan). The latter of these documents get reviewed concurrently with the HCP CC per our 401 Certification and FERC license requirements. Specifically, these two documents are (attached in reverse order):

1. 2016 Annual TDG (GAP) Report
2. 2017 Gas Abatement Plan and Bypass Operating Plan

The latter document is also required in order to obtain an Ecology's approved TDG adjustment during the 2017 bypass season. This adjustment facilitates high survival of downstream migrating fish during peak downstream migration. Both documents are attached for committee review and consideration. Douglas PUD is hoping to receive comments no later than Feb 6th . That will give Douglas PUD a day to update/make changes before seeking approval from the Aquatic SWG at the February 8th, 2017 Aquatic SWG call. Both of these documents are due to the FERC by Feb 28th every year.

Please let me know if you have questions.

Andrew Gingerich
Senior Aquatic Resource Biologist
Public Utility No. 1 of Douglas County
1151 Valley Mall Parkway
East Wenatchee, WA 98802
Office: (509) 881-2323

EMAIL REMINDER FOR 30-DAY REVIEW OF THE 2016 WELLS TDG ANNUAL REPORT

From: Kristi Geris <kgeris@anchorqea.com>
Sent: Thursday, February 02, 2017 7:05 PM
To: Andrew Gingerich; Bob Rose; Chas Kyger; Jason McLellan; John Ferguson; Kristi Geris; Mark Peterschmidt (mape461@ecy.wa.gov); Patrick Verhey (Patrick.Verhey@dfw.wa.gov); 'Steve Lewis'; Zimmerman, Breean (ECY)
Cc: Keith Hatch (Keith.Hatch@bia.gov); Tom Kahler
Subject: FW: 2016 TDG Report and 2017 GAP/BOP - REMINDER
Attachments: 2017_01_05 Douglas - Draft 2016 Wells Dam TDG Annual Report.doc; 2017_01_05 Douglas - Draft 2017 Wells Dam GAP and BOP.DOC

Hello! This is your friendly reminder to please submit edits/comments on the attached documents to Andrew by **COB MON 2/6!** Thanks! –kristi ☺

Kristi Geris

ANCHOR QEA, LLC
kgeris@anchorqea.com
T 509.491.3151 x104
C 360.220.3988

From: Kristi Geris
Sent: Thursday, January 5, 2017 2:21 PM
To: Andrew Gingerich (andrewg@dcpud.org) <andrewg@dcpud.org>; Bao Le <Bao.Le@hdrinc.com>; Bill Towey (bill.towey@colvilletribes.com) <bill.towey@colvilletribes.com>; Bob Rose <rosb@yakamafish-nsn.gov>; 'Brad James' <jamesbwj@dfw.wa.gov>; 'Bret Nine' <bret.nine@colvilletribes.com>; 'Chad Jackson' <chad.jackson@dfw.wa.gov>; Chas Kyger <chask@dcpud.org>; Chris Sheridan <csherida@blm.gov>; Donella Miller (mild@yakamafish-nsn.gov) <mild@yakamafish-nsn.gov>; Fortier, Ryan T (DFW) <Ryan.Fortier@dfw.wa.gov>; Jason McLellan <Jason.McLellan@colvilletribes.com>; Jeff Korth (korthjwk@dfw.wa.gov) <korthjwk@dfw.wa.gov>; John Ferguson <jferguson@anchorqea.com>; Keith Kirkendall (Keith.Kirkendall@noaa.gov) <Keith.Kirkendall@noaa.gov>; kirk.truscott@colvilletribes.com; Kristi Geris <kgeris@anchorqea.com>; Mark Peterschmidt (mape461@ecy.wa.gov) <mape461@ecy.wa.gov>; 'Mary Mayo' <marym@dcpud.org>; Patrick Verhey (Patrick.Verhey@dfw.wa.gov) <Patrick.Verhey@dfw.wa.gov>; Paul Ward (warp@yakamafish-nsn.gov) <warp@yakamafish-nsn.gov>; Ralph Lampman (lamr@yakamafish-nsn.gov) <lamr@yakamafish-nsn.gov>; Shane Bickford (sbickford@dcpud.org) <sbickford@dcpud.org>; 'Steve Lewis' <stephen_lewis@fws.gov>; Steve Parker <pars@yakamafish-nsn.gov>; Zimmerman, Breean (ECY) <bzim461@ECY.WA.GOV>
Cc: Keith Hatch (Keith.Hatch@bia.gov) <Keith.Hatch@bia.gov>; Tom Kahler (tomk@dcpud.org) <tomk@dcpud.org>
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Please let me know if you have questions.

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Office: (509) 881-2323

APPROVAL OF THE 2016 WELLS TDG ANNUAL REPORT BY THE AQUATIC SETTLEMENT WORK GROUP

FINAL

Conference Call Action Items

Aquatic Settlement Work Group

To: Aquatic SWG Parties

Date: February 10, 2017

From: John Ferguson, Chair (Anchor QEA, LLC)

Re: Final Action Items of the February 8, 2017 Aquatic SWG Conference Call

Below is a summary of Action Items from the Aquatic Settlement Work Group (SWG) meeting that was held by conference call on Wednesday, February 8, 2017, from 10:00 to 11:30 a.m. Attendees are listed in Attachment A. These action items include the following:

I. Summary of Action Items

1. Douglas PUD will provide historical Pacific lamprey conversions rates from the count window at Rocky Reach Dam to Wells Dam, as well as Wells Project operation and flow data, to Kristi Geris for distribution to the Aquatic SWG (Item VI-5).
2. Douglas PUD will provide a brief document (2 to 3 pages) outlining merits of all reasonable alternatives for studies of Pacific lamprey in 2017, in the context of a broader plan for meeting Pacific Lamprey Management Plan requirements, to Kristi Geris for distribution to the Aquatic SWG for discussion at the Aquatic SWG meeting on March 8, 2017 (Item VI-5).
3. Douglas PUD, in coordination with Dave Robichaud (LGL Limited), will provide a summary document (5 to 10 pages) highlighting results and findings to date from the 2016 Pacific Lamprey Study, including fish movement, spatial distribution, size metrics versus distance traveled, and detection efficiency for receivers and different detection zones, for discussion at the Aquatic SWG meeting on March 8, 2017 (Item VI-5).
4. U.S. Fish and Wildlife Service (USFWS) will provide a proposal for planting Pacific lamprey within the Wells Dam fishway as a means to test a pheromone hypothesis, for further discussion at a future Aquatic SWG meeting (Item VI-5).
5. **The Aquatic SWG meeting on March 8, 2017, will be held by conference call (Item VII-1).**

II. Summary of Decisions

1. Aquatic SWG members present approved the 2016 Total Dissolved Gas Abatement Plan Annual Report

2. Aquatic SWG members present approved the 2017 Total Dissolved Gas Abatement Plan and Juvenile Fish Bypass Operating Plan, as revised (Item VI-3).

III. Agreements

1. There were no agreements discussed during today's conference call.

IV. Review Items

1. There are no items currently available for review.

V. Documents Finalized

1. There are no documents that have been recently finalized.

Attachment A – List of Attendees

Name	Role	Organization
John Ferguson	Aquatic SWG Chairman	Anchor QEA, LLC
Kristi Geris	Administration/Technical Support	Anchor QEA, LLC
Andrew Gingerich	Aquatic SWG Technical Representative	Douglas PUD
Chas Kyger	Technical Support	Douglas PUD
Dave Robichaud	Observer	LGL Limited
Steve Lewis	Aquatic SWG Technical Representative	U.S. Fish and Wildlife Service
Breean Zimmerman	Aquatic SWG Technical Representative	Washington State Department of Ecology
Bob Rose	Aquatic SWG Technical Representative	Yakama Nation
Jason McLellan	Aquatic SWG Technical Representative	Colville Confederated Tribes