Clean Water Act § 401 Certification Conditions

For the

Willamette Falls Hydroelectric Project

(FERC No. 2233)

Clackamas County, Oregon

The § 401 Certification for the Willamette Falls Hydroelectric Project is subject to and incorporates the following conditions, in accordance with 33 USC 1341(d), which conditions are effective upon issuance of a new license for the Project by the Federal Energy Regulatory Commission.

Certification Conditions

1. Total Dissolved Gas; Antidegradation

a. Portland General Electric (PGE) shall consult with DEQ during PGE's development of design plans for the Project's flow control structure and siphon spillway modifications, in order to prevent or minimize contributions of total dissolved gas (TDG) from operation of these Project features. PGE shall submit to DEQ the final proposed design plans for the flow control structure and siphon spillway modifications for DEQ review and approval, before construction of these Project features.

b. PGE shall implement the TDG Water Quality Monitoring and Management Plan (WQMMP), attached to and incorporated by reference into this Certification as Attachment A. The TDG WQMMP specifies steps and schedule for monitoring of TDG at the Project, reporting of monitoring results, and responses to be taken to correct TDG exceedences, if any, resulting from the operation of the flow control structure and siphon spillway. PGE shall modify the WQMMP as necessary to incorporate specific steps or schedules set out in the design plans for the flow control structure and siphon spillway modifications, and submit such WQMMP modifications to DEQ for DEQ review and approval, before construction of these Project features.

2. Turbidity

Upon applying for any federal permit for construction activities at the Project that might disturb river sediments, PGE shall provide DEQ written notice of such application and of any proposed changes to or new specifications for the construction activities developed since issuance of this Certification. DEQ will notify PGE and the federal agency either that (i) this Certification is sufficient for purposes of the federal permit, or (ii) in light of new information related to the water quality impacts of the construction activities, there is no longer reasonable assurance of compliance with state water quality standards. In the latter event, DEQ will consider the new information, solicit and consider public and agency comment as required by law, and issue a § 401 Certification determination for purposes of the federal permit activities.

3. Protection of Beneficial Uses; Other Appropriate Requirements of State Law

a. Fish. PGE shall perform the following measures, which will be developed and implemented in consultation with a Fish Committee and with approval of Fish Agencies, including ODFW, as specified in the January 29, 2004 Settlement Agreement and Proposed License Articles:
(1) Construct a siphon bypass system at T.W. Sullivan Powerhouse that will accommodate 500 cfs flow (Proposed License Article 4(a));

(2) Renovate the trash rack in the forebay to allow adult fish passage through the rack (Proposed License Article 4(f));

(3) Design and construct an improved discharge for turbine units 12 and 13 (Proposed License Article 4(g));

(4) Design and construct the Unit 13 bypass discharge to decrease velocities so they comply with NOAA Fisheries fish passage criteria (Proposed License Article 4(i));

(5) Develop an Operational Plan for the T.W. Sullivan Powerhouse that describes how flow will be routed through the powerhouse, the siphon bypass, and the fish ladder (Proposed License Article 6) ;

(6) Prior to construction of the flow-control structure at Willamette Falls, remove flashboards during fall low flow periods (Proposed License Article 8);

(7) Design and construct a flow control structure (Proposed License Article 9(a));

(8) Develop and implement an operation plan for the flow-control structure (Proposed License Article 10);

(9) Install and provide flows at lamprey passage ramps (Proposed License Article 15(a));

(10) Implement a Stranding Management Plan (Proposed License Article 14).

b. State Permits. Before commencing any construction activity, PGE shall obtain all necessary state permits and authorizations.

c. Spill Management. PGE shall maintain and implement current Spill Prevention, Control, and Countermeasure (SPCC) plans for oil and hazardous materials prepared in accordance with the Clean Water Act requirements of 40 CFR 112. These plans shall address all locations at the Project where Project operations may potentially result in a spill or release or threatened spill or release to the Willamette River. In the event of a spill or release or threatened spill or release to Project waters or to the Willamette River, PGE shall immediately implement the site's SPCC plans and notify the Oregon Emergency Response System (OERS) at 1-800-452-0311.

4. General

a. Certification Modification. DEQ, in accordance with OAR Chapter 340 Division 48 and, as applicable, 33 USC 1341, may reconsider this Certification and add, delete, or modify certification conditions as necessary to address:

(1) Adverse or potentially adverse Project effects on water quality or designated beneficial uses that did not exist or were not reasonably apparent when this Certification was issued;

(2) TMDLs;

(3) Changes in water quality standards;

(4) Any failure of Certification conditions to protect water quality or designated beneficial uses as expected when the Certification was issued; or

(5) Any change in the Project or its operations that was not contemplated by the Certification that might adversely affect water quality or designated beneficial uses.

b. Other Federal Permits. Upon applying for any federal permit for construction activities at the Project that might disturb river sediments, PGE shall provide DEQ written notice of such application and of any proposed changes to or new specifications for the construction activities since issuance of this Certification. DEQ will notify PGE and the federal agency either that (i) this Certification is sufficient

for purposes of the federal permit, or (ii) in light of new information related to the water quality impacts of the construction activities, there is no longer reasonable assurance of compliance with state water quality standards. In the latter event, DEQ will consider the new information, solicit and consider public and agency comment as required by law, and issue a § 401 Certification determination for purposes of the federal permit activities.

c. Project Changes. PGE shall obtain DEQ review and approval before undertaking any change to the Project that might significantly affect water quality, including changes to Project structures, operations, and flows.

d. Project Repair or Maintenance. PGE shall obtain DEQ review and approval before undertaking Project repair or maintenance activities that might significantly affect water quality (other than project changes required by or considered in this Certification).

e. Access. PGE shall allow DEQ such access as necessary to the Project area and Project records at reasonable times as necessary to monitor compliance with these Certification conditions.

f. Posting of Certification. PGE shall post a copy of these Certification conditions in a prominent location at the T.W. Sullivan Powerhouse.

g. Project- Specific Fees. In accordance with ORS 543.080, PGE shall pay a project-specific fee for DEQ's costs of overseeing implementation of the adaptive management conditions of this Certification. The fee shall be $12,000 annually (2005 dollars, escalated as described in Proposed License Article 19), made payable to "State of Oregon, Department of Environmental Quality", and due on July 1 of each year after issuance of this Certification. DEQ shall credit against this amount any fee or other compensation paid or payable to DEQ, directly or through other agencies of the State of Oregon, during the preceding year (July 1 to June 30) for ODEQ's cost of oversight of adaptive management. ODEQ and PGE shall review the need, if any, to modify, extend, or terminate the fee, in accordance with ORS 543.080. PGE shall continue to pay any project-specific fee required after such review.

Attachment A

Water Quality Monitoring and Management Plan

1.0 Introduction

This Water Quality Monitoring and Management Plan (WQMMP) describes procedures that will be employed by Portland General Electric Company (PGE) to satisfy the requirements of the § 401 Water Quality Certification for the Willamette Falls Hydroelectric Project (FERC # 2233). The Willamette Falls Hydroelectric Project consists of a powerhouse and associated dam structures. A navigation lock, an upstream fish passage facility, and two paper mill complexes are also located at Willamette Falls and affect river flow at the Falls. A description of the Project is available in section 3 of the § 401 Water Quality Certification application.

This monitoring plan, in combination with information contained in PGE's application for § 401 certification, provide the water quality certification agencies (i.e., the Oregon Department of Environmental Quality (ODEQ)) reasonable assurance that the Project will not contribute measurably to the violation of applicable water quality standards and criteria, that the waters potentially affected by the Project will not be degraded from existing conditions, that future Project operations will offset any ongoing contributions to non-attainment of water quality standard numeric or narrative criteria, and that such operations will also mitigate adverse impact to designated beneficial uses.

As a major mitigation measure for the new license period, PGE proposes to construct a controlled flow structure at the apex of Willamette Falls and a new fish bypass route through the powerhouse siphon spillway. The controlled flow structure would consist of a gated opening in the dam at the apex of the Falls to focus flow through a natural channel at the upstream point (apex) of the horseshoe shaped Falls. Within the opening would be an adjustable weir that would control the amount of flow through this location while maintaining upstream river elevation. Focusing river flow over the Falls at the apex location would improve passage conditions for downstream migrating fish, especially under low flow conditions when landing conditions below the Falls are not optimal. A controlled flow structure would take into account many design considerations, including maintaining upstream river elevation above 52.5 feet mean sea level, minimizing adult migrant attraction away from the Oregon Department of Fish and Wildlife's (ODFW) Willamette Falls Fish Ladder entrances, avoiding damaging hydraulic impacts to fish ladder structures, avoid creating total dissolved gas (TDG) water quality problems downstream, avoiding creating a hazard to upstream boaters, and possibly enhancing upstream passage opportunities for adult lamprey. Although the final design for this structure has not been completed, the controlled flow structure would be on the order of 150 feet wide and 10 feet deep, with multiple weir segments, designed for a capacity up to 15,000 cfs (actual capacity will be determined through the design process). Based on performance of the initial structure, minor modifications to the landing area downstream of the control structure would be included to minimize injury to juvenile fish at this location.

The siphon bypass will modify a portion of an existing siphon spillway. An opening will be created within the siphon structure and a control gate will be installed to provide a continuous flow of water directly from the forebay to the tailrace. Flows up to 500cfs through this route are anticipated. Bypassed flows will be released into the tailrace via a "surface skimming" outfall to minimize plunging of the outfall flow and to better direct bypassed fish into the main river channel.

Final design of both the controlled flow structure and the siphon bypass will be aided by physical modeling. Physical modeling will also aid in minimizing, or completely eliminating, any potential impacts to water quality parameters, specifically TDG.

The following plan provides information regarding ODEQ standards and goals, application of these standards and goals to the Project, facilities for compliance, the approach to monitoring, and the reporting of monitoring results and management operations. The schedule of this plan has been determined with reference to the completion of construction of the controlled flow structure and siphon bypass, and operation of the Project with these new structures in place. Construction-related schedule information can be found in the Willamette Falls Implementation Plan, which is Exhibit B to the Willamette Falls Settlement Agreement submitted to FERC in January, 2004.

Various management activities that will be conducted pursuant to this plan, or pursuant to the terms and conditions of the new FERC license, may require PGE to conduct instream work. PGE will obtain any permits, such as a Corps of Engineers 404 permit and associated § 401 certification, that may be required prior to conducting such activities.

2.0 Background

2.1 Biological Need for Siphon Bypass Structure

It has been estimated that Fish Guidance Efficiency (FGE) will increase to 95% or greater at the T.W. Sullivan plant with a new siphon spillway bypass system operating in conjunction with improved forebay hydraulics moving fish past the turbine units to the bypass routes. The siphon bypass will provide a new passage route directly from the T.W. Sullivan forebay into the tailrace, bypassing the powerhouse, and improving the safe bypass of downstream migrants beyond what would be achieved with the forebay hydraulic modifications and the existing unit 13 bypass system alone. The new siphon bypass is expected to pass up to an additional 500 cfs. As a result, T.W. Sullivan forebay flow would increase from 5,850 cfs to 6,350 cfs under most river flow conditions, or from 6,850 cfs to 7,350 cfs under maximum flow conditions, or an increase of 8.6% or 7.3% respectively.

The siphon bypass option also includes changes to the T. W. Sullivan tailrace north shoreline and area between the unit 12 and 13 discharges. Such modifications would eliminate low-flow and eddy conditions conducive to ambush predators. Increasing discharge flow into the tailrace and improving hydraulics would reduce tailrace predation.

Enhanced forebay flows and a second bypass route also should improve Pacific lamprey, steelhead kelt, and adult salmonid fallback passage through T.W. Sullivan. For all species, the higher forebay velocities should increase

sweeping velocities across the louver array. Higher sweep velocity may assist transporting these fish to the existing Unit 13 bypass or the new siphon spillway by increasing warning stimuli (e.g. faster flows and perhaps sound from entrained air; Kynard and Horgan 2001) detectable by fishes near the louvers.

Installation of a new bypass route through the siphon spillway would enhance fish passage at the T.W. Sullivan Development. This measure is expected to benefit threatened Upper Willamette River spring Chinook and winter steelhead ESUs. The measure should also benefit juvenile Pacific lamprey, Lower Columbia River Chinook salmon, Lower Columbia River steelhead, Lower Columbia River/Southwest Washington Coast coho salmon, and Upper Willamette River coastal cutthroat trout.

Contribution of the proposed siphon bypass to TDG below the Falls will likely be negligible. The design and modeling process used by PGE to determine the final outfall configuration will provide additional information on any TDG impacts, and operational guidelines that develop out of the modeling and design process will be employed adaptively to minimize TDG impacts. This WQMMP provides for a means of monitoring for TDG impacts from the siphon bypass.

2.2 Biological Need for Control Flow Structure

The presence of the dam around the crest of the Falls modifies flow patterns around and over Willamette Falls by spreading the flow around the entire Falls. This is most noticeable at lower flows where much of the flow may have been guided over the Falls through natural channels between and over Moore and Abernathy Islands. By spreading flow around the entire dam along the crest of the Falls, some downstream migrants may be deterred from passing over the Falls due to a shallow veil of water passing over the dam/flashboards, or they pass over the Falls at locations that may result in injury from rock outcroppings or by landing on rocks at the base of the Falls. This concern is applicable to not only juvenile downstream migrants but also for kelts and for upstream migrant fallback.

Downstream migration of fish past the Project occurs year round, although 85% of downstream passage occurs from March through June. Most fish that migrate through the Project area pass over Willamette Falls directly. A main concern for fish is potential mortality and injury as the fish migrate over the Falls. This concern of fish mortality or injury at lower flows is heightened due to adverse passage conditions such as rock outcroppings and landing areas, and predation.

To address concerns related to downstream fish passage and understand behavior of downstream migrants, several radio-telemetry studies were conducted with juvenile Chinook salmon and steelhead. Data from these studies were analyzed to determine if focusing flow at the Falls apex could influence the passage of downstream migrants (NAI 2001a) or if the spreading of flow around the Falls caused downstream migrating smolts to hold or move appreciably above the Falls (NAI 2002).

A radio-tag study conducted in the fall 2000 helped determine if smolts could be attracted to a 300-ft open section of the flashboards made at the apex of the falls. This study was conducted in October 2000 when flows over the falls

were approximately 12,500 cfs. Of the fish that passed over the Falls, the proportion that passed at the slot location increased from 37.5% to 80.6% from pre-slot to post-slot conditions (NAI 2001a).

The downstream passage radio-tag study in the Spring 2002 was conducted at flows on the order of 15-20,000 cfs with virtually all flashboards removed due to the high winter flows (NAI 2002). Analysis of radio-telemetry data from this study indicated that the smolts moved downstream very quickly and did not exhibit appreciable movement or delay above the Falls as they passed downstream. Approximately 82% of the tagged fish passed over the Falls in the vicinity of the apex in this study. Survival performance of migrants over the Falls was not an intended product of either study.

2.3 Historical Measurements of TDG at Willamette Falls

TDG was monitored at the Willamette Falls Project during 2000-2002 to better understand whether the flow that occurs over the dam and the Falls contributes to total dissolved gas levels downstream of the Falls. The TDG values recorded during the 2000/2001 monitoring period (late June - early November of 2000 and May – August of 2001) remained below 110 % at all of the monitored sites with the exception of sites immediately within the horseshoe of the Falls. Nine (22%) of the 41 measurements taken exceeded 110 %. Measured values ranged from 111 to 115 % and usually occurred when river flows exceeded 7,000 cfs and flows over the Falls were small (i.e. 500 cfs). TDG levels were less than 110% just downstream of the Falls at the location where the T.W. Sullivan tailrace and BHPC powerhouse discharges enter the main river channel. TDG levels recorded for the T.W. Sullivan forebay, T.W. Sullivan tailrace, and BHPC tailrace indicate that TDG levels are generally reduced as water passed through the Project's generators. The lower TDG of water discharged from the powerhouses tended to reduce TDG levels in the main river channel below the Project by dilution in the range of flows measured (approx. 6,000 to 15,000 cfs).

Additional TDG measurements were obtained at several sites below the Falls at much higher flows during the winter of 2001/2002. As flows increased at the Falls, water surface elevation at the base of the Falls increased proportionately more than above the Falls (approximately 3-ft of downstream elevation increase for every 1-ft of upstream elevation increase), thereby increasing the available plunge depth of water flow over the Falls. The plunge depth within the Falls is determined by geologic constraints approximately one-half mile downstream of the Falls. TDG measurements were obtained at 100,000 cfs, 56,000 cfs, 40,000 cfs and 28,000 cfs. As expected,

TDG levels were much higher (120%, 118%, 114%, and 110% respectively) and persisted at sampling sites for several miles downstream.

3.0 Total Dissolved Gas Monitoring

3.1 ODEQ Total Dissolved Gas Standards

The applicable ODEQ standard for total dissolved gas states, "The concentration of TDG relative to atmospheric pressure at the point of sample collection shall not exceed 110% of saturation, except when stream flow exceeds the ten-year, seven-day average flood. However, for Hatchery receiving waters and waters of less than two feet in depth, the concentration of TDG relative to atmospheric pressure at the point of sample collection shall not exceed 105% of saturation (OAR 340-041-0031)."

3.2 Application of Standard to Willamette Falls Project

The super-saturation of atmospheric gases in water may cause crippling or lethal gas bubbles (Gas Bubble Trauma or GBT) to form in the tissues of fish. The standard is designed to prohibit discharges or activities that will result in atmospheric gases reaching known harmful concentrations in the water column.

TDG levels sometimes exceed 110% of saturation either just within the horseshoe area of Willamette Falls during low flow, or for several miles downstream at high flow. These high TDG levels coincide with water spilling over the Falls, which is a natural source of high TDG. Monitoring TDG values downstream of the Falls following construction of a controlled flow structure would indicate whether the structure was contributing to conditions where high TDG levels may be present naturally.

3.3 Facilities for Compliance

A controlled flow structure, consisting of an opening in the dam and an adjustable weir at the apex of the Falls, will be constructed to focus river flow over the Falls and improve passage conditions for downstream migrating fish. Additionally, the siphon bypass outfall will be constructed to direct flows from the proposed siphon bypass structure in such a manner so as to optimize hydraulic conditions in the tailrace for safe downstream migrant egress from the tailrace. Both structures will be designed to minimize contributions to TDG levels in the Willamette River.

3.4 Monitoring Objectives

There are three primary objectives of this WQMMP. These objectives include:

- To determine whether the Project is in compliance with the ODEQ TDG standards and the § 401 certification with new project structures in place that modify flows paths at Willamette Falls.
- To collect TDG data to aid in the identification and/or implementation of adaptive management measures needed to ensure compliance with the ODEQ water quality standards and the § 401 certification.

3.5 Approach to Total Dissolved Gas Monitoring

PGE proposes to monitor TDG at incremental river flows with the controlled flow structure and the siphon bypass in both operating and non-operating modes. If possible, TDG monitoring will begin prior to the installation of these structures; however, if this is not possible, TDG measurements obtained with the structures in place but not operating will be similar, if not identical, to measurements without the structures. PGE will submit draft data and

progress reports on a monthly and quarterly basis, respectively, to ODEQ. A draft report will be submitted to ODEQ within three months of completing the planned TDG monitoring. A continuous TDG recording device will be employed downstream of the Falls to enable collection of TDG data, either through data downloads or remote access. Such a device will allow PGE and ODEQ to closely monitor TDG during the migration periods for salmonids and at various levels of river discharge and controlled flow structure and siphon bypass operation. PGE will study the relationship between TDG and various combinations of river discharge and operation of the controlled flow structure and the siphon bypass.

PGE also proposes to compare monitoring results with previous TDG measurements at Willamette Falls under various levels of river discharge. Based upon the study results, PGE may develop operating criteria, or other measures, associated with operation of the controlled flow structure or siphon bypass (see Section 3.7 below). The proposed water quality monitoring in this proposal is intended to provide reasonable assurance that installation and operation of the new Project structures do not contribute to high TDG conditions in the river.

3.6 Detailed Plan for Total Dissolved Gas Monitoring

TDG data will be collected using continuous monitoring equipment and techniques developed by the United States Geological Survey (USGS) for monitoring TDG at other hydropower facilities in the Columbia Basin (Tanner, 2001). TDG data will be collected continuously at a single location downstream of Willamette Falls utilizing quality assurance / quality control measures described in Tanner (2001). If needed, TDG will be measured above the Falls in the T.W. Sullivan forebay utilizing a discreet grab-sample approach should PGE or ODEQ determine such data is necessary to adequately assess the controlled flow structure affect on TDG. Measurements in the forebay are assumed representative of ambient (inflow) concentrations. Downstream of the Falls, TDG will be measured at a location which will be determined in consultation with ODEQ, and with assistance of the United States Geological Survey (USGS).

One sampling site downstream of the falls is appropriate for the proposed monitoring program; little evidence of horizontal or vertical TDG stratification in the Willamette River was observed from previous TDG monitoring at Willamette Falls (NAI 2001b). Even at sites immediately downstream of the Falls, stratification was not strong and varied in direction; at times, surface values were higher than those at deeper depths, at other times surface values were slightly lower.

In order to provide additional tools for interpreting results of TDG monitoring, PGE will collect ancillary data including but not limited to barometric pressure, air and water temperature, water elevation above and below Falls, river discharge, operational status of the powerhouse, and operational status of the controlled flow and siphon bypass structures. Some of this data, such as barometric pressure, temperature, and water elevation will be recorded at the same time as TDG data where daily averages are not sufficient for correlating with the TDG measurements. TDG assessment will be conducted under the flow and operating conditions shown in Table 1. Operating conditions will be subject to fish passage testing that is anticipated to be occurring during the same timeframe. Additionally,

since flow in the river is not controllable, sampling will occur when the desired flow condition occurs. Flows within a reasonable range of the desired flow (ie, ±10%), will be considered acceptable. Each monitoring condition will be held for a 24-hr period to allow equilibrium to occur prior to collecting data. Any significant changes in environmental (ie, outside the ±10% range) or operating conditions during the data collection period will be recorded to help assess TDG results.

Table 1. TDG Monitoring Conditions

Flow (in CFS) Read at USGS gage 14191000 (SLM03)	Operating Conditions*		Remarks
	Siphon Bypass	Controlled Flow Structure	
Summer low flow (6-7,000)	Off	Off	Any impact to TDG from Siphon Bypass should be evident at these lower flow conditions. If TDG impact observed, additional testing will be performed at less than full Siphon Bypass capacity.
	On	Off	
10,000	On	Off	
	Off	Off	
	Off	On	
	On	On	
20,000	N/A	On and Off	If TDG impact observed, an additional measurement will be obtained with structure in interim position if feasible based on design. If TDG impact persists, TDG monitoring will be repeated following any identified and implemented adaptive management measures.
30,000		On and Off	
40,000		On and Off	
50,000		On and Off	
60,000		On and Off	
70,000		On and Off	
80.000		On and Off	
90,000		On and Off	
100,000		On and Off	

- "On" indicates the structure is in operation. For the controlled flow structure, the gate(s) are lowered and water is passing through it and over the apex of the Falls. For the siphon bypass, the gate is open and flow is passing down the outfall and into the tailrace. "Off" indicates the structures are not operating; all gates are up and water is not being passed. Where "On and Off" is shown, this indicates two separate monitoring conditions.

3.7 Adaptive Management and Endpoint

PGE will employ principles of adaptive management to the operations of the Project, including reasonable changes to the operation or additional modifications to the flow control structure and siphon bypass. This approach will implement and assess operational and/or structural modification steps identified during the design process, or possibly during the monitoring period, to further decrease TDG generated from these structures. Operational and/or structural modifications as part of this adaptive management approach are envisioned to be minor in nature and

consistent with the structures' purpose to safely pass migrating fish downstream past the Project. This WQMMP will be modified to include the revised management plan once the design for the two structures is adopted.

As design, construction and operation of these structures commences under the terms of the new FERC license and §401 permit from ODEQ, additional management and monitoring measures will be detailed under this adaptive management section, as necessary, to respond to new information and experiences with TDG below the falls and in the tailrace.

While the exact TDG response to the new structures, specifically the controlled flow structure at the Falls apex, is not know at this time, an endpoint to this WQMMP would be characterized by the collection of sufficient TDG data at adequate environmental and operation conditions (Table 1) that demonstrate: 1- TDG violations do not occur; or 2- if TDG violations occur, that the new structures do not contribute to the high TDG levels; or 3- agreed upon adaptive management efforts have been implemented to the satisfaction of ODEQ.

3.8 Reporting

PGE will submit and review with ODEQ draft data collected on a monthly basis during data collection periods. Quarterly progress reports will be produced that summarizes TDG monitoring data for the current reporting period. A brief discussion of all data collected to that point will also be included. These quarterly reports will be submitted to the ODEQ and distributed to the Fish Technical Committee (FTC).

A draft and final report will be produced at the conclusion of the above proposed monitoring. A draft report will be submitted to the ODEQ and distributed to the FTC within 90 days of data collection completion. After a 45-day review and comment period, a Final report will be submitted within 45-days after the end of the comment period. The draft and final report will include conclusions as well as any recommendations for additional modifications and/or monitoring, if appropriate.

3.9 Schedule

If possible, data collection will be initiated in 2005 prior to the construction and operation of the bypass structures. Siphon bypass construction is planned for 2005 and the controlled flow structure in 2006. It is anticipated data collection will occur as flows allow in 2005 and 2006 until construction is initiated on the controlled flow structure. Data collection will resume after the controlled flow structure is operational. Additional sampling needs will be assessed and discussed as part of the reporting and periodic meetings of the FTC with additional sample scheduling done as needed.

4.0 Quality Assurance/Quality Control

4.1 Approach to Quality Assurance/Quality Control

PGE will develop and submit for approval to the ODEQ a comprehensive Quality Assurance (QA) and Quality Control (QC) plan. All measures outlined in the QA/QC plan would be Project specific, with explanations of how data collection conducted at all sites will comply with guidelines. PGE's plan will include regular evaluation of the

TDG fixed station performance. Getting the continuous monitoring station in place prior to the installation of the controlled flow structure is important to establish a baseline dataset. The following sections provide a brief outline of expected QA/QC measures for TDG measurements. PGE will implement this Water Quality Monitoring Plan in accordance with the approved QA/QC plan.

4.2 Equipment Calibration and Maintenance

Routine calibration and maintenance of field and lab equipment will be done in accordance with manufacturer's guidelines, and in compliance with the methods and protocols described by Tanner (2001). PGE or its contractor will perform these equipment calibration checks at a bi-weekly interval. At the conclusion of the field sampling, the TDG equipment will be recalibrated to check for deviations from baseline calibration points. Differences between start and ending calibration points will be presented in the final report and will be considered prior to data analysis.

4.3 Audits and Replicates

The senior aquatic scientist/project manager for this project will perform audits of TDG measurements, or ensure that contractors are conducting and reporting results of regular audits.

4.4 Data Quality

Data quality will be assured by the implementation of an ODEQ-approved comprehensive Quality Assurance (QA) and Quality Control (QC) plan.

4.5 Reporting

A report will be produced within six months after data collection that summarizes relevant water quality data and establishes compliance with approved QA/QC procedures. The report will be submitted to the ODEQ and distributed to appropriate parties within the Willamette Falls FTC.

5.0 Literature Cited

Normandeau Associates, Inc. 2001a. Final Report: Fall 2000 evaluation of juvenile spring chinook salmon downstream migration at the Willamette Falls Project under two passage scenarios. Prepared for PGE and BHPC. Drumore, Pennsylvania.

Normandeau Associates, Inc. 2001b. Mathur, D. and S. Haney. 2001. Draft Report, Summary of Willamette Falls Hydroelectric Project 2001 water quality conditions. Report prepared for Blue Heron Paper Company, Oregon City, OR, PGE, Portland, OR, and Willamette Falls Project Fisheries, Aquatics, and Terrestrial Workgroup.

Normandeau Associates, Inc. 2002a. Karchesky, C.M., T.D. Brush, D. Mathur, and E.J. White. 2002. Evaluation of juvenile steelhead downstream migration at the Willamette Falls Project (Draft). Report prepared for PGE and BHPC. Drumore, Pennsylvania.

PGE and BHPC. 2002. Final License Application for Willamette Falls Hydroelectric Project. Portland, Oregon.

Tanner, D.Q., H.E. Harrison, and S.W. McKenzie. 1996. Total Dissolved Gas, Barometric Pressure, and Water Temperature Data, Lower Columbia River, Oregon and Washington, 1996. USGS Open File Report 96-662A. Portland, Oregon.

Tanner, D.Q., and M.W. Johnston 2001. Data Collection Methods, Quality Assurance Data, and Site Considerations for Total dissolved Gas Monitoring, Lower Columbia River, Oregon and Washington, 2000. USGS Water-Resources Investigations Report 01-4005. Portland, Oregon.