
Final Report

**Water Quality Monitoring During
Turbine Venting Tests at the Iron
Gate Powerhouse, Klamath
Hydroelectric Project**

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Introduction

Purpose and Objective

This report describes the results of water quality monitoring in the Klamath River downstream of the Iron Gate powerhouse during turbine venting tests at the powerhouse during 2008. The turbine venting tests were conducted to support the ongoing assessment of measures to improve water quality in the vicinity of the Klamath Hydroelectric Project (Project). The primary objective of the turbine venting tests and associated water quality monitoring was to evaluate the ability and effectiveness of turbine venting to enhance dissolved oxygen (DO) in the tailwaters downstream of Iron Gate dam and powerhouse.

The Iron Gate powerhouse contains a single Francis-type turbine with a generating capacity of 18 megawatts (MW) and hydraulic capacity of 1,550 cubic feet per second (cfs). Like many turbines of similar design, the Iron Gate unit is equipped with an air admission system, which normally admits air into the turbine draft tube¹ at low wicket gate² openings to reduce or eliminate cavitation³ and residual draft tube swirl⁴. As the induced air travels through the draft tube and into the powerhouse tailwaters, a fraction of the oxygen (and nitrogen) goes into solution, increasing DO (and dissolved nitrogen). A potentially efficient method of improving DO is available by configuring the air admission valve to remain open at all gate openings (i.e., turbine venting).

This report is a companion document to a report by Principia Research that describes the effects of the turbine venting tests on the operation and performance of the powerhouse generating unit. Principia (2008) describes the effect of air admissions on generation efficiency, and quantifies the amount of air drawn into the unit through the air admission system over a range of turbine flows.

Background

PacifiCorp is implementing a Reservoir Management Plan (RMP) for improving water quality in Copco and Iron Gate reservoirs (PacifiCorp 2008). The RMP is evaluating the effectiveness and feasibility of several technologies and measures to more effectively control water quality conditions in Copco and Iron Gate reservoirs that result from significant loads of organic and nutrient matter originating from upstream of the Project. The Project

¹ The draft tube is the specially shaped outlet of the turbine unit.

² The wicket gate is a set of guide vanes that direct inflowing water tangentially to the turbine runner. This radial flow acts on the runner vanes, causing the runner to spin. The wicket gate is adjustable to allow efficient turbine operation for a range of water flow conditions.

³ Cavitation is the phenomenon of formation of bubbles in water flowing through the turbine where the pressure of the water falls below its vapor pressure. Cavitation is an undesirable occurrence because it can cause damage to components, vibrations, and a loss of efficiency.

⁴ Francis turbines operated at partial discharge can have a high level of residual flow swirl at the draft tube inlet in the event of a mismatch between the swirl generated by the wicket gate and the angular momentum of flow on the turbine runner. This residual flow swirl can result in undesirable effects on turbine operation efficiency.

reservoirs on the Klamath River (i.e., Iron Gate, Copco, and J.C. Boyle reservoirs) are nutrient-enriched (eutrophic) due to large inflow loads of nutrient and organic matter from upstream sources, notably Upper Klamath Lake (UKL). In general, eutrophic lakes strongly stratify and typically experience low DO levels in the deeper water during summer (Thornton et al. 1990, Holdren et al. 2001, Cooke et al. 2005).

Daily mean dissolved oxygen conditions are at or near saturation throughout the Klamath River downstream of Iron Gate dam due to the many rapids and riffles in the river that provide mechanical reaeration (PacifiCorp 2008). An exception is the reach immediately below Iron Gate dam during late summer and fall periods, where relatively deep releases from Iron Gate reservoir entrain water, resulting in discharges from the dam of water with low dissolved oxygen concentration.

An important goal of the RMP is to assess potential techniques for increasing DO in Project-affected reaches, including downstream of Iron Gate dam and powerhouse. The RMP specifically identifies turbine venting as one of the potential techniques. In concept, turbine venting uses an air admission valve to allow the induction of air into the water passageways within a turbine to aerate the releases from a dam. Such turbine aeration utilizes the low pressures of the water passing through the turbine to entrain air for tailrace DO enhancement (Cooke and Kennedy 1989, Thornton et al. 1990, MEI 2005).

In 2005, MEI (2005) conducted a preliminary assessment of the potential use of turbine venting at the Iron Gate powerhouse. MEI (2005) used modeling to estimate air admission rates, DO uptake, and potential total dissolved gas (TDG) for the observed powerhouse operating conditions. MEI (2005) estimated that turbine air admission could result in DO uptake of 1.5 to 2.7 mg/L depending on turbine operation conditions.

In part based on the MEI (2005) assessment, the Final Environmental Impact Statement (FEIS) for the Project issued by the Federal Energy Regulatory Commission (FERC) concluded that turbine venting would be effective in achieving increases in dissolved oxygen in the Klamath River downstream of Iron Gate dam. On this basis, FERC (2007) recommended a measure to include turbine venting and follow-up DO monitoring at Iron Gate. In response to FERC's recommendation, PacifiCorp incorporated the turbine venting study in the RMP, and conducted the study in 2008.

Methods

Testing took place on two occasions: (1) August 18-22, 2008; and (2) October 9-12, 2008. During the two events, turbine venting testing was performed over a range of turbine airflow conditions between the air admission valve fully open to fully closed. Because the flow releases at Iron Gate are subject to regulated instream flow requirements, the range of turbine flow conditions was limited to 990 to 1500 cfs.

The water quality monitoring during turbine venting tests consisted principally of continuous and spot (instantaneous) measurements of DO and TDG in the tailwaters and the river downstream of Iron Gate dam and powerhouse. Data were collected with two types of recording instruments: (1) YSI Datasonde; and (2) Hydrolab Minisonde. The YSI Datasonde was used to measure and record DO in milligrams per liter (mg/L) and percent saturation (% saturation). The Hydrolab Minisonde was used to measure and record TDG in millimeters of mercury (mmHg) and percent saturation (% saturation).

During the August 2008 event, a continuously-recording YSI Datasonde and Hydrolab Minisonde was deployed downstream of Iron Gate dam near the Iron Gate Hatchery bridge (at RM 189.8). A second Hydrolab Minisonde was deployed in the Klamath River further downstream near Blue Heron Park (RM 188.6) to measure TDG, while a second YSI Datasonde was used for taking spot measurements of DO at various locations downstream of Iron Gate dam. Apparent malfunction resulted in non-collection of data by the YSI Datasonde deployed near the Iron Gate Hatchery bridge. Fortunately, a similar datasonde had been deployed throughout the summer by the Karuk Tribe nearby at the USGS Gaging Station 11516530 (RM 189.5). The Karuk Tribe graciously provided the provisional data collected by their datasonde covering the August 2008 event (S. Corum, pers. comm., October 2008). This Karuk Tribe data is included along with the other data discussed in the *Results* section that follows.

During the October 2008 event, continuously-recording YSI Datasonde and Hydrolab Minisonde units were deployed at both monitoring stations: (1) downstream of Iron Gate dam near the Iron Gate Hatchery bridge (RM 189.9); and (2) the Klamath River further downstream near Blue Heron Park (RM 188.6). Continuous monitoring was supplemented by spot measurements using other instruments at the Iron Gate powerhouse tailrace (RM 190.0), the Klamath River at the USGS Gaging Station 11516530 (RM 189.5), and the Klamath River at Klamathon Bridge (RM 184.2).

Prior to deployment, the instruments were calibrated and programmed to collect water quality readings at 30-minute intervals. The instruments were set to begin collecting baseline data prior to testing (i.e., during existing regular operations). Continuous monitoring and spot measurements occurred during testing, and data continued to be collected for an additional 24 hours after testing ceased and regular operations resumed.

Results

Test Conditions

August 2008

During the August event, turbine venting testing was performed over a range of turbine airflow conditions between the air admission valve fully open to fully closed. From a zero to 38 percent wicket gate opening, the valve is fully open. At 38 percent, the valve begins closing and is fully closed at gate openings greater than 65 percent (Principia 2008).

Monitoring began on August 18 prior to testing during existing regular powerhouse operations. The existing regular operations included a wicket gate opening of about 60 percent with the air admission valve slightly open. The turbine penstock discharge was 990 cfs, and the river discharge measured at the USGS Gaging Station 11516530 (below Bogus Creek) was 1030 cfs.

At about noon on August 19, the wicket gate opening was adjusted to about 23 percent with the air admission valve fully open. This condition remained until about 3 PM on August 20, when flow was increased to a turbine penstock discharge of about 1500 cfs with a river discharge measured at the USGS Station (11516530) of 1560 cfs. A series of gate opening adjustments were made until about 6 PM to support a series of turbine efficiency measurements by Principia (2008). The turbine efficiency measurements made during this three-hour period on August 20 were conducted at gate openings from 30 percent to about 85 percent at 5 percent increments. The fully-closed valve setting at the 85 percent gate openings was held until about mid-day on August 21, when the regular wicket gate opening of about 60 percent was reinstated with the air admission valve slightly open.

October 2008

The October monitoring event was conducted to obtain additional water quality measurements during turbine venting with the air admission valve fully open. This event was conducted only to obtain the additional water quality measurements. No additional turbine efficiency data was collected. The river discharge measured at the USGS Gaging Station 11516530 (below Bogus Creek) remained at 1320 to 1340 cfs during this event.

Monitoring began on October 9 prior to turbine venting during existing regular powerhouse operations (i.e., a wicket gate opening of about 60 percent with the air admission valve slightly open). At 8:30 AM on October 10, the air admission valve was fully opened at a gate opening of about 30 percent and venting occurred for the following 24 hours. Both instantaneous and continuous data were collected for an additional 24 hours after regular operations resumed.

Water Quality Measurements During the August 2008 Test

Dissolved Oxygen

Continuous measurements of DO from the Klamath River below Iron Gate powerhouse during the August 2008 test are shown in Figures 1 and 2. The continuous measurement data is provided in Appendix A.

Test conditions during the August test period are indicated on Figures 1 and 2 by a hatched line with a value determined as follows: (1) positive or negative values indicate a condition when the turbine air admission valve was on or off, respectively; and (2) the magnitude of the values correspond to the percent opening of turbine wicket gates. The pre-test existing operation condition is represented on the plots by a value of +60, which corresponds to the current operation with the admission valve on at a 60 percent gate opening. The test condition when the air is fully on is represented on the plots by a value of +23 with the admission valve on at a 23 percent gate opening.

The continuous measurements of DO shown in Figures 1 and 2 indicate that turbine venting air admissions produced an increase in DO in turbine discharges to the river during the August 2008 test. The first evidence of this effect can be seen when the air admission valve was briefly shut off around noon on August 19, which appeared to cause a drop in DO of about 1 mg/L and 10 percent saturation (Figure 1).

This brief valve shut-off period was followed by a 27-hour period when the air admission system was fully on at a gate opening of 23 percent (shown on the later part of the Figure 1 plot and earlier part of the Figure 2 plot). During this “fully air on” period, DO ranged from a minimum of about 7.2 mg/L and 80 percent saturation to a maximum of about 8.6 mg/L and 96 percent saturation. By comparison, the previous day’s pre-test DO values ranged from a minimum of about 6.2 mg/L and 68 percent saturation to a maximum of about 8.3 mg/L and 93 percent saturation.

The “fully air on” condition remained until about 3 PM on August 20, when flow was increased to a turbine penstock discharge of about 1500 cfs with a river discharge measured at the USGS Station (11516530) of 1560 cfs. A spike in DO is evident at this time in Figure 2, when DO increased by about 1 mg/L and 10 percent saturation. Over the next few hours, a series of gate opening adjustments were made to support a series of turbine efficiency measurements by Principia (2008). Concurrent smaller responses in DO occurred during this short period (Figure 2).

At the conclusion of the series of gate opening adjustments, a “fully air off” condition (i.e., a fully-closed valve setting at the 85 percent gate openings) was held until about mid-day on August 21, when the regular wicket gate opening of about 60 percent was reinstated with the air admission valve slightly open. During this “fully air off” condition, DO values declined to a minimum of about 5.6 mg/L and 64 percent saturation to a maximum of about 8.3 mg/L and 94 percent saturation.

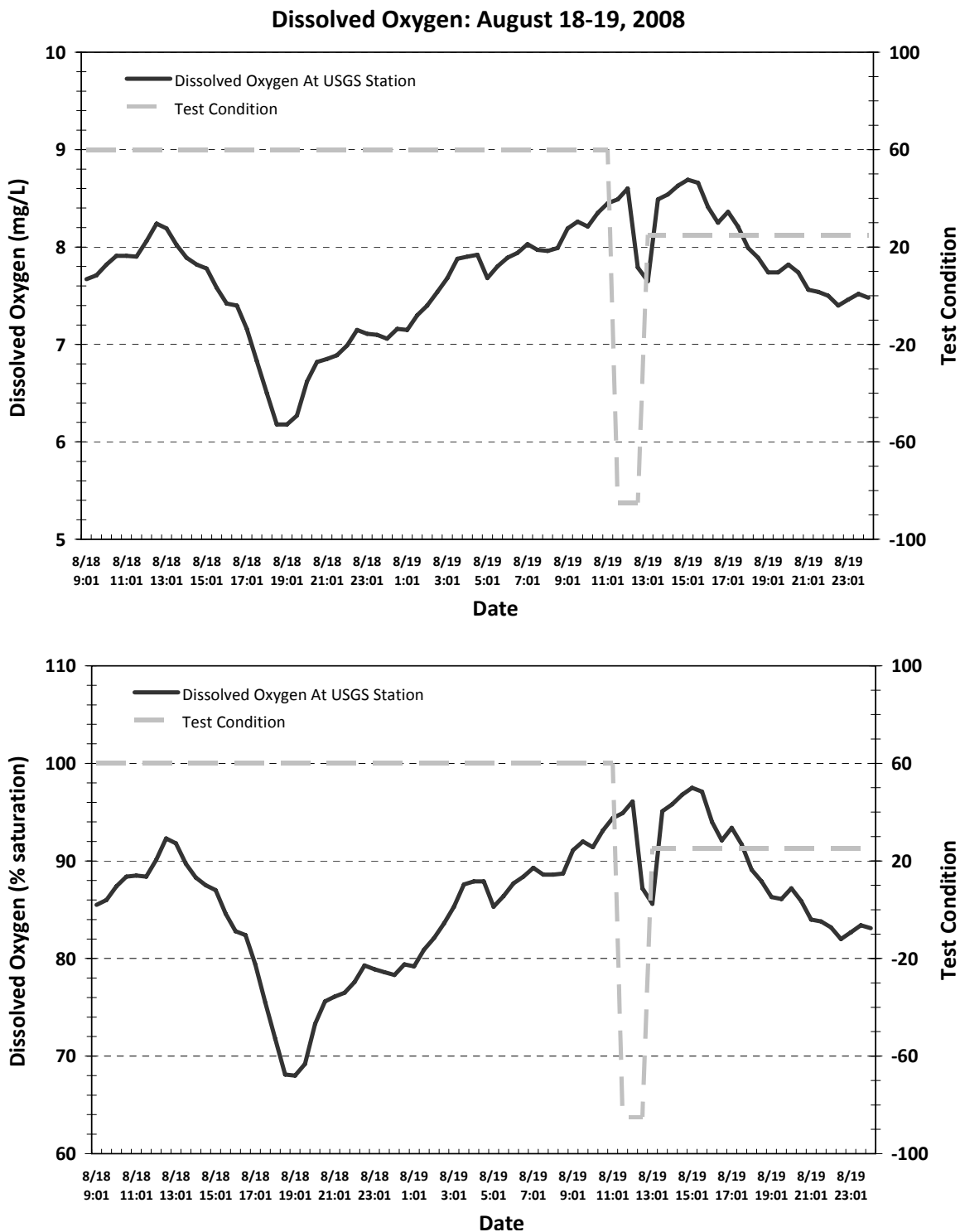


Figure 1. Continuous measurements of DO in mg/l (top plot) and percent saturation (bottom plot) from the Klamath River near the USGS Gage Station below Iron Gate powerhouse during August 18-19, 2008. Test conditions are indicated by the hatched line with a value determined as explained in the *Results* section of the report.

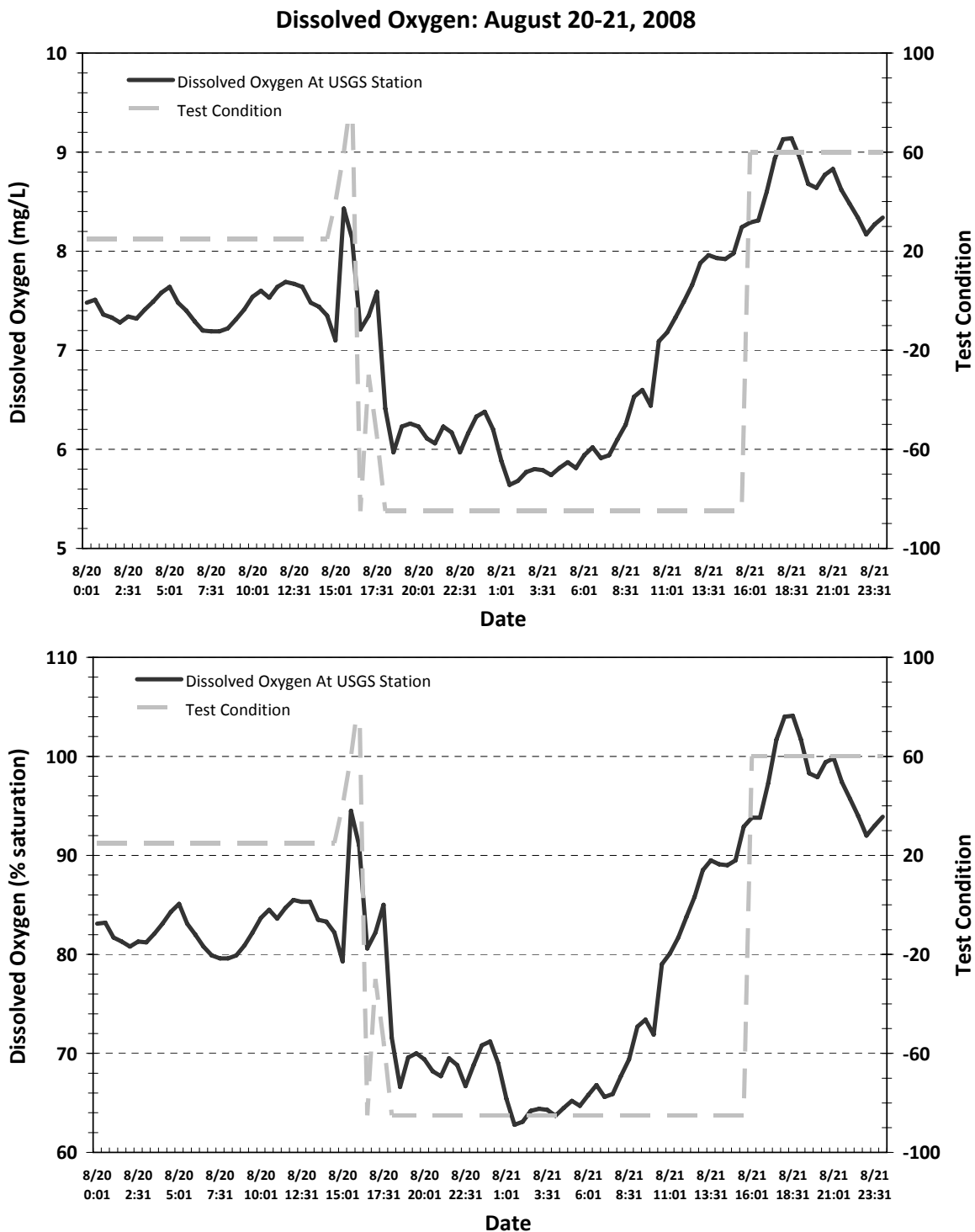


Figure 2. Continuous measurements of DO in mg/l (top plot) and percent saturation (bottom plot) from the Klamath River near the USGS Gage Station below Iron Gate powerhouse during August 20-21, 2008. Test conditions are indicated by the hatched line with a value determined as explained in the *Results* section of the report.

The changes in the continuous measurements of DO as described above suggest two main results. First, the air admission operation that is currently used at the Iron Gate powerhouse appears to provide an increase in DO on the order of about 1 mg/L and 10 percent saturation over what would occur without air admission. Second, additional air admission (turbine venting) appears to provide an additional increase in DO on the order of about 1 mg/L and 10 percent saturation over what occurs with the existing operation condition.

Spot (instantaneous) measurements of DO from various locations downstream of Iron Gate dam taken during the August 2008 test are provided in Appendix B. Maximum, mean, and minimum values from these spot measurements are shown in Figure 3. These maximum, mean, and minimum values were derived by combining measurements across locations during the portion of the August test period when conditions represented: (1) current, existing operations, (2) full air on conditions when turbine flows were about 1000 cfs, and (3) full air on conditions when turbine flows were about 1500 cfs.

The values shown in Figure 3 suggest that full air on conditions produced an increase in DO of up to about 2 mg/L and 20 percent saturation over what occurs with the existing operation condition. The values also suggest that powerhouse discharge may have an effect. In this case, the maximum, mean, and minimum values for the full air on conditions at 1000 cfs are greater than the values at 1500 cfs.

The maximum, mean, and minimum values from the spot measurements suggests a slightly greater increase in DO from turbine venting than is indicated based on the continuous data (Figures 1 and 2). This could be explained at least in part by the potential confounding factor of diurnal and spatial variability. For example, the spot measurements were taken at various times of the day when underlying natural diurnal changes in DO was occurring. This variability increases the uncertainty of the comparisons made based on these measurements. However, even taking such variability into account, the increases in DO from turbine venting indicated in Figure 3 generally support the continuous data results described above.

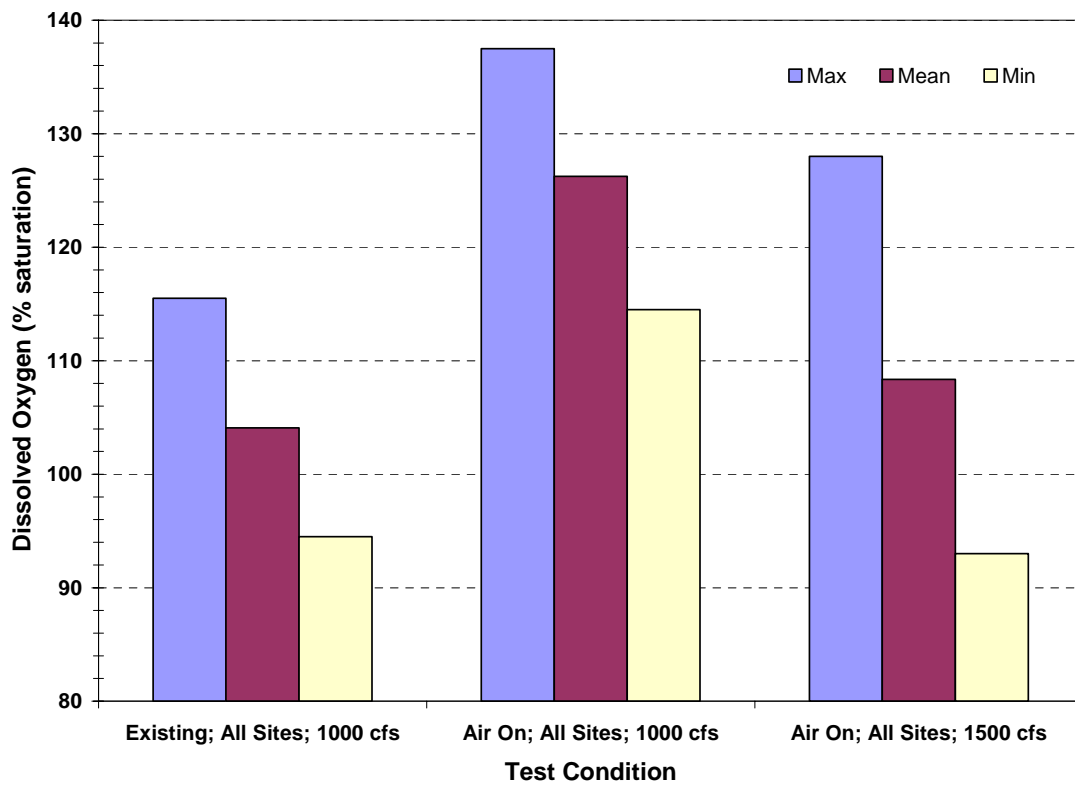
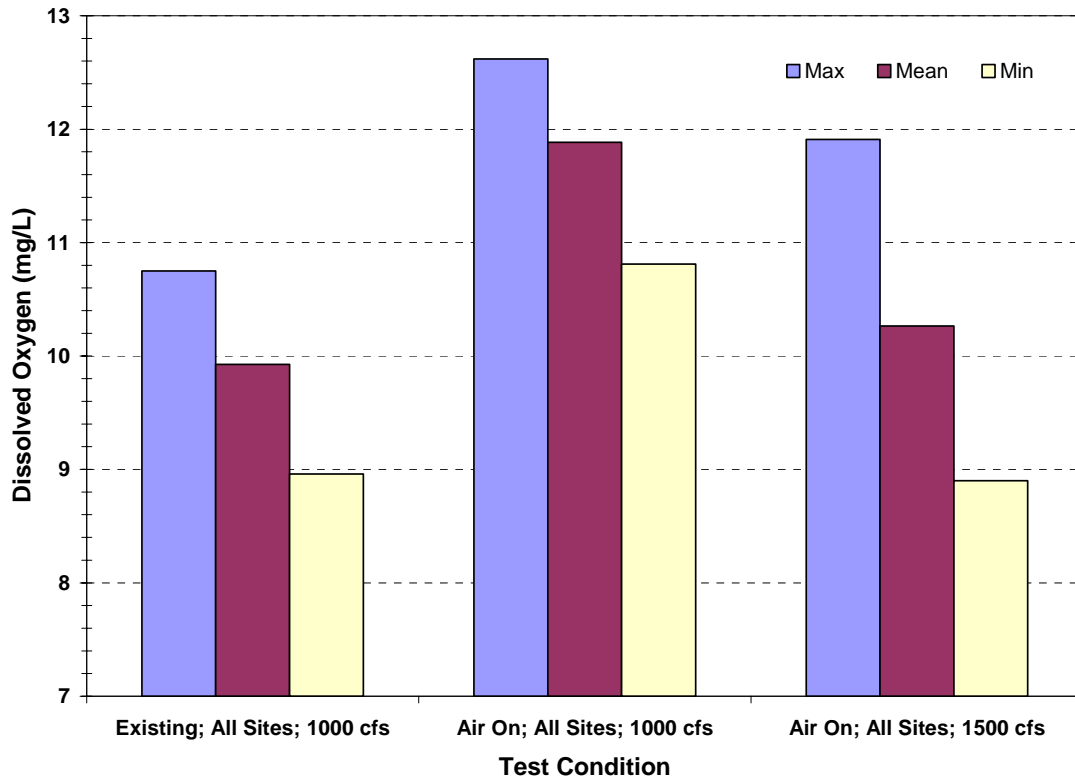


Figure 3. Maximum, mean, and minimum DO values in mg/L (top plot) and percent saturation (bottom plot) from spot (instantaneous) measurements taken at various locations below Iron Gate powerhouse during the August 2008 testing event.

Total Dissolved Gas

Continuous measurements of TDG from the Klamath River below Iron Gate powerhouse during the August 2008 test are shown in Figure 4. The continuous measurement data is provided in Appendix A.

The continuous measurements of TDG shown in Figure 4 indicate that turbine venting air admissions produced an increase in TDG in turbine discharges to the river during the August 2008 test. However, these increases were consistently less than those indicated for DO (Figures 1 and 2), and were consistently below 110 percent, which is the criteria established by the U.S. EPA to prevent fish harm from potential gas bubble disease (USEPA 1976).

Spot (instantaneous) measurements of TDG from various locations downstream of Iron Gate dam taken during the August 2008 test are provided in Appendix B. Maximum, mean, and minimum values from these spot measurements are shown in Figure 5. These maximum, mean, and minimum values were derived by combining measurements across locations during the portion of the August test period when conditions represented: (1) current, existing operations, (2) full air on conditions when turbine flows were about 1000 cfs, and (3) full air on conditions when turbine flows were about 1500 cfs.

The values shown in Figure 5 suggest that turbine venting (at full air on conditions) produced only small changes in TDG. Maximum TDG values indicate that all spot measurements of TDG during the August 2008 test period were below 110 percent.

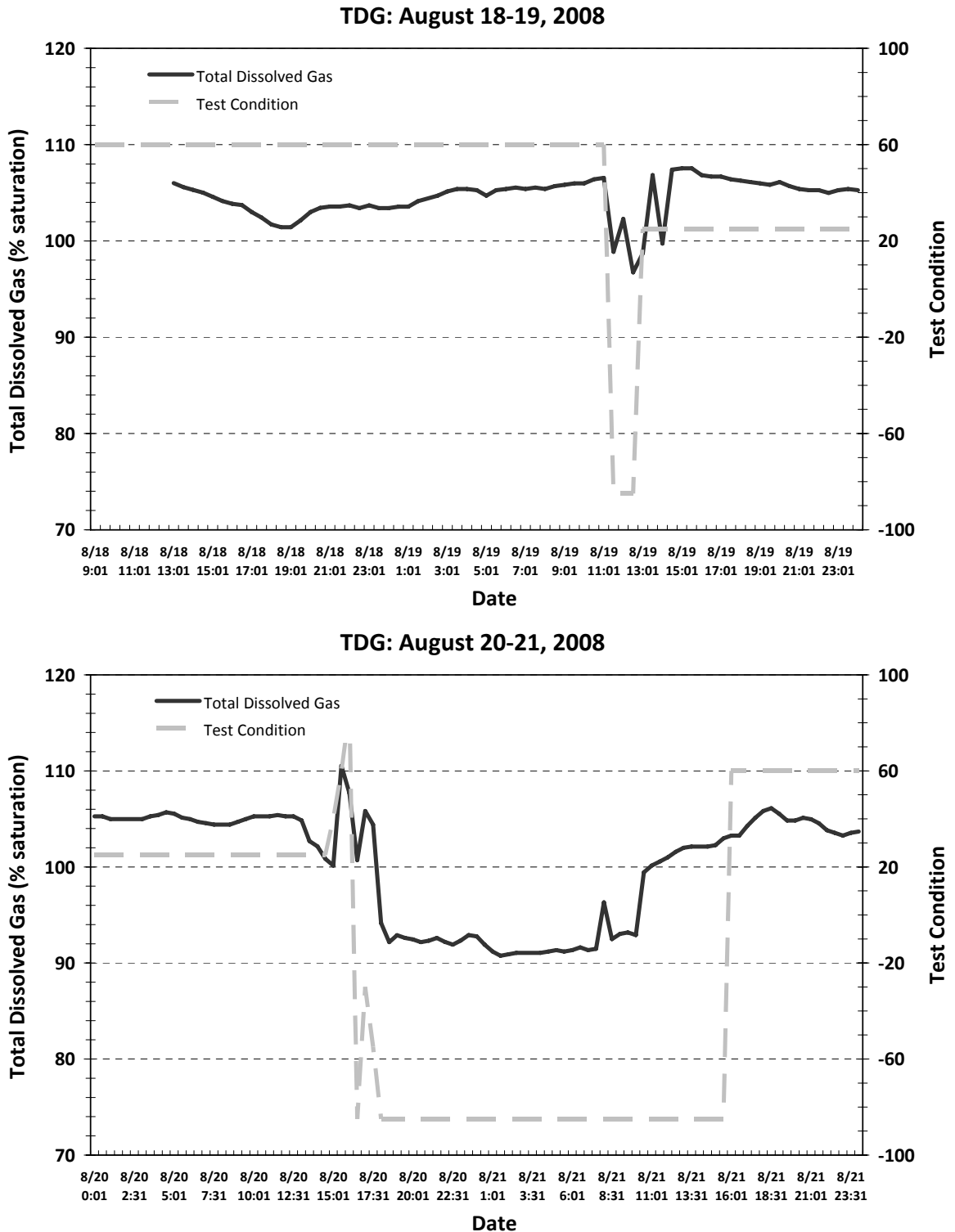


Figure 4. Continuous measurements of TDG (in percent saturation) from the Klamath River near the USGS Gage Station below Iron Gate powerhouse during August 18-19 (top plot) and August 20-21 (bottom plot). Test conditions are indicated by the hatched line with a value determined as explained in the *Results* section of the report.

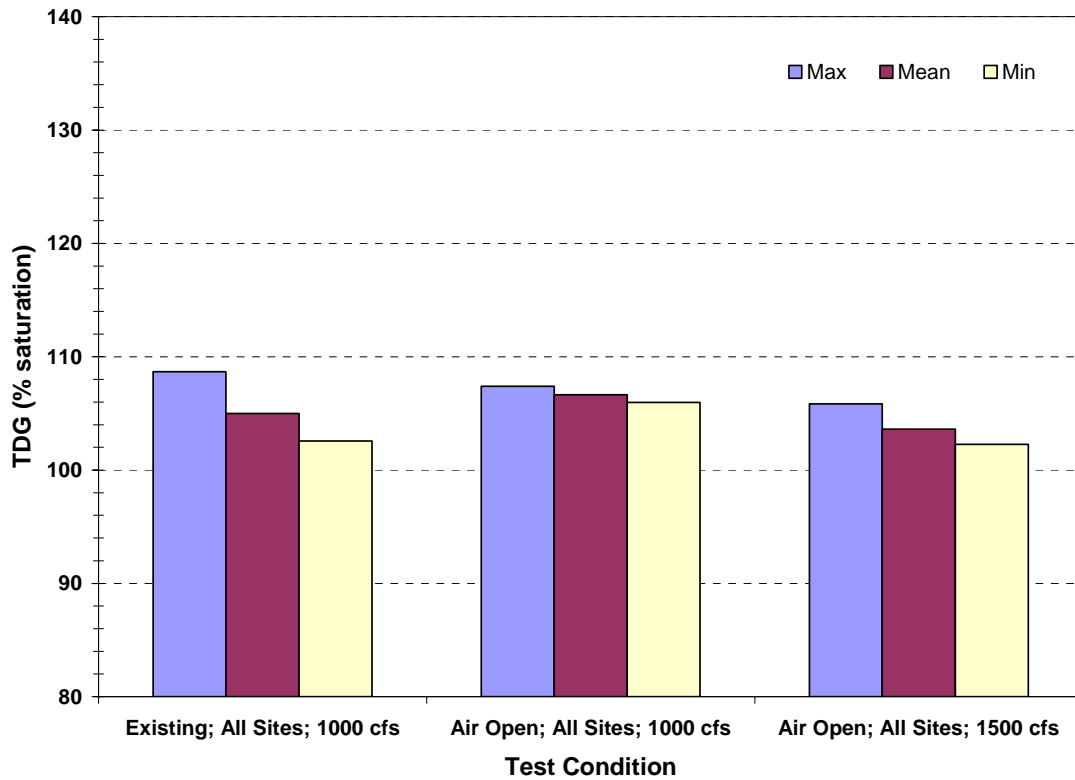


Figure 5. Maximum, mean, and minimum TDG values (in percent saturation) from spot (instantaneous) measurements taken at various locations below Iron Gate powerhouse during the August 2008 testing event.

Water Quality Measurements During the October 2008 Test

Dissolved Oxygen

Continuous measurements of DO from the Klamath River below Iron Gate powerhouse (near the Iron Gate Hatchery bridge) and near Blue Heron Park during the October 2008 test are shown in Figure 6. The continuous measurement data is provided in Appendix C.

Test conditions during the October test period are indicated on Figure 6 by a hatched line. The existing operation condition is represented on the plots by a value of +60, which corresponds to the current operation with the admission valve on at a 60 percent gate opening. The test condition when the air is fully on is represented on the plots by a value of +23 with the admission valve on at a 23 percent gate opening.

The continuous measurements of DO shown in Figure 6 indicate that turbine venting (air fully on) produced an increase in DO in turbine discharges to the river during the October 2008 test. A spike in DO is evident at the time that turbine venting (air fully on) commenced on October 10, when DO quickly increased by about 0.5 mg/L and 7 percent saturation (Figure 6). At the end of the turbine venting (air fully on) period on October 11, DO quickly decreased by a similar amount (Figure 6). However, in general, the range in DO values did not change much during the turbine venting (air fully on) condition, particularly in the Klamath River at Blue Heron Park further downstream.

Overall, the continuous measurements indicate that turbine venting provided less increase in DO during the October test than the previous August test. The lesser effect in October may be related to the reservoir beginning to destratify and there is a greater proportion of low-DO water from Iron Gate reservoir than is captured in the penstock to the powerhouse at this time. The consistently higher DO levels measured in the Klamath River at Blue Heron Park further downstream indicates that significant mechanical reaeration of river flow occurs over a relatively short distance downstream of Iron Gate dam.

Spot (instantaneous) measurements of DO from various locations downstream of Iron Gate dam taken during the October 2008 test are provided in Appendix D. Maximum, mean, and minimum values from these spot measurements are shown in Figure 7. These maximum, mean, and minimum values were derived by combining measurements across locations during the portion of the August test period when conditions represented: (1) current, existing operations, and (2) full air on conditions.

The values shown in Figure 7 suggest that full air on conditions produced little, if any increase in DO over what occurs with the existing operation condition. These values show a similar lack of change in the range in DO values as observed in the continuous data, with the exception of the spikes observed in the continuous data at the start and end of the turbine venting period (Figure 6).

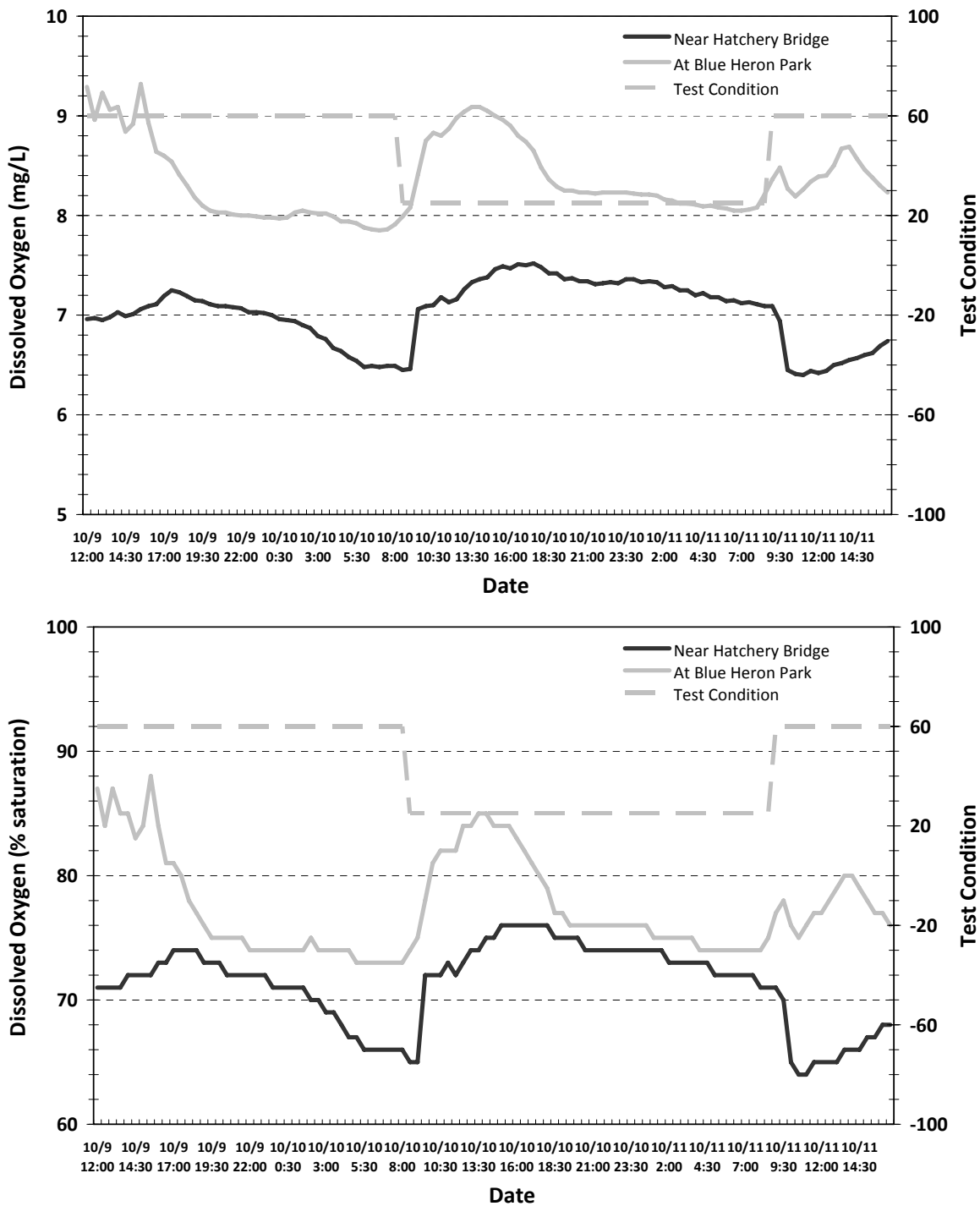


Figure 6. Continuous measurements of DO in mg/L (top plot) and percent saturation (bottom plot) from the Klamath River near the Iron Gate Hatchery bridge below Iron Gate powerhouse and near Blue Heron Park during October 9-11, 2008. Test conditions are indicated by the hatched line with a value determined as explained in the *Results* section of the report.

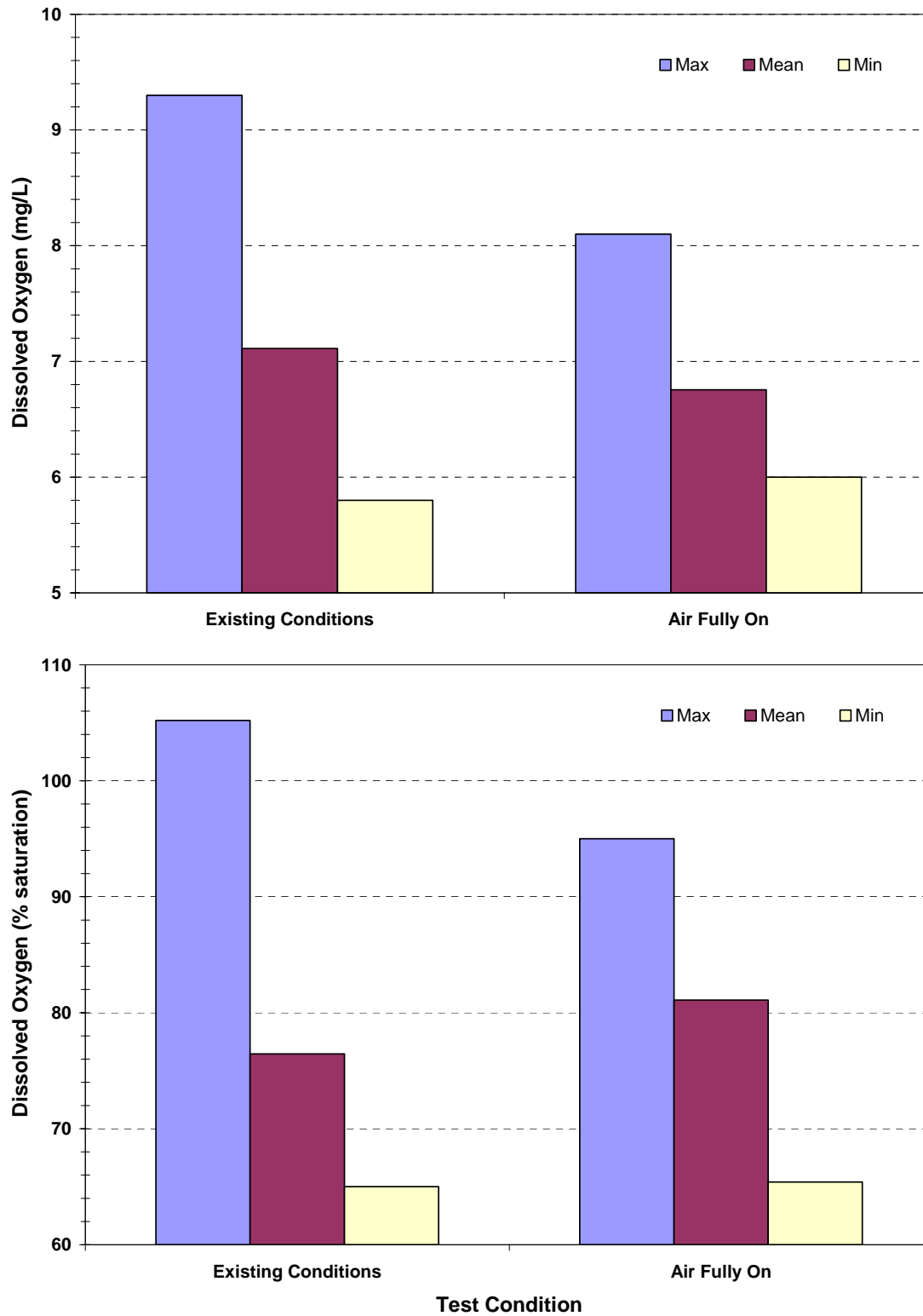


Figure 7. Maximum, mean, and minimum DO values in mg/L (top plot) and percent saturation (bottom plot) from spot (instantaneous) measurements taken at various locations below Iron Gate powerhouse during the October 2008 testing event.

Total Dissolved Gas

Continuous measurements of TDG from the Klamath River below Iron Gate powerhouse (near the Iron Gate Hatchery bridge) and near Blue Heron Park during the October 2008 test are shown in Figure 8. The continuous measurement data is provided in Appendix C.

The continuous measurements of TDG shown in Figure 8 indicate that turbine venting air admissions produced a modest increase in TDG in turbine discharges to the river during the October 2008 test. As with DO, a spike in TDG is evident at the time that turbine venting (air fully on) commenced on October 10, when TDG increased by about 4 percent saturation (Figure 8). At the end of the turbine venting (air fully on) period on October 11, TDG decreased by a similar amount (Figure 8). However, in general, the range in TDG values did not change much during the turbine venting (air fully on) condition. The continuous measurements of TDG were consistently below 110 percent.

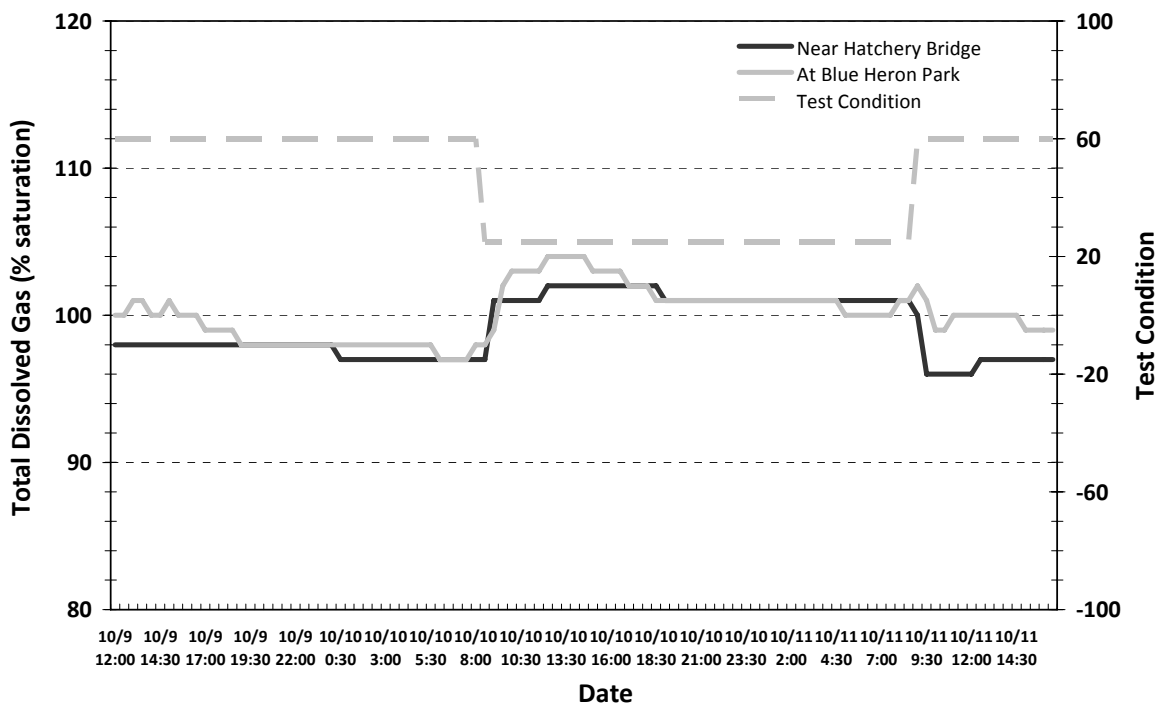


Figure 8. Continuous measurements of TDG (in percent saturation) from the Klamath River near the Iron Gate Hatchery bridge below Iron Gate powerhouse and near Blue Heron Park during October 9-11, 2008. Test conditions are indicated by the hatched line with a value determined as explained in the Results section of the report.

Spot (instantaneous) measurements of TDG from various locations downstream of Iron Gate dam taken during the October 2008 test are provided in Appendix D. Maximum, mean, and minimum values from these spot measurements are shown in Figure 9. These maximum, mean, and minimum values were derived by combining measurements across locations during the portion of the October test period when conditions represented: (1) current, existing operations, and (2) full air on conditions.

The values shown in Figure 9 suggest that turbine venting (at full air on conditions) produced only small changes in TDG. Maximum TDG values indicate that all spot measurements of TDG during the October 2008 test period were below 110 percent.

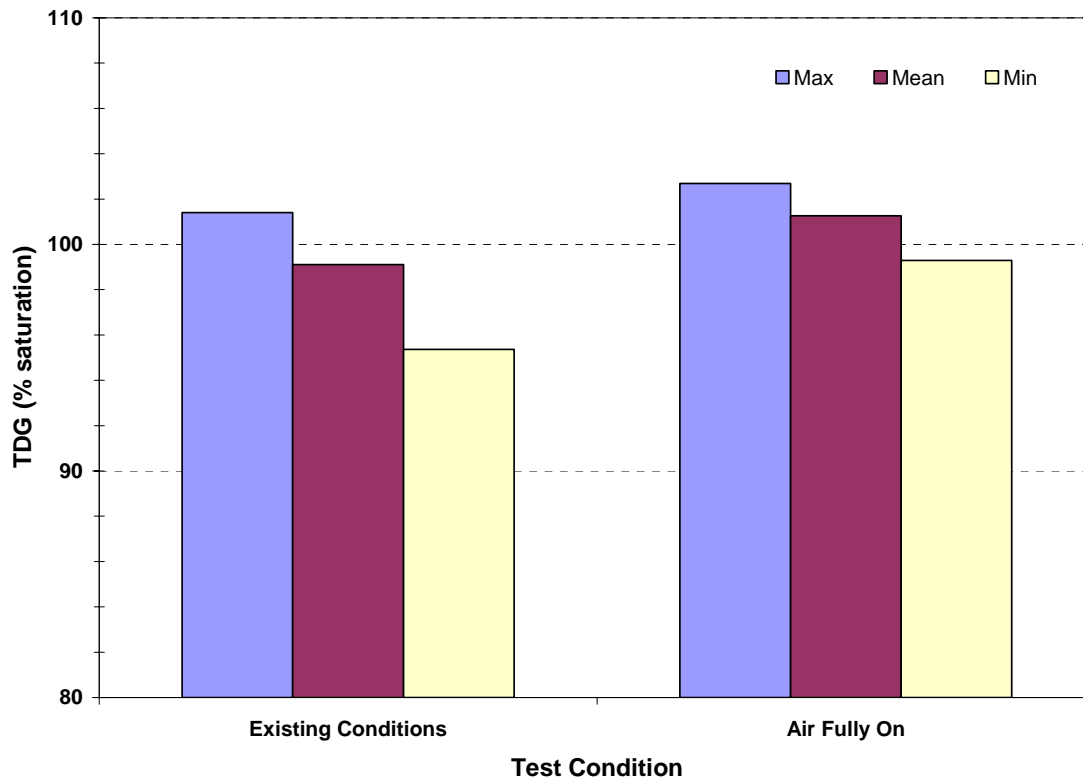


Figure 9. Maximum, mean, and minimum TDG values (in percent saturation) from spot (instantaneous) measurements taken at various locations below Iron Gate powerhouse during the October 2008 testing event.

Conclusions

Turbine venting tests and associated water quality monitoring were conducted during 2008 to evaluate the ability and effectiveness of turbine venting to enhance DO downstream of Iron Gate dam and powerhouse. Testing took place on two occasions: (1) August 18-22, 2008; and (2) October 9-12, 2008.

The results of these tests indicate that turbine venting provides enhancement of DO in the Klamath River just downstream of the Iron Gate powerhouse. Monitoring data taken during the tests suggests that full air on conditions produce an increase in DO of about 0.5 to 2 mg/L (about 7 to 20 percent saturation) over what occurs with the current air admission operation. These results are in reasonable agreement with the preliminary assessment by MEI (2005) of the potential use of turbine venting at the Iron Gate powerhouse. MEI (2005) estimated that turbine air admission could result in DO uptake of 1.5 to 2.7 mg/L depending on turbine operation conditions.

In general, the turbine venting provided greater increase in DO during the August test than the October test. The lesser effect in October may be related to a greater proportion of low-DO water from Iron Gate reservoir than is captured in the penstock to the powerhouse at that time. The consistently higher DO levels measured in the Klamath River at Blue Heron Park in October indicates that significant mechanical reaeration of river flow occurs over a relatively short distance downstream of Iron Gate dam.

TDG measurements indicate that turbine venting produces modest, if any increase in TDG in turbine discharges to the river. In all cases, TDG measurements taken during the tests were below 110 percent, which is the criteria established by the U.S. EPA to prevent fish harm from potential gas bubble disease (USEPA 1976).

Although these tests indicate that turbine venting can provide further enhancement of DO, it is evident that the amount of enhancement varies depending on conditions - for example, by time of year (as indicated by the differences between the August and October test results) or river flow amount (as indicated by the differences between flow levels during the August test). In consideration of this variability, it is recommended that additional testing be considered under more varied and extended turbine venting conditions. The resulting additional information will be valuable in better defining the specific operating conditions under which turbine venting is implemented.

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Appendix A:
Continuous Water Quality Data
from August 18-22, 2008

Table A-1. Continuous flow and water quality data taken at sites downstream of Iron Gate dam during turbine venting testing of August 18-21, 2008.

Date & Time	Test Condition	USGS Data	PC Data	PC Data	PC Data	Tribe Data	Tribe Data	Tribe Data	PC Data	PC Data
		River Flow	Turbine Flow	Water Temp	Water Temp	Water Temp	Dissolved Oxygen	Dissolved Oxygen	TDG	TDG
		At USGS Station (CFS)	At IG Powerhouse (CFS)	Hatchery Bridge (deg C)	At Blue Heron (deg C)	At USGS Station (deg C)	At USGS Station (% sat)	At USGS Station (mg/L)	At Blue Heron (% sat)	Hatchery Bridge (% sat)
8/18/08 9:01	60	1030	995	21.9		20.7	85.5	7.67		
8/18/08 9:31	60	1030	994	21.9		20.7	86.0	7.71		
8/18/08 10:01	60	1030	992	21.9		20.8	87.4	7.82		
8/18/08 10:31	60	1040	994	21.9		20.8	88.4	7.91		
8/18/08 11:01	60	1030	995	21.9		20.9	88.5	7.91		
8/18/08 11:31	60	1040	995	21.9		20.8	88.4	7.90		
8/18/08 12:01	60	1040	995	22.0		20.8	90.1	8.06		
8/18/08 12:31	60	1040	996	22.0		20.9	92.3	8.24		
8/18/08 13:01	60	1040	996	22.0		21.0	91.8	8.19		106.0
8/18/08 13:31	60	1040	994	21.9		20.9	89.7	8.02		105.6
8/18/08 14:01	60	1040	991	21.8		20.9	88.3	7.89		105.3
8/18/08 14:31	60	1030	994	21.8		20.9	87.5	7.82		105.0
8/18/08 15:01	60	1040	996	21.7		20.8	87.0	7.78		104.6
8/18/08 15:31	60	1040	996	21.6		20.7	84.6	7.58		104.1
8/18/08 16:01	60	1030	995	21.5	21.7	20.7	82.8	7.42	106.0	103.9
8/18/08 16:31	60	1040	995	21.5	21.5	20.6	82.4	7.40	105.7	103.7
8/18/08 17:01	60	1040	995	21.3	21.3	20.4	79.4	7.16	105.3	103.0
8/18/08 17:31	60	1040	995	21.2	21.2	20.3	75.5	6.83	104.9	102.4
8/18/08 18:01	60	1030	994	21.1	21.0	20.2	71.8	6.50	104.4	101.7
8/18/08 18:31	60	1040	997	21.0	20.9	20.1	68.1	6.18	103.7	101.4
8/18/08 19:01	60	1040	1000	21.0	20.8	20.0	68.0	6.18	103.1	101.4
8/18/08 19:31	60	1040	999	21.2	20.7	20.1	69.2	6.27	102.7	102.1
8/18/08 20:01	60	1040	998	21.4	20.6	20.3	73.3	6.62	102.4	103.0

Table A-1. Continuous flow and water quality data taken at sites downstream of Iron Gate dam during turbine venting testing of August 18-21, 2008.

Date & Time	Test Condition	USGS Data	PC Data	PC Data	PC Data	Tribe Data	Tribe Data	Tribe Data	PC Data	PC Data
		River Flow	Turbine Flow	Water Temp	Water Temp	Water Temp	Dissolved Oxygen	Dissolved Oxygen	TDG	TDG
		At USGS Station	At IG Powerhouse	Hatchery Bridge	At Blue Heron	At USGS Station	At USGS Station	At USGS Station	At Blue Heron	Hatchery Bridge
8/18/08 20:31	60	1040	997	21.5	20.7	20.4	75.6	6.82	102.6	103.4
8/18/08 21:01	60	1040	996	21.5	20.9	20.5	76.1	6.85	103.0	103.6
8/18/08 21:31	60	1040	996	21.5	21.0	20.4	76.5	6.89	103.1	103.6
8/18/08 22:01	60	1040	995	21.6	21.0	20.4	77.6	6.99	103.3	103.7
8/18/08 22:31	60	1050	999	21.5	21.0	20.4	79.3	7.15	103.3	103.4
8/18/08 23:01	60	1030	1002	21.5	21.1	20.4	78.9	7.11	103.6	103.7
8/18/08 23:31	60	1030	999	21.5	21.1	20.3	78.6	7.10	103.6	103.4
8/19/08 0:01	60	1040	995	21.4	21.0	20.4	78.3	7.06	103.1	103.4
8/19/08 0:31	60	1040	997	21.4	21.0	20.4	79.4	7.16	103.0	103.6
8/19/08 1:01	60	1030	998	21.5	20.9	20.4	79.2	7.15	103.0	103.6
8/19/08 1:31	60	1040	994	21.5	20.9	20.3	80.9	7.30	103.0	104.1
8/19/08 2:01	60	1040	989	21.6	20.9	20.4	82.1	7.40	103.0	104.4
8/19/08 2:31	60	1030	991	21.6	21.0	20.4	83.6	7.54	103.3	104.7
8/19/08 3:01	60	1030	993	21.7	21.0	20.5	85.3	7.68	103.4	105.1
8/19/08 3:31	60	1040	995	21.8	21.1	20.6	87.6	7.88	103.7	105.4
8/19/08 4:01	60	1030	997	21.8	21.1	20.6	87.9	7.90	104.0	105.4
8/19/08 4:31	60	1040	995	21.7	21.2	20.5	87.9	7.92	104.1	105.3
8/19/08 5:01	60	1030	993	21.6	21.2	20.5	85.3	7.68	104.1	104.7
8/19/08 5:31	60	1040	994	21.7	21.1	20.4	86.4	7.80	104.0	105.3
8/19/08 6:01	60	1030	994	21.7	21.1	20.5	87.7	7.89	103.8	105.4
8/19/08 6:31	60	1040	997	21.8	21.1	20.6	88.4	7.94	104.0	105.5
8/19/08 7:01	60	1030	999	21.7	21.1	20.6	89.3	8.03	104.3	105.4
8/19/08 7:31	60	1040	994	21.7	21.2	20.5	88.6	7.97	104.6	105.5
8/19/08 8:01	60	1030	989	21.7	21.2	20.6	88.6	7.96	104.6	105.4

Table A-1. Continuous flow and water quality data taken at sites downstream of Iron Gate dam during turbine venting testing of August 18-21, 2008.

Date & Time	Test Condition	USGS Data	PC Data	PC Data	PC Data	Tribe Data	Tribe Data	Tribe Data	PC Data	PC Data
		River Flow	Turbine Flow	Water Temp	Water Temp	Water Temp	Dissolved Oxygen	Dissolved Oxygen	TDG	TDG
		At USGS Station	At IG Powerhouse	Hatchery Bridge	At Blue Heron	At USGS Station	At USGS Station	At USGS Station	At Blue Heron	Hatchery Bridge
8/19/08 8:31	60	1040	988	21.8	21.2	20.5	88.7	7.99	105.1	105.7
8/19/08 9:01	60	1040	987	21.8	21.3	20.6	91.1	8.19	105.8	105.8
8/19/08 9:31	60	1030	989	21.8	21.4	20.6	92.0	8.26	106.5	106.0
8/19/08 10:01	60	1040	991	21.8	21.5	20.6	91.4	8.21	107.0	106.0
8/19/08 10:31	60	1030	992	21.9	21.6	20.7	93.1	8.35	107.4	106.4
8/19/08 11:01	60		993		21.7	20.8	94.4	8.45	107.7	106.5
8/19/08 11:31	-85	1040	993	22.0	21.8	20.8	94.9	8.49	108.3	98.9
8/19/08 12:01	-85	1050	992	22.0	21.9	20.8	96.1	8.60	108.4	102.3
8/19/08 12:31	-85	1060	1000	21.9	22.0	20.9	87.2	7.79	108.5	96.7
8/19/08 13:01	25	1040	1008	21.9	22.0	20.9	85.6	7.65	106.0	98.7
8/19/08 13:31	25		1003		22.0	21.0	95.1	8.49	102.6	106.8
8/19/08 14:01	25	1040	998	22.0	22.0	21.0	95.8	8.54	104.0	99.7
8/19/08 14:31	25	1040	878	22.0	22.0	21.0	96.8	8.63	108.0	107.4
8/19/08 15:01	25	1040	757	22.0	21.9	21.0	97.5	8.69	108.4	107.5
8/19/08 15:31	25	1040	876	22.0	21.9	21.0	97.1	8.66	108.4	107.5
8/19/08 16:01	25	1040	995	21.8	21.8	20.8	94.0	8.41	107.8	106.8
8/19/08 16:31	25	1040	992	21.8	21.7	20.8	92.1	8.25	107.5	106.7
8/19/08 17:01	25	1040	989	21.8	21.6	20.8	93.4	8.36	107.1	106.7
8/19/08 17:31	25	1030	989	21.8	21.5	20.7	91.7	8.21	106.5	106.4
8/19/08 18:01	25	1040	989	21.7	21.5	20.7	89.1	7.99	106.4	106.3
8/19/08 18:31	25	1040	991	21.7	21.4	20.6	87.9	7.89	105.7	106.1
8/19/08 19:01	25	1040	993	21.7	21.3	20.6	86.3	7.74	105.1	106.0
8/19/08 19:31	25	1040	993	21.7	21.3	20.6	86.1	7.74	104.8	105.8
8/19/08 20:01	25	1030	992	21.7	21.2	20.7	87.2	7.82	104.7	106.1

Table A-1. Continuous flow and water quality data taken at sites downstream of Iron Gate dam during turbine venting testing of August 18-21, 2008.

Date & Time	Test Condition	USGS Data	PC Data	PC Data	PC Data	Tribe Data	Tribe Data	Tribe Data	PC Data	PC Data
		River Flow	Turbine Flow	Water Temp	Water Temp	Water Temp	Dissolved Oxygen	Dissolved Oxygen	TDG	TDG
		At USGS Station	At IG Powerhouse	Hatchery Bridge	At Blue Heron	At USGS Station	At USGS Station	At USGS Station	At Blue Heron	Hatchery Bridge
8/19/08 20:31	25	1030	993	21.6	21.2	20.5	85.9	7.74	104.6	105.7
8/19/08 21:01	25	1030	993	21.6	21.2	20.5	84.0	7.56	104.7	105.4
8/19/08 21:31	25	1040	994	21.6	21.2	20.5	83.8	7.54	104.6	105.3
8/19/08 22:01	25	1030	994	21.5	21.1	20.4	83.2	7.50	104.4	105.3
8/19/08 22:31	25	1040	993	21.5	21.1	20.4	82.0	7.40	104.3	105.0
8/19/08 23:01	25	1040	992	21.5	21.1	20.4	82.7	7.46	104.3	105.3
8/19/08 23:31	25	1040	993	21.6	21.1	20.4	83.4	7.52	104.1	105.4
8/20/08 0:01	25	1040	994	21.5	21.1	20.5	83.1	7.48	104.3	105.3
8/20/08 0:31	25	1030	994	21.5	21.1	20.4	83.2	7.51	104.3	105.3
8/20/08 1:01	25	1030	994	21.5	21.1	20.5	81.7	7.36	104.1	105.0
8/20/08 1:31	25	1030	994	21.5	21.1	20.4	81.3	7.33	104.1	105.0
8/20/08 2:01	25	1030	993	21.5	21.0	20.4	80.8	7.28	104.0	105.0
8/20/08 2:31	25	1030	993	21.5	21.0	20.4	81.3	7.34	104.0	105.0
8/20/08 3:01	25	1040	993	21.5	21.0	20.4	81.2	7.32	104.0	105.0
8/20/08 3:31	25	1030	992	21.6	21.0	20.4	82.1	7.41	104.0	105.3
8/20/08 4:01	25	1030	991	21.6	21.0	20.5	83.1	7.49	104.0	105.4
8/20/08 4:31	25	1030	992	21.6	21.1	20.5	84.3	7.58	104.1	105.7
8/20/08 5:01	25	1040	992	21.6	21.1	20.6	85.1	7.64	104.3	105.5
8/20/08 5:31	25	1030	992	21.6	21.1	20.5	83.1	7.48	104.4	105.1
8/20/08 6:01	25	1040	992	21.5	21.1	20.4	82.0	7.40	104.3	105.0
8/20/08 6:31	25	1030	993	21.5	21.1	20.4	80.8	7.29	104.1	104.7
8/20/08 7:01	25	1040	993	21.4	21.0	20.4	79.9	7.20	104.1	104.6
8/20/08 7:31	25	1030	993	21.4	21.0	20.3	79.6	7.19	104.1	104.4
8/20/08 8:01	25	1030	992	21.4	21.0	20.3	79.6	7.19	104.3	104.4

Table A-1. Continuous flow and water quality data taken at sites downstream of Iron Gate dam during turbine venting testing of August 18-21, 2008.

Date & Time	Test Condition	USGS Data	PC Data	PC Data	PC Data	Tribe Data	Tribe Data	Tribe Data	PC Data	PC Data
		River Flow	Turbine Flow	Water Temp	Water Temp	Water Temp	Dissolved Oxygen	Dissolved Oxygen	TDG	TDG
		At USGS Station	At IG Powerhouse	Hatchery Bridge	At Blue Heron	At USGS Station	At USGS Station	At USGS Station	At Blue Heron	Hatchery Bridge
8/20/08 8:31	25	1030	992	21.4	21.0	20.3	79.9	7.22	104.8	104.4
8/20/08 9:01	25	1030	991	21.4	21.1	20.3	80.9	7.31	105.3	104.7
8/20/08 9:31	25	1030	991	21.5	21.1	20.4	82.2	7.41	105.3	105.0
8/20/08 10:01	25	1040	991	21.5	21.1	20.5	83.7	7.54	105.4	105.3
8/20/08 10:31	25	1030	990	21.6	21.3	20.5	84.5	7.60	106.3	105.3
8/20/08 11:01	25	1040	989	21.6	21.3	20.5	83.6	7.53	106.5	105.3
8/20/08 11:31	25	1030	989	21.6	21.4	20.4	84.7	7.64	106.8	105.4
8/20/08 12:01	25	1030	988	21.6	21.3	20.5	85.5	7.69	106.1	105.3
8/20/08 12:31	25	1040	1002	21.5	21.3	20.5	85.3	7.67	106.1	105.3
8/20/08 13:01	25	1120	1016	21.6	21.4	20.7	85.3	7.64	106.7	104.8
8/20/08 13:31	25	1300	1131	21.6	21.4	20.7	83.5	7.48	106.7	102.7
8/20/08 14:01	25	1430	1246	21.7	21.6	20.9	83.3	7.44	106.5	102.1
8/20/08 14:31	25	1510	1350	21.7	21.6	20.9	82.2	7.35	105.1	100.9
8/20/08 15:01	40	1570	1454	21.6	21.6	20.8	79.3	7.10	103.8	100.1
8/20/08 15:31	60	1570	1471	21.7	21.6	21.0	94.5	8.43	103.1	110.5
8/20/08 16:01	85	1550	1488	21.6	21.5	20.9	91.0	8.13	107.7	107.7
8/20/08 16:31	-85	1540	1489	21.6	21.5	20.8	80.6	7.21	109.1	100.7
8/20/08 17:01	-30	1560	1489	21.7	21.4	20.8	82.2	7.35	105.3	105.8
8/20/08 17:31	-55	1540	1485	21.6	21.4	20.9	85.0	7.59	100.6	104.4
8/20/08 18:01	-85	1550	1480	21.6	21.4	20.8	71.6	6.41	105.3	94.2
8/20/08 18:31	-85	1560	1489	21.6	21.3	20.7	66.6	5.97	101.1	92.2
8/20/08 19:01	-85	1560	1497	21.6	21.3	20.8	69.6	6.23	96.3	92.9
8/20/08 19:31	-85	1560	1497	21.6	21.3	20.8	70.0	6.26	95.7	92.6
8/20/08 20:01	-85	1570	1496	21.6	21.3	20.7	69.4	6.23	95.7	92.5

Table A-1. Continuous flow and water quality data taken at sites downstream of Iron Gate dam during turbine venting testing of August 18-21, 2008.

Date & Time	Test Condition	USGS Data	PC Data	PC Data	PC Data	Tribe Data	Tribe Data	Tribe Data	PC Data	PC Data
		River Flow	Turbine Flow	Water Temp	Water Temp	Water Temp	Dissolved Oxygen	Dissolved Oxygen	TDG	TDG
		At USGS Station	At IG Powerhouse	Hatchery Bridge	At Blue Heron	At USGS Station	At USGS Station	At USGS Station	At Blue Heron	Hatchery Bridge
8/20/08 20:31	-85	1560	1495	21.6	21.3	20.7	68.2	6.11	95.2	92.2
8/20/08 21:01	-85	1570	1493	21.6	21.3	20.7	67.7	6.06	95.0	92.3
8/20/08 21:31	-85	1560	1497	21.6	21.2	20.7	69.5	6.23	94.7	92.6
8/20/08 22:01	-85	1560	1501	21.6	21.3	20.7	68.8	6.17	94.9	92.2
8/20/08 22:31	-85	1560	1500	21.6	21.3	20.7	66.7	5.97	94.9	91.9
8/20/08 23:01	-85	1560	1499	21.6	21.2	20.7	68.8	6.16	94.5	92.3
8/20/08 23:31	-85	1560	1497	21.7	21.2	20.8	70.8	6.33	94.6	92.9
8/21/08 0:01	-85	1560	1495	21.6	21.3	20.8	71.2	6.38	94.9	92.8
8/21/08 0:31	-85	1560	1499	21.5	21.3	20.6	69.0	6.20	95.0	91.9
8/21/08 1:01	-85	1570	1503	21.5	21.3	20.6	65.4	5.88	94.7	91.2
8/21/08 1:31	-85	1560	1500	21.4	21.2	20.6	62.8	5.64	94.0	90.8
8/21/08 2:01	-85	1560	1497	21.4	21.1	20.5	63.1	5.68	93.6	90.9
8/21/08 2:31	-85	1560	1492	21.4	21.1	20.6	64.2	5.77	93.5	91.1
8/21/08 3:01	-85	1560	1486	21.4	21.1	20.5	64.4	5.80	93.6	91.1
8/21/08 3:31	-85	1560	1492	21.4	21.1	20.5	64.3	5.79	93.6	91.1
8/21/08 4:01	-85	1560	1497	21.4	21.1	20.4	63.7	5.74	93.6	91.1
8/21/08 4:31	-85	1560	1497	21.4	21.0	20.5	64.5	5.81	93.6	91.2
8/21/08 5:01	-85	1560	1497	21.4	21.0	20.5	65.2	5.87	93.6	91.3
8/21/08 5:31	-85	1560	1495	21.4	21.1	20.6	64.7	5.81	93.8	91.2
8/21/08 6:01	-85	1560	1492	21.4	21.0	20.4	65.8	5.94	93.8	91.3
8/21/08 6:31	-85	1560	1491	21.4	21.0	20.4	66.8	6.02	93.8	91.6
8/21/08 7:01	-85	1560	1489	21.4	21.0	20.4	65.6	5.91	94.0	91.3
8/21/08 7:31	-85	1510	1472	21.4	21.0	20.4	65.9	5.94	94.0	91.5
8/21/08 8:01	-85	1500	1454	21.4	21.0	20.4	67.7	6.10	94.2	96.3

Table A-1. Continuous flow and water quality data taken at sites downstream of Iron Gate dam during turbine venting testing of August 18-21, 2008.

Date & Time	Test Condition	USGS Data	PC Data	PC Data	PC Data	Tribe Data	Tribe Data	Tribe Data	PC Data	PC Data
		River Flow	Turbine Flow	Water Temp	Water Temp	Water Temp	Dissolved Oxygen	Dissolved Oxygen	TDG	TDG
		At USGS Station	At IG Powerhouse	Hatchery Bridge	At Blue Heron	At USGS Station	At USGS Station	At USGS Station	At Blue Heron	Hatchery Bridge
8/21/08 8:31	-85	1500	1444	21.5	21.1	20.5	69.4	6.25	94.9	92.5
8/21/08 9:01	-85	1500	1433	21.6	21.2	20.6	72.7	6.53	95.5	93.0
8/21/08 9:31	-85	1500	848	21.6	21.3	20.5	73.4	6.60	96.4	93.2
8/21/08 10:01	-85	1500	263	21.6	21.4	20.7	71.9	6.44	97.2	92.9
8/21/08 10:31	-85	1500	264	21.6	21.5	20.6	79.0	7.09	97.3	99.4
8/21/08 11:01	-85	1500	264	21.6	21.5	20.7	80.1	7.18	100.0	100.1
8/21/08 11:31	-85	1510	757	21.7	21.5	20.7	81.7	7.33	103.0	100.6
8/21/08 12:01	-85	1510	1250	21.7	21.6	20.8	83.8	7.49	103.4	101.0
8/21/08 12:31	-85	1510	1349	21.9	21.7	20.9	85.8	7.66	104.0	101.6
8/21/08 13:01	-85	1510	1447	21.9	21.8	21.1	88.5	7.88	104.4	102.0
8/21/08 13:31	-85	1510	1449	21.9	21.9	21.1	89.5	7.96	105.0	102.1
8/21/08 14:01	-85	1510	1451	21.9	21.9	21.1	89.1	7.93	105.1	102.1
8/21/08 14:31	-85	1510	1443	21.9	21.9	21.1	89.0	7.92	105.1	102.1
8/21/08 15:01	-85	1510	1434	21.9	21.9	21.0	89.5	7.98	105.0	102.3
8/21/08 15:31	-85	1510	1438	22.1	21.7	21.2	92.9	8.24	103.8	103.0
8/21/08 16:01	60	1510	1442	22.1	21.8	21.4	93.8	8.29	104.4	103.3
8/21/08 16:31	60	1500	1328	22.2	22.0	21.3	93.8	8.31	105.0	103.3
8/21/08 17:01	60	1510	1213	22.3	22.0	21.4	97.3	8.60	104.7	104.3
8/21/08 17:31	60	1510	1319	22.5	22.0	21.7	101.7	8.94	104.8	105.1
8/21/08 18:01	60	1510	1424	22.6	22.1	21.8	104.0	9.13	105.5	105.8
8/21/08 18:31	60	1510	1437	22.7	22.2	21.8	104.1	9.14	106.0	106.1
8/21/08 19:01	60	1500	1450	22.5	22.3	21.7	101.7	8.94	105.8	105.5
8/21/08 19:31	60	1510	1445	22.4	22.3	21.5	98.3	8.68	105.5	104.8
8/21/08 20:01	60	1510	1439	22.4	22.1	21.5	97.9	8.64	105.0	104.8

Table A-1. Continuous flow and water quality data taken at sites downstream of Iron Gate dam during turbine venting testing of August 18-21, 2008.

Date & Time	Test Condition	USGS Data	PC Data	PC Data	PC Data	Tribe Data	Tribe Data	Tribe Data	PC Data	PC Data
		River Flow	Turbine Flow	Water Temp	Water Temp	Water Temp	Dissolved Oxygen	Dissolved Oxygen	TDG	TDG
		At USGS Station	At IG Powerhouse	Hatchery Bridge	At Blue Heron	At USGS Station	At USGS Station	At USGS Station	At Blue Heron	Hatchery Bridge
8/21/08 20:31	60	1510	1442	22.5	22.1	21.5	99.4	8.77	104.5	105.1
8/21/08 21:01	60	1510	1445	22.4	22.1	21.4	99.8	8.83	104.7	105.0
8/21/08 21:31	60	1510	1442	22.3	22.1	21.4	97.4	8.62	104.8	104.5
8/21/08 22:01	60	1500	1439	22.2	22.0	21.3	95.7	8.48	104.7	103.8
8/21/08 22:31	60	1510	1447	22.1	21.9	21.3	94.0	8.34	104.1	103.5
8/21/08 23:01	60	1510	1455	22.1	21.8	21.1	92.0	8.17	104.0	103.3
8/21/08 23:31	60	1500	1457	22.1	21.7	21.1	93.0	8.27	103.6	103.5
8/22/08 0:01	60	1510	1458	22.1	21.7	21.2	93.9	8.34	103.5	103.7
8/22/08 0:31	60	1510	1447	22.1	21.7	21.0	93.4	8.32	103.7	103.4
8/22/08 1:01	60	1510	1436	22.0	21.7	21.0	93.3	8.31	103.5	103.3
8/22/08 1:31	60	1510	1434	22.1	21.7	21.1	92.7	8.25	103.5	103.3
8/22/08 2:01	60	1510	1432	22.0	21.6	21.0	92.9	8.27	103.3	103.3
8/22/08 2:31	60	1510	1435	22.0	21.7	21.1	91.6	8.16	103.4	103.0
8/22/08 3:01	60	1510	1438	21.9	21.6	20.9	90.2	8.05	103.3	102.7
8/22/08 3:31	60	1510	1437	21.9	21.6	21.1	90.3	8.04	103.0	102.7
8/22/08 4:01	60	1510	1436	21.9	21.5	20.8	89.2	7.97	103.0	102.4
8/22/08 4:31	60	1510	1432	21.8	21.5	20.8	88.0	7.87	102.8	102.1
8/22/08 5:01	60	1510	1428	21.9	21.5	20.8	87.3	7.81	102.6	102.1
8/22/08 5:31	60	1500	1429	21.9	21.4	20.9	88.8	7.93	102.4	102.4
8/22/08 6:01	60	1510	1429	21.8	21.4	20.9	89.8	8.02	102.6	102.4
8/22/08 6:31	60	1510	1429	21.8	21.4	20.8	88.0	7.87	102.7	102.1
8/22/08 7:01	60	1510	1429	21.7	21.4	20.8	86.5	7.75	102.7	101.7
8/22/08 7:31	60	1510	1433	21.7	21.3	20.8	86.3	7.72	102.4	101.7
8/22/08 8:01	60	1510	1437	21.7	21.3	20.7	85.7	7.68	102.6	101.6

Table A-1. Continuous flow and water quality data taken at sites downstream of Iron Gate dam during turbine venting testing of August 18-21, 2008.

Date & Time	Test Condition	USGS Data	PC Data	PC Data	PC Data	Tribe Data	Tribe Data	Tribe Data	PC Data	PC Data
		River Flow	Turbine Flow	Water Temp	Water Temp	Water Temp	Dissolved Oxygen	Dissolved Oxygen	TDG	TDG
		At USGS Station	At IG Powerhouse	Hatchery Bridge	At Blue Heron	At USGS Station	At USGS Station	At USGS Station	At Blue Heron	Hatchery Bridge
8/22/08 8:31	60	1510	1441	21.6	21.3	20.7	84.6	7.59	102.8	101.1
8/22/08 9:01	60	1530	1444	21.6	21.4	20.6	80.6	7.25	103.1	96.7
8/22/08 9:31	60	1530	1465	21.6	21.4	20.6	74.7	6.71	103.0	93.6
8/22/08 10:01	60	1530	1485	21.6	21.4	20.7	73.8	6.61	98.3	93.3
8/22/08 10:31	60	1530	1471	21.6	21.5	20.6	73.1	6.57	97.6	93.0
8/22/08 11:01	60	1530	1456	21.6	21.5	20.7	72.7	6.53	97.6	92.9
8/22/08 11:31	60	1530	1461	21.6	21.5	20.7	74.2	6.65	97.4	93.2
8/22/08 12:01	60	1530	1465	21.7	21.6	20.8	75.4	6.75	97.6	93.5
8/22/08 12:31	60	1530	1471	21.7	21.7	20.9	76.7	6.85	98.0	93.6
8/22/08 13:01	60	1530	1477	21.7	21.7	20.9	77.5	6.93	98.3	93.8
8/22/08 13:31	60	1530	1476	21.7	21.8	21.0	78.0	6.95	98.4	93.9
8/22/08 14:01	60	1530	1475	21.8	21.8	21.0	78.9	7.02	98.3	94.0
8/22/08 14:31	60	1530	1475	21.8	21.8	21.1	79.6	7.09	98.4	94.3
8/22/08 15:01	60	1540	1475	21.8	21.8	21.1	81.1	7.22	98.4	94.5
8/22/08 15:31	60	1540	1478	21.9	21.8	21.1	80.4	7.16	98.4	94.3
8/22/08 16:01	60	1540	1480	21.9	21.8	21.1	80.0	7.12	98.3	94.3
8/22/08 16:31	60	1530	1479	22.0	21.8	21.2	78.8	6.99	98.0	94.3
8/22/08 17:01	60	1530	1478	22.0	21.8	21.2	78.7	6.99	97.7	94.3
8/22/08 17:31	60	1530	1474	21.9	21.8	21.2	77.7	6.90	97.3	94.0
8/22/08 18:01	60	1520	1469	22.0	21.8	21.2	78.9	7.00	97.0	94.5
8/22/08 18:31	60	1520	1462	22.0	21.7	21.1	81.0	7.20	96.7	95.0
8/22/08 19:01	60	1530	1455	21.9	21.7	21.0	81.4	7.25	97.0	95.2
8/22/08 19:31	60	1520	1456	22.0	21.6	21.0	82.2	7.32	97.2	95.9
8/22/08 20:01	60	1520	1456	22.1	21.6	21.2	88.2	7.83	97.0	97.3

Table A-1. Continuous flow and water quality data taken at sites downstream of Iron Gate dam during turbine venting testing of August 18-21, 2008.

Date & Time	Test Condition	USGS Data	PC Data	PC Data	PC Data	Tribe Data	Tribe Data	Tribe Data	PC Data	PC Data
		River Flow	Turbine Flow	Water Temp	Water Temp	Water Temp	Dissolved Oxygen	Dissolved Oxygen	TDG	TDG
		At USGS Station	At IG Powerhouse	Hatchery Bridge	At Blue Heron	At USGS Station	At USGS Station	At USGS Station	At Blue Heron	Hatchery Bridge
8/22/08 20:31	60	1520	1463	22.1	21.7	21.2	91.0	8.08	98.3	97.7
8/22/08 21:01	60	1520	1470	22.0	21.8	21.2	90.1	8.00	98.7	97.0
8/22/08 21:31	60	1520	1466	21.8	21.7	21.0	84.0	7.48	98.9	95.6
8/22/08 22:01	60	1520	1462	21.7	21.6	20.8	78.3	7.00	97.9	94.5
8/22/08 22:31	60	1520	1462	21.7	21.5	20.9	76.2	6.81	96.7	94.0
8/22/08 23:01	60	1520	1462	21.7	21.4	20.8	73.4	6.57	96.2	93.3
8/22/08 23:31	60	1520	1463	21.7	21.3	20.9	74.2	6.63	95.6	93.6

Appendix B:
Spot Measurements Taken
During August 18-22, 2008

Table B-1. Spot (instantaneous) measurements taken at sites downstream of Iron Gate dam during turbine venting testing of August 18-21, 2008.

Location	Test Conditions	Flow	Date	Time	Temp (°C)	DO (% sat)	DO (mg/l)	TDG (mmHg)	TDG (% sat)
Powerhouse Tailrace	Existing conditions	1000	Aug-19	11:07	21.7	108	10.2	764	109
	Air Fully Off	1000	Aug-19	12:10	21.6	93	8.8	702	100
	Air Fully On	1000	Aug-19	13:40	21.6	110	10.4	770	110
	Air Fully Off	1500	Aug-21	8:45	21.5	85	8.1	680	97
	Air Fully Off	1500	Aug-21	9:55	21.5	82	7.8	673	96
	Air Fully On	1500	Aug-21	10:15	21.4	93	8.9	727	103
	Air Fully On	1500	Aug-21	15:10	21.9	114	10.8	744	106
At Hatchery Bridge	Existing conditions	1000	Aug-18	13:26	21.8	95	9.0	740	106
	Air Fully Off	1500	Aug-21	9:45	21.5	--	--	683	97
	Air Fully On	1500	Aug-21	15:30	--	--	--	724	103
Below Hatchery Bridge	Existing conditions	1000	Aug-18	14:12	21.8	97	9.7	730	104
	Air Fully Off	1000	Aug-19	12:25	22.1	109	10.3	708	101
	Air Fully On	1000	Aug-19	14:25	22.0	115	10.8	755	107
	Air Fully Off	1500	Aug-21	9:15	21.5	88	8.4	679	97
	Air Fully On	1500	Aug-21	11:40	21.7	100	9.5	724	103
	Air Fully On	1500	Aug-21	15:40	22.1	111	10.5	724	103
USGS Gaging Station	Air Fully Off	1000	Aug-19	12:44	20.8	107	9.7	702	100
	Air Fully On	1000	Aug-19	14:40	20.9	122	11.8	750	107
	Air Fully Off	1500	Aug-21	9:00	20.5	88	8.5	687	98
	Air Fully On	1500	Aug-21	11:50	20.8	102	9.8	720	102
Blue Heron RV Park	Existing conditions	1000	Aug-18	15:30	21.7	105	10.0	726	104

Table B-1. Spot (instantaneous) measurements taken at sites downstream of Iron Gate dam during turbine venting testing of August 18-21, 2008.

Location	Test Conditions	Flow	Date	Time	Temp (°C)	DO (% sat)	DO (mg/l)	TDG (mmHg)	TDG (% sat)
	Air Fully On	1000	Aug-19	15:00	21.9	126	11.9	753	107
	Air Fully On	1500	Aug-21	12:25	21.6	108	10.3	728	103
Fish Hook Restaurant	Air Fully Off	1000	Aug-19	13:20	22.3	125	11.7	733	104
	Air Fully On	1000	Aug-19	15:15	22.1	131	12.3	746	106
	Air Fully Off	1500	Aug-21	9:13	21.3	93	8.9	688	98
	Air Fully On	1500	Aug-21	12:35	21.9	112	10.5	736	104
Klamathon Bridge	Existing Conditions	1000	Aug-18	17:25	22.5	116	10.8	718	103
	Air Fully On	1000	Aug-19	15:40	24.4	138	12.6	746	106
	Air Fully Off	1500	Aug-21	7:15	20.6	86	8.4	675	96
	Air Fully On	1500	Aug-21	14:00	22.8	128	11.9	736	104

Appendix C:
Continuous Water Quality Data
from October 9-12, 2008

Table C-1. Continuous flow and water quality data taken at sites downstream of Iron Gate dam during turbine venting testing of October 9-11, 2008.

Date & Time	Test Condition	USGS Data	PC Data	PC Data	PC Data	PC Data	PC Data	PC Data	PC Data	PC Data	PC Data
		River Flow	Turbine Flow	Water Temp	Water Temp	Dissolved Oxygen	Dissolved Oxygen	Dissolved Oxygen	Dissolved Oxygen	TDG	TDG
		At USGS Station	At IG Pwrhse	Hatchery Bridge	At Blue Heron	Hatchery Bridge	At Blue Heron	Hatchery Bridge	At Blue Heron	Hatchery Bridge	At Blue Heron
		(CFS)	(CFS)	(deg C)	(deg C)	(% sat)	(% sat)	(mg/L)	(mg/L)	(% sat)	(% sat)
10/9/2008 12:00	60	1320	1150	16.4	16.1	71	87	6.96	9.29	98	100
10/9/2008 12:30	60	1320	1150	16.4	16.1	71	84	6.97	8.96	98	100
10/9/2008 13:00	60	1320	1150	16.4	16.2	71	87	6.95	9.23	98	101
10/9/2008 13:30	60	1320	1150	16.4	16.2	71	85	6.98	9.06	98	101
10/9/2008 14:00	60	1320	1150	16.5	16.2	72	85	7.03	9.09	98	100
10/9/2008 14:30	60	1320	1150	16.5	16.2	72	83	6.99	8.84	98	100
10/9/2008 15:00	60	1320	1150	16.5	16.3	72	84	7.01	8.92	98	101
10/9/2008 15:30	60	1320	1150	16.5	16.3	72	88	7.06	9.32	98	100
10/9/2008 16:00	60	1320	1150	16.5	16.2	73	84	7.09	8.93	98	100
10/9/2008 16:30	60	1320	1150	16.5	16.1	73	81	7.11	8.64	98	100
10/9/2008 17:00	60	1320	1150	16.5	16	74	81	7.19	8.6	98	99
10/9/2008 17:30	60	1320	1150	16.4	16	74	80	7.25	8.54	98	99
10/9/2008 18:00	60	1320	1150	16.4	16	74	78	7.23	8.41	98	99
10/9/2008 18:30	60	1320	1150	16.4	15.9	74	77	7.19	8.3	98	99
10/9/2008 19:00	60	1320	1150	16.3	15.8	73	76	7.15	8.18	98	98
10/9/2008 19:30	60	1320	1150	16.3	15.8	73	75	7.14	8.1	98	98
10/9/2008 20:00	60	1320	1150	16.3	15.8	73	75	7.11	8.05	98	98
10/9/2008 20:30	60	1320	1150	16.3	15.8	72	75	7.09	8.03	98	98
10/9/2008 21:00	60	1320	1150	16.3	15.8	72	75	7.09	8.03	98	98
10/9/2008 21:30	60	1320	1150	16.3	15.8	72	75	7.08	8.01	98	98
10/9/2008 22:00	60	1320	1150	16.2	15.7	72	74	7.07	8	98	98
10/9/2008 22:30	60	1320	1150	16.2	15.7	72	74	7.03	8	98	98

Table C-1. Continuous flow and water quality data taken at sites downstream of Iron Gate dam during turbine venting testing of October 9-11, 2008.

Date & Time	Test Condition	USGS Data	PC Data	PC Data	PC Data	PC Data	PC Data	PC Data	PC Data	PC Data	PC Data
		River Flow	Turbine Flow	Water Temp	Water Temp	Dissolved Oxygen	Dissolved Oxygen	Dissolved Oxygen	Dissolved Oxygen	TDG	TDG
		At USGS Station	At IG Pwrhse	Hatchery Bridge	At Blue Heron	Hatchery Bridge	At Blue Heron	Hatchery Bridge	At Blue Heron	Hatchery Bridge	At Blue Heron
		(CFS)	(CFS)	(deg C)	(deg C)	(% sat)	(% sat)	(mg/L)	(mg/L)	(% sat)	(% sat)
10/9/2008 23:00	60	1320	1150	16.2	15.7	72	74	7.03	7.99	98	98
10/9/2008 23:30	60	1320	1150	16.2	15.7	71	74	7.02	7.98	98	98
10/10/2008 0:00	60	1320	1150	16.2	15.7	71	74	7	7.98	98	98
10/10/2008 0:30	60	1320	1150	16.2	15.7	71	74	6.96	7.97	97	98
10/10/2008 1:00	60	1320	1150	16.2	15.6	71	74	6.95	7.98	97	98
10/10/2008 1:30	60	1320	1150	16.1	15.6	71	74	6.94	8.03	97	98
10/10/2008 2:00	60	1320	1150	16.1	15.6	70	75	6.9	8.05	97	98
10/10/2008 2:30	60	1320	1150	16.1	15.6	70	74	6.87	8.03	97	98
10/10/2008 3:00	60	1320	1150	16.1	15.6	69	74	6.79	8.02	97	98
10/10/2008 3:30	60	1320	1150	16.1	15.6	69	74	6.76	8.02	97	98
10/10/2008 4:00	60	1320	1150	16.1	15.6	68	74	6.67	7.99	97	98
10/10/2008 4:30	60	1320	1150	16.1	15.6	67	74	6.64	7.94	97	98
10/10/2008 5:00	60	1320	1150	16.1	15.6	67	73	6.58	7.94	97	98
10/10/2008 5:30	60	1320	1150	16.1	15.5	66	73	6.54	7.92	97	98
10/10/2008 6:00	60	1320	1150	16.1	15.5	66	73	6.48	7.88	97	97
10/10/2008 6:30	60	1320	1150	16	15.5	66	73	6.49	7.86	97	97
10/10/2008 7:00	60	1320	1150	16	15.5	66	73	6.48	7.85	97	97
10/10/2008 7:30	60	1320	1150	16	15.5	66	73	6.49	7.86	97	97
10/10/2008 8:00	60	1320	1150	16	15.5	66	73	6.49	7.91	97	98
10/10/2008 8:30	25	1320	1150	16	15.5	65	74	6.45	7.99	97	98
10/10/2008 9:00	25	1320	1150	16	15.5	65	75	6.46	8.08	101	99
10/10/2008 9:30	25	1320	1150	16	15.5	72	78	7.06	8.41	101	102

Table C-1. Continuous flow and water quality data taken at sites downstream of Iron Gate dam during turbine venting testing of October 9-11, 2008.

Date & Time	Test Condition	USGS Data	PC Data	PC Data	PC Data	PC Data	PC Data	PC Data	PC Data	PC Data	PC Data
		River Flow	Turbine Flow	Water Temp	Water Temp	Dissolved Oxygen	Dissolved Oxygen	Dissolved Oxygen	Dissolved Oxygen	TDG	TDG
		At USGS Station	At IG Pwrhse	Hatchery Bridge	At Blue Heron	Hatchery Bridge	At Blue Heron	Hatchery Bridge	At Blue Heron	Hatchery Bridge	At Blue Heron
		(CFS)	(CFS)	(deg C)	(deg C)	(% sat)	(% sat)	(mg/L)	(mg/L)	(% sat)	(% sat)
10/10/2008 10:00	25	1320	1150	16	15.6	72	81	7.09	8.75	101	103
10/10/2008 10:30	25	1320	1150	16	15.7	72	82	7.1	8.83	101	103
10/10/2008 11:30	25	1320	1150	16	15.7	73	82	7.18	8.8	101	103
10/10/2008 12:00	25	1320	1150	16	15.7	72	82	7.13	8.87	101	103
10/10/2008 12:30	25	1320	1150	16	15.8	73	84	7.16	8.98	102	104
10/10/2008 13:00	25	1320	1150	16	15.9	74	84	7.26	9.04	102	104
10/10/2008 13:30	25	1320	1150	16.1	15.9	74	85	7.33	9.09	102	104
10/10/2008 14:00	25	1320	1150	16.1	15.9	75	85	7.36	9.09	102	104
10/10/2008 14:30	25	1320	1150	16.1	15.9	75	84	7.38	9.05	102	104
10/10/2008 15:00	25	1320	1150	16.1	15.9	76	84	7.46	9	102	103
10/10/2008 15:30	25	1320	1150	16.1	15.9	76	84	7.49	8.96	102	103
10/10/2008 16:00	25	1320	1150	16.2	15.8	76	83	7.47	8.9	102	103
10/10/2008 16:30	25	1320	1150	16.1	15.8	76	82	7.51	8.8	102	103
10/10/2008 17:00	25	1320	1150	16.1	15.8	76	81	7.5	8.74	102	102
10/10/2008 17:30	25	1320	1150	16.1	15.7	76	80	7.52	8.65	102	102
10/10/2008 18:00	25	1320	1150	16.1	15.6	76	79	7.48	8.48	102	102
10/10/2008 18:30	25	1320	1150	16.1	15.6	75	77	7.42	8.36	102	101
10/10/2008 19:00	25	1320	1150	16	15.6	75	77	7.42	8.29	101	101
10/10/2008 19:30	25	1320	1150	16	15.5	75	76	7.36	8.25	101	101
10/10/2008 20:00	25	1320	1150	16	15.5	75	76	7.37	8.25	101	101
10/10/2008 20:30	25	1320	1150	16	15.5	74	76	7.34	8.23	101	101
10/10/2008 21:00	25	1320	1150	15.9	15.4	74	76	7.34	8.23	101	101

Table C-1. Continuous flow and water quality data taken at sites downstream of Iron Gate dam during turbine venting testing of October 9-11, 2008.

Date & Time	Test Condition	USGS Data	PC Data	PC Data	PC Data	PC Data	PC Data	PC Data	PC Data	PC Data	PC Data
		River Flow	Turbine Flow	Water Temp	Water Temp	Dissolved Oxygen	Dissolved Oxygen	Dissolved Oxygen	Dissolved Oxygen	TDG	TDG
		At USGS Station	At IG Pwrhse	Hatchery Bridge	At Blue Heron	Hatchery Bridge	At Blue Heron	Hatchery Bridge	At Blue Heron	Hatchery Bridge	At Blue Heron
		(CFS)	(CFS)	(deg C)	(deg C)	(% sat)	(% sat)	(mg/L)	(mg/L)	(% sat)	(% sat)
10/10/2008 21:30	25	1320	1150	15.9	15.4	74	76	7.31	8.22	101	101
10/10/2008 22:00	25	1320	1150	15.9	15.4	74	76	7.32	8.23	101	101
10/10/2008 22:30	25	1320	1150	15.9	15.4	74	76	7.33	8.23	101	101
10/10/2008 23:00	25	1320	1150	15.8	15.3	74	76	7.32	8.23	101	101
10/10/2008 23:30	25	1320	1150	15.8	15.3	74	76	7.36	8.23	101	101
10/11/2008 0:00	25	1320	1150	15.8	15.3	74	76	7.36	8.22	101	101
10/11/2008 0:30	25	1320	1150	15.8	15.3	74	76	7.33	8.21	101	101
10/11/2008 1:00	25	1320	1150	15.8	15.3	74	75	7.34	8.21	101	101
10/11/2008 1:30	25	1320	1150	15.8	15.2	74	75	7.33	8.2	101	101
10/11/2008 2:00	25	1320	1150	15.7	15.2	73	75	7.28	8.16	101	101
10/11/2008 2:30	25	1320	1150	15.7	15.2	73	75	7.29	8.15	101	101
10/11/2008 3:00	25	1320	1150	15.7	15.2	73	75	7.25	8.12	101	101
10/11/2008 3:30	25	1320	1150	15.7	15.2	73	75	7.25	8.12	101	101
10/11/2008 4:00	25	1320	1150	15.7	15.1	73	74	7.2	8.11	101	101
10/11/2008 4:30	25	1320	1150	15.7	15.1	73	74	7.22	8.09	101	101
10/11/2008 5:00	25	1320	1150	15.7	15.1	72	74	7.18	8.1	101	100
10/11/2008 5:30	25	1320	1150	15.7	15.1	72	74	7.18	8.08	101	100
10/11/2008 6:00	25	1320	1150	15.6	15.1	72	74	7.14	8.07	101	100
10/11/2008 6:30	25	1320	1150	15.6	15	72	74	7.15	8.05	101	100
10/11/2008 7:00	25	1320	1150	15.6	15	72	74	7.12	8.05	101	100
10/11/2008 7:30	25	1320	1150	15.6	15	72	74	7.13	8.06	101	100
10/11/2008 8:00	25	1320	1150	15.6	15	71	74	7.11	8.08	101	101

Table C-1. Continuous flow and water quality data taken at sites downstream of Iron Gate dam during turbine venting testing of October 9-11, 2008.

Date & Time	Test Condition	USGS Data	PC Data	PC Data	PC Data	PC Data	PC Data	PC Data	PC Data	PC Data	PC Data
		River Flow	Turbine Flow	Water Temp	Water Temp	Dissolved Oxygen	Dissolved Oxygen	Dissolved Oxygen	Dissolved Oxygen	TDG	TDG
		At USGS Station	At IG Pwrhse	Hatchery Bridge	At Blue Heron	Hatchery Bridge	At Blue Heron	Hatchery Bridge	At Blue Heron	Hatchery Bridge	At Blue Heron
		(CFS)	(CFS)	(deg C)	(deg C)	(% sat)	(% sat)	(mg/L)	(mg/L)	(% sat)	(% sat)
10/11/2008 8:30	25	1320	1150	15.6	15	71	75	7.09	8.21	101	101
10/11/2008 9:00	60	1330	1160	15.6	15.1	71	77	7.09	8.36	100	102
10/11/2008 9:30	60	1330	1160	15.6	15.1	70	78	6.94	8.48	96	101
10/11/2008 10:00	60	1330	1160	15.6	15.2	65	76	6.45	8.27	96	99
10/11/2008 10:30	60	1330	1160	15.6	15.3	64	75	6.41	8.19	96	99
10/11/2008 11:00	60	1330	1160	15.6	15.4	64	76	6.4	8.26	96	100
10/11/2008 11:30	60	1330	1160	15.6	15.4	65	77	6.44	8.34	96	100
10/11/2008 12:00	60	1330	1160	15.6	15.4	65	77	6.42	8.39	96	100
10/11/2008 12:30	60	1330	1160	15.6	15.5	65	78	6.44	8.4	97	100
10/11/2008 13:00	60	1330	1160	15.7	15.5	65	79	6.5	8.5	97	100
10/11/2008 13:30	60	1330	1160	15.7	15.5	66	80	6.52	8.67	97	100
10/11/2008 14:00	60	1330	1160	15.7	15.5	66	80	6.55	8.69	97	100
10/11/2008 14:30	60	1330	1160	15.7	15.5	66	79	6.57	8.57	97	100
10/11/2008 15:00	60	1330	1160	15.8	15.5	67	78	6.6	8.46	97	99
10/11/2008 15:30	60	1330	1160	15.8	15.5	67	77	6.62	8.38	97	99
10/11/2008 16:00	60	1330	1160	15.8	15.5	68	77	6.69	8.3	97	99
10/11/2008 16:30	60	1330	1160	15.7	15.4	68	76	6.74	8.23	97	99

Appendix D:
Spot Measurements Taken
During October 9-12, 2008

Table D-1. Spot (instantaneous) measurements taken at sites downstream of Iron Gate dam during turbine venting testing of October 9-12, 2008.

Location	Test Conditions	Flow (cfs)	Date and Time	Temp (°C)	DO (% sat)	DO (mg/l)	TDG (mmHg)	TDG (% sat)
IG Tail Race	Existing Conditions	1320	Oct-9 10:45	16.1	75	8.1	710	100
IG Tail Race	Existing Conditions	1320	Oct-9 15:00	16.3	83	6.4	700	99
IG Tail Race	Existing Conditions	1320	Oct-10 8:15	15.4	76	5.9	693	98
IG Tail Race	Air Fully On	1320	Oct-10 8:30	15.6	83	6.5	724	103
IG Tail Race	Air Fully On	1320	Oct-10 11:38	15.6	84	6.5	720	102
IG Tail Race	Air Fully On	1320	Oct-11 8:45	15.2	83	6.5	718	102
IG Tail Race	Existing Conditions	1330	Oct-11 8:55	15.2	76	6.0	700	99
IG Tail Race	Existing Conditions	1330	Oct-12 15:00	15.3	73	5.8	689	97
YSI Station	Existing Conditions	1320	Oct-9 11:14	16.2	71	7.0	708	100
YSI Station	Air Fully On	1320	Oct-10 9:00	15.9	65	6.5	710	101
YSI Station	Air Fully On	1320	Oct-10 9:30	15.9	76	6.0	721	102
YSI Station	Existing Conditions	1330	Oct-11 9:00	15.6	71	7.1	705	100
YSI Station	Existing Conditions	1330	Oct-12 9:00	15.2	65	6.5	679	95
USGS Gauging Station	Existing Conditions	1320	Oct-9 15:30	16.0	85	6.6	702	99
USGS Gauging Station	Air Fully On	1320	Oct-10 9:00	15.2	80	6.3	711	101
USGS Gauging Station	Existing Conditions	1330	Oct-11 9:20	14.8	76	6.0	698	99
USGS Gauging Station	Existing Conditions	1330	Oct-12 14:20	14.9	78	6.2	691	97
Blue Herron	Existing Conditions	1320	Oct-9 11:40	16.3	87	9.3	712	101
Blue Herron	Air Fully On	1320	Oct-10 9:00	15.5	75	8.1	700	99
Blue Herron	Air Fully On	1320	Oct-10 10:00	15.6	90	7.0	719	102
Blue Herron	Existing Conditions	1330	Oct-11 9:30	15.1	100	8.5	711	101

Table D-1. Spot (instantaneous) measurements taken at sites downstream of Iron Gate dam during turbine venting testing of October 9-12, 2008.

Location	Test Conditions	Flow (cfs)	Date and Time	Temp (°C)	DO (% sat)	DO (mg/l)	TDG (mmHg)	TDG (% sat)
Blue Herron	Existing Conditions	1330	Oct-12 9:00	14.7	71	7.9	693	97
Klamathon	Existing Conditions	1320	Oct-9 13:15	16.4	105	8.0	716	101
Klamathon	Air Fully On	1320	Oct-10 10:15	15.4	95	7.4	710	100
Klamathon	Existing Conditions	1330	Oct-11 9:45	14.7	94	7.5	708	100
Klamathon	Existing Conditions	1330	Oct-12 13:05	15.9	105	8.1	722	101