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Via Electronic Filing

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

February 26, 2016

Subject: Wells Hydroelectric Project No. 2149
2015 Total Dissolved Gas Report – License Article 401 (b)

Dear Secretary Bose:

Pursuant to Article 401(b) of the new 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 Report (TDG Report) for calendar year 2015. Article 401(b) requires Douglas PUD to file an annual TDG Report with the Federal Energy Regulatory Commission (FERC) by February 28th during each year of the new license.

The final 2015 TDG Report is attached as Appendix A to this letter and was reviewed and approved by 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).

The enclosed 2015 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. The pre-filing consultation record supporting the review and approval of the 2015 TDG Report can be found in Appendix B.

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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 – 2015 Total Dissolved Gas Report – Wells Project
2) Appendix B – Pre-filing consultation record for the 2015 TDG Report

Copy:
Mr. Charlie McKinney – Ecology, Yakima
Mr. Keith Kirkendall – NMFS, Portland
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Wells Aquatic Settlement Work Group
Mr. Tom Kahler – Douglas PUD
Mr. Andrew Gingerich – Douglas PUD

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APPENDIX A: 2015 TOTAL DISSOLVED GAS REPORT – WELLS PROJECT

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Wells Hydroelectric Project
Total Dissolved Gas Abatement Plan

2015 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 2016

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1 INTRODUCTION

The 2015 Wells Hydroelectric Project (Wells Project) Gas Abatement Plan (GAP) was approved by the Washington State Department of Ecology (Ecology) on February 11, 2015. 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 2015 monitoring season and describes the background, operations, and results of GAP implementation at the Wells Project in 2015. In addition, this report contains TDG performance for the Wells Project following the completion of the 2015 fish passage season, towards measuring TDG performance outside of the fish passage season. Data summarized in this report includes monitoring from January 1, 2015 to December 31, 2015.

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® HYDROLAB MiniSonde 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.

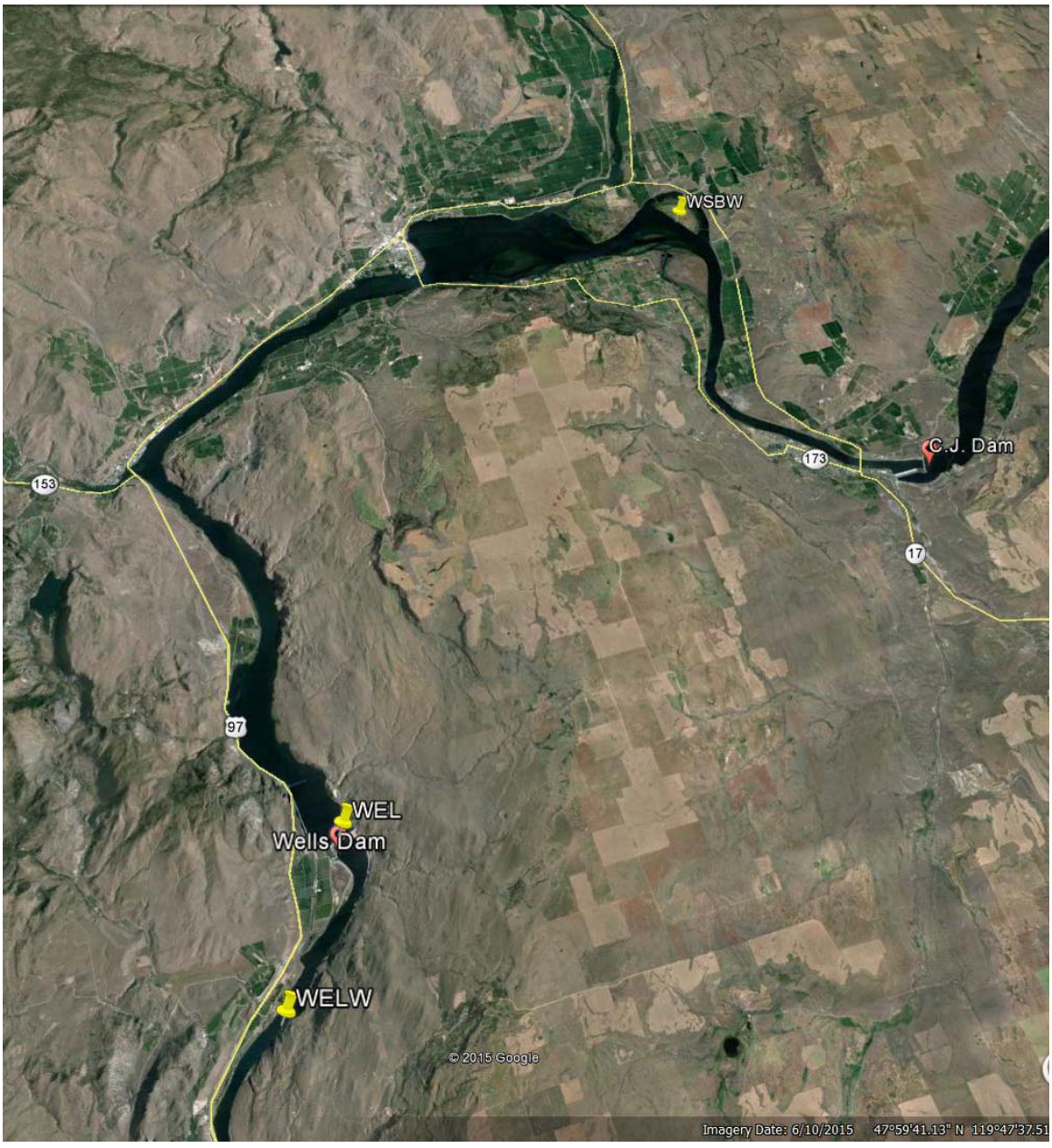

Figure 1. TDG fixed monitoring stations (yellow pins) above and below the Wells Project

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 2015 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 2015 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 2011-2015 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. Turbine units 4 and 5 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 2015, the GAP recommended moving spill back to the spillbays above turbine unit 7 when forced spill exceeded 53 kcfs, since turbine unit 7 was operable prior to the 2015 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 2015 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

Towards the end of 2015 the Washington Department of Ecology designated a new 401 Certification and Hydroproject 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). However, beginning with the 2015 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 2015 Fish Passage Season started on April 9 (0:00 hrs) and ended at midnight on August 19th at Wells Dam. 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 2015 show that average monthly flows between April and August ranged from 106.2 to 163.7 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, 1969-2015.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
2015	130.2	144.3	134.5	109.6	113.1	106.6	101.5	111.0	71.9	68.5	87.1	86.7	107.1
Average since 1969	108.8	107.8	106.5	116.7	150.0	163.7	135.2	106.2	75.3	75.7	87.7	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	
2006-2015 (10 year Mean)	106.3	95.7	99.2	129.6	161.8	182.1	149.4	109.8	65.2	66.5	84.1	97.7	112.4

Average monthly flows during the first three months of 2015 were noticeably higher than historic norms; the months of January through March saw 120-134% of normal flows (Figure 2 inset). A wet spring was followed by a reduction in average flows and the apparent absence of a normal freshet in June 2015 (Figure 2). Columbia River flows at Wells Dam in 2015 were well below averages in all months of the fish passage season except August when compared to historic monthly flows (1969-2015; Figure 2). Flows from August to December were normal and moderate in 2015.

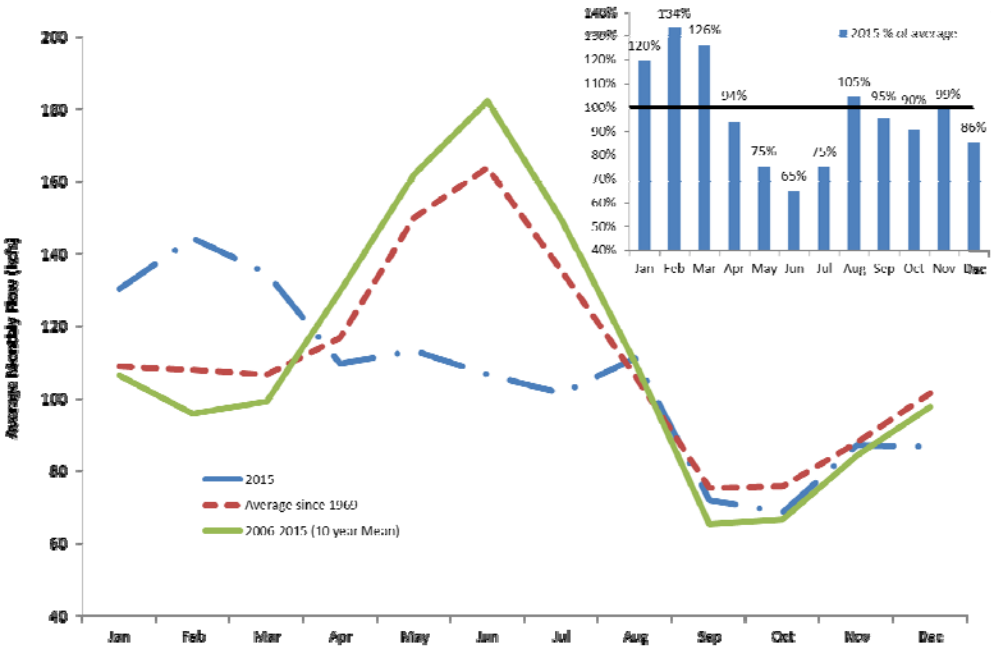

Figure 2. 2015 monthly flows compared to historic normal and averages. The blue bars in the inset figure represent the percent of average flows observed in 2015 relative to historic norms.

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2.2 Fish Spill 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 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 2012-2015 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).

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Late winter and spring flows (Jan to March) at Wells Dam were much higher than average historic flows. However, flows in May, June, and July were well below historic norms. Large spill volumes from May through July are characteristic of normal freshet conditions observed at Wells Dam. Flows during these months are associated with winter snowpack melt or "freshet run-off" in the upper-Columbia River including Columbia River drainage located in Canada. However, 2015 flows were atypical and characterized by a wet late winter and early spring and a relatively dry spring and summer period.

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 2015. 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 2015.

3.2 Biological Monitoring

The 2015 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 2015, 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.

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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.

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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% (September 1 – March 31). Additionally, there were three compliance criteria for the 2015 fish passage adjustment that must be met in association with operation at the Wells Project as described in the 2015 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 (January 1 to March 31 and September 1 to December 31). 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 but occurred in 2015. In the preceding months (January to March) leading up the fish passage season the Wells Tailrace sensor recorded n = 6 days where observed values were at or above 110%. These days included 2/14 (4 hours), 2/19 (1 hour), 2/21 (1 hour), 2/27 (3 hours), 3/21 (3 hours), and 3/24 (3 hours). Post event analysis suggests that the exceedances were associated with unscheduled discharges from the upstream federal Columbia River projects and unexpectedly high incoming flows with no actionable option(s) to schedule load and prevent exceeding the 781 msl Project Elevation.

Following the completion of the fish passage season on August 31st there were no hourly values above 110% recorded (September to December).

3.5.2 Fish Passage Season Compliance

Wells Tailrace 125% hourly standard

No exceedances of the 125% hourly tailrace criterion occurred in 2015 (Table 2).

Wells Tailrace 120% 12C-High standard

No exceedances of the 120% 12C –High tailrace criterion occurred in 2015 (Table 2).

Rocky Reach Forebay 115% 12C-High standard

No exceedances of the 115% 12C –High Rocky Reach Forebay criterion occurred in 2015 (Table 2; Figure 3).

3.5.3 Yearly TDG Compliance Summary

The following table summarizes TDG compliance at the Well Project for the entire 2015 season.

Table 2. 2015 TDG compliance summary.

	Compliance
Wells Tailrace 125% hourly standard	
Days out of compliance	0
Fish passage season	152
DCPUD compliance	**100%**
Wells Tailrace 120% 12C-High standard	
Days out of compliance	0
Fish passage season	152
DCPUD compliance	**100%**
Rocky Reach Forebay 115% 12C-High standard	
Days out of compliance	0
Fish passage season	152
DCPUD compliance	**100%**
Wells Tailrace 110% (Non-fish passage season standard)	
Days out of compliance	6
Fish passage season	213
DCPUD compliance	**97.2%**

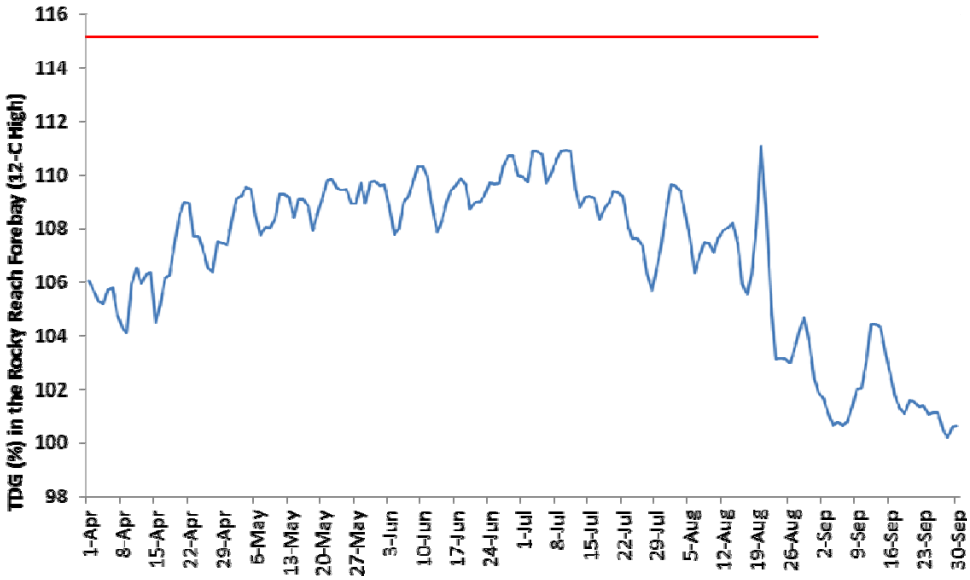

Figure 3. **12C-High values in the Rocky Reach forebay during the 2015 fish passage season. The 115% standard is represented by the solid red line. Data courtesy of Chelan PUD.**

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 2015 (Year 2), 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 2015 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 2016, with the first year data collection (pilot) expected to begin in the spring of 2017. Adaptive management and implementation of the Spill Playbook and biological monitoring (i.e., GBT monitoring in biota, as needed) continued in 2015 and is expected to continue in 2016.

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4.2 Operational

Flows at Wells Dam were above normal in early 2015 but below normal during the juvenile 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 these early spill events was six days were values slightly above 110% were recorded in the Wells tailrace. Historically, Douglas PUD has not had difficultying meeting the 110% standard outside of the fish bypass season.

Wells Dam demonstrated exceptional performance during the fish passage season 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 approved GAP during the entire 2015 fish passage season utilizing the lessons learned during previous years of spill study at the Wells Project. The 2015 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 conducted during the 2015 monitoring season.

5 CONCLUSIONS

TDG performance at Wells Dam during the 2015 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 current turbine rebuild that provides only 9 out of 10 units to operate during the peak hydrograph reduces the amount of water that can be generated by approximately 20 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.

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6 REFERENCES

Bickford, S. A., J. R. Skalski, R. Townsend, S. McCutcheon, R. Richmond, R. Frith and R. Fechhelm. 2001. Project survival estimates for yearling summer steelhead migrating through the Wells Hydroelectric Facility, 2000.

Bickford, S. A., T. Kahler, R. Townsend, J. R. Skalski, R. Richmond, S. McCutcheon and R. Fechhelm. 2011. Project survival estimates for yearling Chinook migrating through the Wells Hydroelectric Project, 2010 (2010 spring migrant survival verification study).

EES Consulting, Carroll, J., ENSR, and Parametrix. 2007. Total Dissolved Gas Production Dynamics Study. Wells Hydroelectric Project. FERC No. 2149. Prepared by EES Consulting, Joe Carroll, ENSR, and Parametrix. Environmental Protection Agency (EPA). 1976. Quality Criteria for Water. PB-263943.

Gingerich, A., and B. Patterson. 2011. Douglas PUD Gas Bubble Trauma Biological Monitoring. 2011. Wells Hydroelectric Project. FERC No. 2149. Public Utility District No. 1 of Douglas County, East Wenatchee, WA.

National Marine Fisheries Service (NMFS). 2000. Endangered Species Act – Section 7 Consultation: Biological Opinion. Consultation on Remand for Operation of the Columbia River Power System and 19 Bureau of Reclamation Projects in the Columbia Basin. F/NWR/2004/00727. November 30, 2005. Pages 5-6, 5-7, 5-53, 10-9, and Appendix E: Risk Analysis.

Patterson B., and A. Gingerich. 2011. Memorandum to Pat Irle, Washington Department of Ecology re: Evaluation of TDG at Wells Dam, 2011 mid-season analysis. August 17, 2011.

Pickett, P., H. Rueda, M. Herold. 2004. Total Maximum Daily Load for Total Dissolved Gas in the Mid-Columbia River and Lake Roosevelt. Submittal Report. Washington Department of Ecology, Olympia, WA. U.S. Environmental Protection Agency, Portland, OR. June 2004. Publication No. 04-03-002.

Politano, M., A. Arenas Amado and L. Weber. 2009. An Investigation into the Total Dissolved Gas Dynamics of the Wells Project (Total Dissolved Gas Evaluation). Report prepared by IIHR-Hydroscience & Engineering, University of Iowa, Iowa City, Iowa.

Skalski, J. R., G.E. Johnson, C.M. Sullivan, E. Kudera, and M.W. Erho. 1996. Statistical evaluation of turbine bypass efficiency at Wells Dam on the Columbia River, Washington. Canadian Journal of Fisheries and Aquatic Sciences 53:2188-2198.

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APPENDIX B – PRE-FILING CONSULTATION RECORD FOR THE 2015 TDG REPORT

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NOTICE TO THE AQUATIC SETTLEMENT WORK GROUP TO REVIEW THE 2015 TDG REPORT

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From: Kristi Geris <kgeris@anchorqea.com>
Sent: Tuesday, January 05, 2016 5:23 PM
To: Andrew Gingerich; Bob Rose; Chris Sheridan; Harris, Anna (ECY); Jason McLellan; Patrick Verhey (Patrick.Verhey@dfw.wa.gov); 'Steve Lewis'; John Ferguson; Kristi Geris; Keith Hatch (Keith.Hatch@bia.gov); Bob Dach (Robert.dach@bia.gov)
Cc: Bao Le; Bill Towey (bill.towey@colvilletribes.com); 'Brad James'; 'Bret Nine'; 'Chad Jackson'; Charlie McKinney (cmck461@ecy.wa.gov); Chas Kyger; Donella Miller (mild@yakamafish-nsn.gov); Fortier, Ryan T (DFW); Jeff Korth; 'Jessi Gonzales'; Keith Kirkendall (Keith.Kirkendall@noaa.gov); Kirk Truscott; Mark Peterschmidt (mape461 @ecy.wa.gov); Mary Mayo; Paul Ward (warp@yakamafish-nsn.gov); Ralph Lampman (lamr@yakamafish-nsn.gov); Shane Bickford; Steve Parker
Subject: FW: 2015 TDG Report and 2016 Gas Abatement Plan/Bypass Operating Plan
Attachments: 2016_01_05 Douglas - Draft 2015 Wells Dam TDG Annual Report.doc; 2016_01_05 Douglas - Draft 2016 Wells Dam GAP and BOP.doc

Hi Aquatic SWG: please see the email below from Andrew and the attached Draft 2015 Wells Dam Gas Abatement Plan (GAP) and Total Dissolved Gas (TDG) Report and Draft 2016 Wells Dam GAP and Bypass Operating Plan (BOP) for review. The attached draft 2015 report and draft 2016 plan are available for a 30-day review period, with comments due to Andrew by **COB Monday, February 8, 2016**. Douglas PUD will request approval of the draft 2015 report and draft 2016 plan during the Aquatic SWG meeting on February 10, 2016.

The attached draft 2015 report and draft 2016 plan are also available for download from the Aquatic SWG Extranet site under: Documents > All by Mtg Date > 1/13/2016 (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: Tuesday, January 05, 2016 5:04 PM
To: Kristi Geris <kgeris@anchorqea.com>
Subject: 2015 TDG report and 2016 Gas Abatement Plan/Bypass Operating Plan

Hi Kristi, please distribute to the technical reps within the Aquatic SWG. Please make sure that we include BIA, and BLM.

As I discussed during the December call, every year at this time Douglas PUD provides two documents to the Aquatic SWG for consideration. The first summarizes TDG compliance during the previous year and the second provides the plans that will be in place to provide safe and effective passage of juvenile salmonids, meet TDG criteria, and operate the Project safely. The latter of these documents get reviewed concurrently with the HCP CC per our 401 Certification and FERC license requirements. These two documents are:

1. 2015 Annual TDG (GAP) Report
2. 2016 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 bypass season, which facilitates survival of downstream migrating fish. Both documents are attached for committee review and consideration. Douglas PUD is hoping to have them reviewed and approved by the Feb 10th call, since both are due to the FERC by Feb 28th.

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

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APPROVAL OF THE 2015 TDG REPORT FROM THE AQUATIC SETTLEMENT WORK GROUP

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Final Meeting Action Items

Aquatic Settlement Work Group

To: Aquatic SWG Parties **Date**: February 11, 2016

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

Re: Final Action Items of the February 10, 2016 Aquatic SWG Meeting

Below is a summary of Action Items from the Aquatic SWG meeting that was held in-person at Wells Dam in Azwell, Washington, on Wednesday, February 10, 2016, from 10:15 a.m. to 12:00 p.m. Attendees are listed in Attachment A. These action items include the following:

I. Summary of Action Items

1. Bob Rose will discuss internally the Colville Confederated Tribes' (CCT's) proposed criteria for culling juvenile white sturgeon, and will report back to the Aquatic SWG (Item VI-1).
2. Steve Lewis will investigate what actions are required of agencies conducting Pacific lamprey translocation activities in the Mid-Columbia Basin, with regard to Section 7 consultation with the U.S. Fish and Wildlife Service (USFWS; Item VI-1).
3. Bob Rose will provide a report detailing the 2015 Yakama Nation (YN) Lamprey Translocation Releases in the Methow Basin, and the YN Pacific Lamprey Supplementation and Monitoring Frameworks, once available, to Kristi Geris for distribution to the Aquatic SWG (Item VI-1).
4. John Ferguson will follow-up with Bob Rose regarding YN approval of the 2016 Lamprey Approach, Passage, and Enumeration Study Plan, as revised (Item VI-3).
5. **The Aquatic SWG meeting on March 9, 2016, will be held by conference call (Item VII-1).**

II. Summary of Decisions

1. The Aquatic SWG members present approved the 2015 Juvenile Lamprey Habitat Evaluation Study Report (Item VI-2).

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2. The Aquatic SWG members present approved the 2016 Lamprey Approach, Passage, and Enumeration Study Plan, as revised (Item VI-3).
3. The Aquatic SWG members present approved the 2016-2017 Bull Trout Passage and Take Monitoring at Wells Dam and Twisp River Weir Study Plan, contingent on incorporating comments received from USFWS, which were reviewed and discussed during the meeting on February 10, 2016 (Item VI-4).
4. The Aquatic SWG members present approved the 2015 Wells Dam Gas Abatement Plan (GAP) and Total Dissolved Gas (TDG) Report, contingent on approval by the Washington State Department of Ecology (Ecology; Item VI-5).
5. The Aquatic SWG members present approved the 2016 Wells Dam GAP and Bypass Operating Plan (BOP), contingent on approval by Ecology (Item VI-6).
6. The Aquatic SWG members present approved the 2016 Aquatic Settlement Agreement (ASA) Action Plan (Item VI-7).

III. Agreements

1. The Aquatic SWG members present agreed to a March 1, 2016, deadline to transfer surplus white sturgeon offsite that are in excess of the Douglas PUD 5,000-fish White Sturgeon Program, in order to grow program fish to the target size at release (Item VI-9).

IV. Review Items

1. Kristi Geris sent an email to the Aquatic SWG on February 8, 2016, notifying them that the Draft 2015 Aquatic Nuisance Species Management Plan Annual Report is available for a 30-day review period, with edits and comments due to Chas Kyger by Tuesday, March 8, 2016.

V. Documents Finalized

1. The Final 2016 Wells Dam GAP and BOP that was approved by the Aquatic SWG on February 10, 2016, and by the Wells Habitat Conservation Plan (HCP) Coordinating Committee on January 26, 2016, was distributed to the Aquatic SWG by Kristi Geris following the Aquatic SWG meeting on February 10, 2016 (Item VI-6).
2. The Final 2015 Juvenile Lamprey Habitat Evaluation Study Report that was approved by the Aquatic SWG on February 10, 2016, was distributed to the Aquatic SWG by Kristi Geris on February 11, 2016 (Item VI-2).

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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
Chad Jackson	Technical Support	Washington Department of Fish and Wildlife
Jason McLellan	Aquatic SWG Technical Representative	Colville Confederated Tribes

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APPROVAL OF THE 2015 TDG REPORT FROM WASHINGTON DEPARTMENT OF ECOLOGY

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From: McKinney, Charlie (ECY) <cmck461@ECY.WA.GOV>
Sent: Thursday, February 18, 2016 12:01 PM
To: Andrew Gingerich
Cc: Peterschmidt, Mark F. (ECY)
Subject: TDG Reports

February 18, 2016

To: Andrew Gingerich, Douglas County PUD

From: Charles McKinney, WA Dept. of Ecology, Water Quality Program

The Washington Department of Ecology (Ecology) has reviewed and approves the 2015 GAP and TDG report submitted by Douglas PUD for the Wells Project.
Ecology has also reviewed and approves the 2016 Gas Abatement Plan, Spill Play Book and Bypass Operating plan.

Ecology grants PUD District No. 1 of Douglas County an adjustment to the 110% TDG standard for the purposes of 2016 Spill Season, as authorized under WAC 173-201A-200(1)(f)(ii), in order to facilitate the passage of ESA listed salmonids at the Project.

Please let me know if you have any questions.

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Document Content(s)

Final 2015 Wells Total Dissolved Gas Annual Report.PDF.....1-32