



PUGET SOUND ENERGY
The Energy To Do Great Things

STREAMFLOW GAGING PLAN

LICENSE ARTICLE 406

BAKER RIVER PROJECT
FERC No. 2150-033

Puget Sound Energy
Bellevue, Washington

September 2009

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1.0 Introduction

A license was issued by the Federal Energy Regulatory Commission (FERC) on October 17, 2008 to Puget Sound Energy Inc. (Puget) for the Baker River Hydroelectric Project No. 2150. The FERC License contains articles that set forth various requirements that the licensee must satisfy within the first year of the license. Article 406 provides for the development of a streamflow gaging plan.

1.1 FERC License Compliance

Article 406 of the license states the following:

Within one year of license issuance, the licensee shall file, for Commission approval, a streamflow gaging plan. In addition to an implementation schedule, the plan shall include provisions for operating and maintaining a real-time streamflow monitoring gage in the lower Baker River.

The licensee shall prepare the plan after consultation with the U.S. Fish and Wildlife Service, National Marine Fisheries Service, Washington Department of Fish and Wildlife, and U.S. Geological Survey. The licensee shall include the plan documentation of consultation, copies of comments and recommendations on the completed plan after it has been prepared and provided to the consulted entities, and specific descriptions of how all comments are accommodated by the plan. The licensee shall allow a minimum of 30 days for the consulted entities to comment and to make recommendations before filing the plan with the Commission. If the licensee does not adopt a recommendation, the filing shall include the licensee's reasons, based on project-specific information.

The Commission reserves the right to require changes to the plan. The licensee shall not begin implementing the plan until the Commission notifies the licensee that the plan is approved. Upon Commission approval, the licensee shall implement the plan, including any changes required by the Commission.

1.2 Distribution of the Draft Plan

This Plan was distributed to the following parties for comments and recommendations:

Lou Ellyn Jones, U.S. Fish and wildlife Service; Steve Fransen, National Marine Fisheries Service; Brock Applegate, Washington Department of Fish and Wildlife; and Robert Kimbrough, U.S. Geological Survey. Comments and recommendations received are discussed in section 6.

2.0 Gage Locations and Descriptions

This plan describes the river discharge and reservoir elevation gages at the Project from upstream to downstream as shown in Figure 1 below. These gages include:

- Baker Lake (USGS Gage 12191600)
- Lake Shannon (USGS Gage 12193000)
- Baker River (USGS Gage 12193400 pre-May 2009, or 12193500, post-May 2009)
- Skagit River (USGS Gage 12194000)

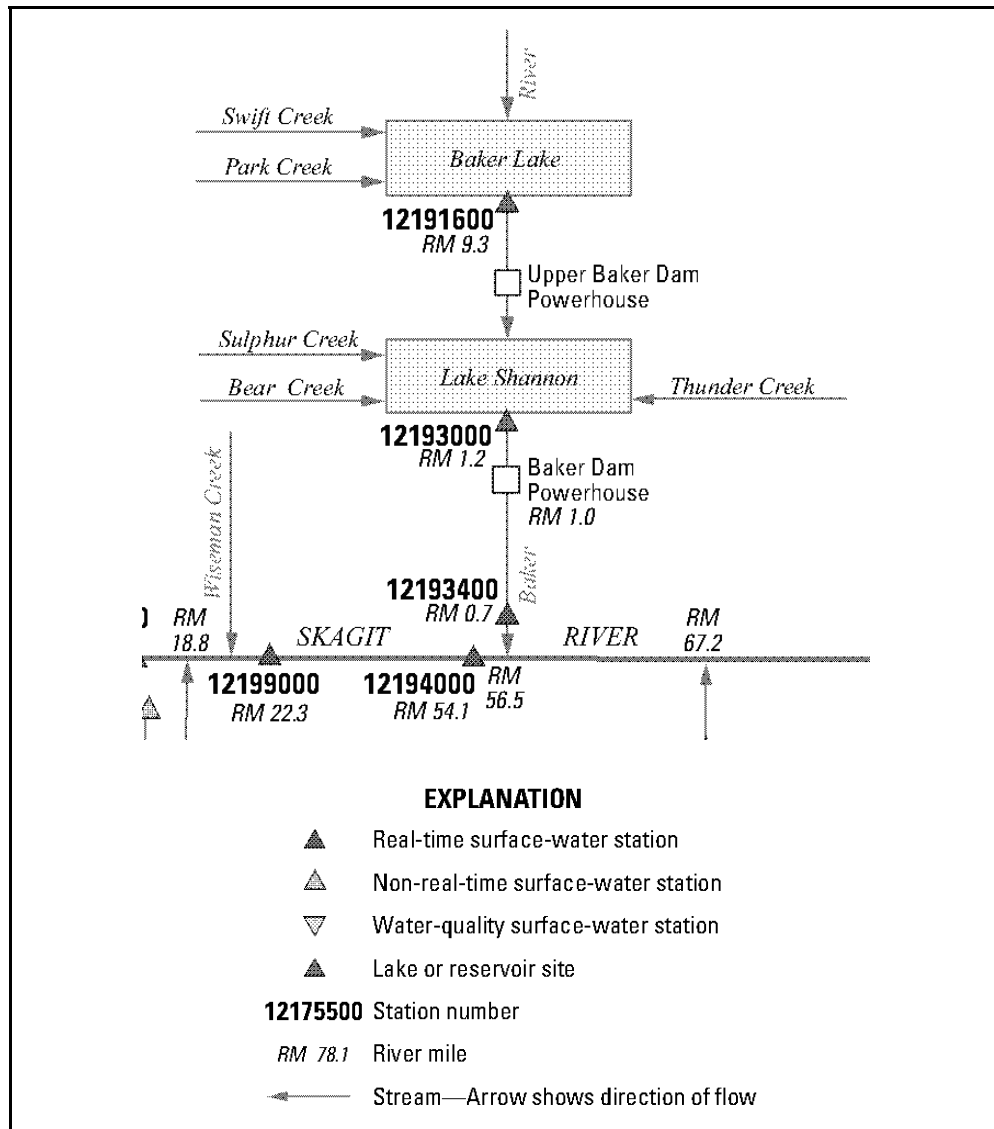


Figure 1. USGS gages at the Baker River Hydroelectric Project.

Provisional real-time 15-minute data is available for these sites on the USGS web site at <http://waterdata.usgs.gov/wa/nwis/>. The USGS defines provisional data as:

Recent data provided by the USGS in Washington -- including stream discharge, water levels, precipitation, and components from water-quality monitors--are preliminary and have not received final approval. Most data relayed by satellite or other telemetry have received little or no review. Inaccuracies in the data may be present because of instrument malfunctions or physical changes at the measurement site. **Subsequent review may result in significant revisions to the data.**

2.1 Baker Lake

2.1.1 Instrumentation Location

The Baker Lake gage is located at Latitude 48°38'58", Longitude 121°41'22", in SW 1/4 Section 31, Township 37 North, Range 9 East, in Whatcom County. The USGS identifies this gage as station 12191600 Baker Lake at Upper Baker Dam near Concrete, WA. The instrument is a high level data logger/pressure transducer with a high data rate GOES transmitter and was installed in its current location during September 2006 by USGS personnel.

The gage is on the upriver side of Baker Dam on the Baker River, 8.0 miles north of Concrete at river mile 9.3. The drainage area to the gage is 215 square miles. Lake elevation is reported to NAVD of 1988. Prior to October 1, 2004, lake elevation was reported to NGVD of 1929. Normal lake elevation varies from 658.77 feet and 727.77 feet NAVD 1988 (top of tainter gates). Funds for the operation of the gage and telemetry equipment, and production of the data are provided by Puget Sound Energy.

2.1.2 Data Collection

Daily mean water surface elevation is available from the USGS beginning 07-09-1959. Provisional real time 15-minute data is available on the USGS web site at <http://waterdata.usgs.gov/wa/nwis/>.

2.2 Lake Shannon

2.2.1 Instrumentation Location

The gage on Lake Shannon is located at Latitude 48°32'53", Longitude 121°44'22", in SW 1/4 Section 2, Township 35 North, Range 8 East, in Skagit County. The USGS gage is designated as station 12193000 Lake Shannon at Concrete, WA. The gage is situated at Lower Baker Dam near the left bank, 0.7 miles north of Concrete and at river mile 1.2. The drainage area measured at this gage is 84 square miles. The instrument is a high level data logger/pressure transducer with a high data rate GOES transmitter and was installed in its current location during September 2006 by USGS personnel.

The lake elevation is reported to NAVD of 1988. Prior to October 1, 2004, lake elevation was reported to NGVD of 1929. Normal lake elevation varies from 358.75 feet to 442.35 feet NAVD 1988. Funds for the operation of the gage and telemetry equipment, and production of the data, are provided by Puget Sound Energy.

2.2.2 Data Collection

Daily mean water surface elevation data for this general location is available from the USGS beginning 10-1-1974. Provisional real-time 15-minute data is available on the USGS web site at <http://waterdata.usgs.gov/wa/nwis/>.

2.3 Baker River

2.3.1 Instrumentation Location

The gage is located at Latitude 48°32'26", Longitude 121°44'32", in NW 1/4 NW 1/4 Section 11, Township 35 North, Range 8 East, in Skagit County. The USGS designates this gage as station 12193400 "Baker River at Henry Thompson Bridge at Concrete, WA" which replaced station 12193500 "Baker River at Concrete" in May 2009. The gage is 0.2 miles northeast of the Town of Concrete and is on the left bank at river mile 0.7 above the confluence with the Skagit River and drains approximately 297 square miles of the Baker River Watershed. Elevation of the gage is approximately 197.0 feet NAVD1988. Funds for the operation of the gage and telemetry equipment, and production of the data are provided by Puget Sound Energy.

The instrument is a high level data logger/pressure transducer with a high data rate GOES transmitter and was installed in its current location during September 2007 in conjunction with USGS personnel.

2.3.2 Data Collection

Daily mean discharge data for this general location is available beginning 10-1-1910 under station 12193500 "Baker River at Concrete, WA". Daily mean gage height data for this designation is available beginning 10-1-1987. Provision real time 15-minute data is available on the USGS web site at <http://waterdata.usgs.gov/wa/nwis/>. The data from this gage may be affected by backwater from the Skagit River when the stage of the Skagit River exceeds 29 feet at station 12194000 Skagit River near Concrete, WA..

2.4 Skagit River at Concrete

2.4.1 Instrumentation Location

Latitude 48°31'28", Longitude 121°46'11", in SE 1/4 NE 1/4 Section 16, Township 35 North, Range 8 East, in Skagit County on the right bank at Dalles Bridge, 1.3 miles southwest of Concrete, 2.4 miles downstream from Baker River, and at river mile 54.1. The USGS identifies this gage as station 1214000 Skagit River near Concrete, WA. Drainage area 2,737 mi², of which 400 mi² is in Canada. Datum of gage is 130.0 feet above NGVD of 1929. Funds for the operation of the gage and telemetry equipment, and production of the data, are provided by Puget Sound Energy, Seattle City Light, and Skagit County Public Works Department.

2.4.2 Data Collection

Daily mean discharge data for this general location is available beginning 10-1-1924 under station 12194000 "Skagit River Near Concrete, WA". Daily mean gage height data

for this designation is available beginning 12-9-1985. Provisional real time 15-minute data is available on the USGS web site at <http://waterdata.usgs.gov/wa/nwis/>.

3.0 Operation and Maintenance Schedule

PSE contracts with the U.S. Geological Survey (USGS) to operate and maintain the gaging station(s) associated with the Project. The current agreement is renewed each year in the October to December timeframe. This arrangement has been in effect for more than fifty years.

The USGS collects base data at the gaging stations that consists of records of stage and measurements of discharge of streams. In addition, observations of factors affecting the stage-discharge relation or the stage-capacity relation, weather records, and other information are used to supplement base data in determining the daily flow or volume of water in storage.

Records of stage are obtained from a water-stage recorder that is either downloaded electronically in the field to a laptop computer or similar device or is transmitted using telemetry such as GOES satellite, land-line or cellular-phone modems, or by radio transmission. Measurements of discharge are made with a current meter or acoustic Doppler current profiler, using the general methods adopted by the USGS. These methods are described in standard textbooks and *USGS Water Supply Paper 2175* (Rantz and others, 1982).

Quality of the data collected and published by the USGS follows procedures identified in *Open File Report 03-490* (Kresch and Tomlinson, 2004). This document is a Surface Water Quality Assurance Plan for the Washington District USGS Water Resources Discipline. The Plan documents the standards, storage, analysis and publication of surface-water data in the state of Washington. The plan also serves as a guide to all USGS District personnel involved in surface water data activities, and changes as the needs and requirements of the District and Discipline change.

4.0 Reporting

Annual reports as required by Article 106, “Flow Implementation”, summarize the past year’s discharge monitoring data on the Baker River. Specifically, Article 106(g) addresses the monitoring of flows and ramping rates from the Project. As stated:

Instream flows and ramping rates shall be monitored at the USGS gage (Station 12193500 [replaced by station 12193400 in May 2009]) Baker River at Concrete or via other approved means. Results of monitoring shall be made available to the commission as part of the report required by this article.

Flow data for the previous 12 months from this gage will be included in the annual report to FERC and Washington Department of Ecology as required.

5.0 References and Literature Cited

Kresch, David L. and Stewart A Tomlinson, 2004. Assurance Plan for the Washington District, U.S. Geological Survey, Water Resources Discipline: U.S. Geological Survey Open File Report 03-490, 53p.

Rantz, S.E., and others, 1982. Measurements and computation of streamflow, volumes 1 and 2: U.S. Geological Survey Water-Supply Paper 2175, 631p.

6.0 Review Comments and Responses

An initial phone call was made on August 17, 2009 to representatives from the U.S. Fish and Wildlife Service, National Marine Fisheries Service, Washington Department of Fish and Wildlife, and U.S. Geological Survey as identified in the license article. The individuals agreed that once the draft plan was received, a deadline of September 22, 2009 would be sufficient to review and respond with comments. Puget then sent the draft plan to those individuals on August 18, 2009 via overnight certified mail.

6.1 Distribution List

Table 1. Streamflow Gaging Plan reviewers.

Name	Organization	Address
Brock Applegate	WA Dept of Fish & Wildlife	Post Office Box 1100 La Conner, WA 98257
Steve Fransen	NOAA Fisheries	510 Desmond S.E., Ste. 103 Lacey, WA 98503
Lou Ellyn Jones	US Fish & Wildlife Service	510 Desmond Dr. SE, Suite 102 Lacey, WA 98503
Robert Kimbrough	U.S. Geological Survey	934 Broadway, Suite 300 Tacoma, WA 98402

6.2 Cover Letter

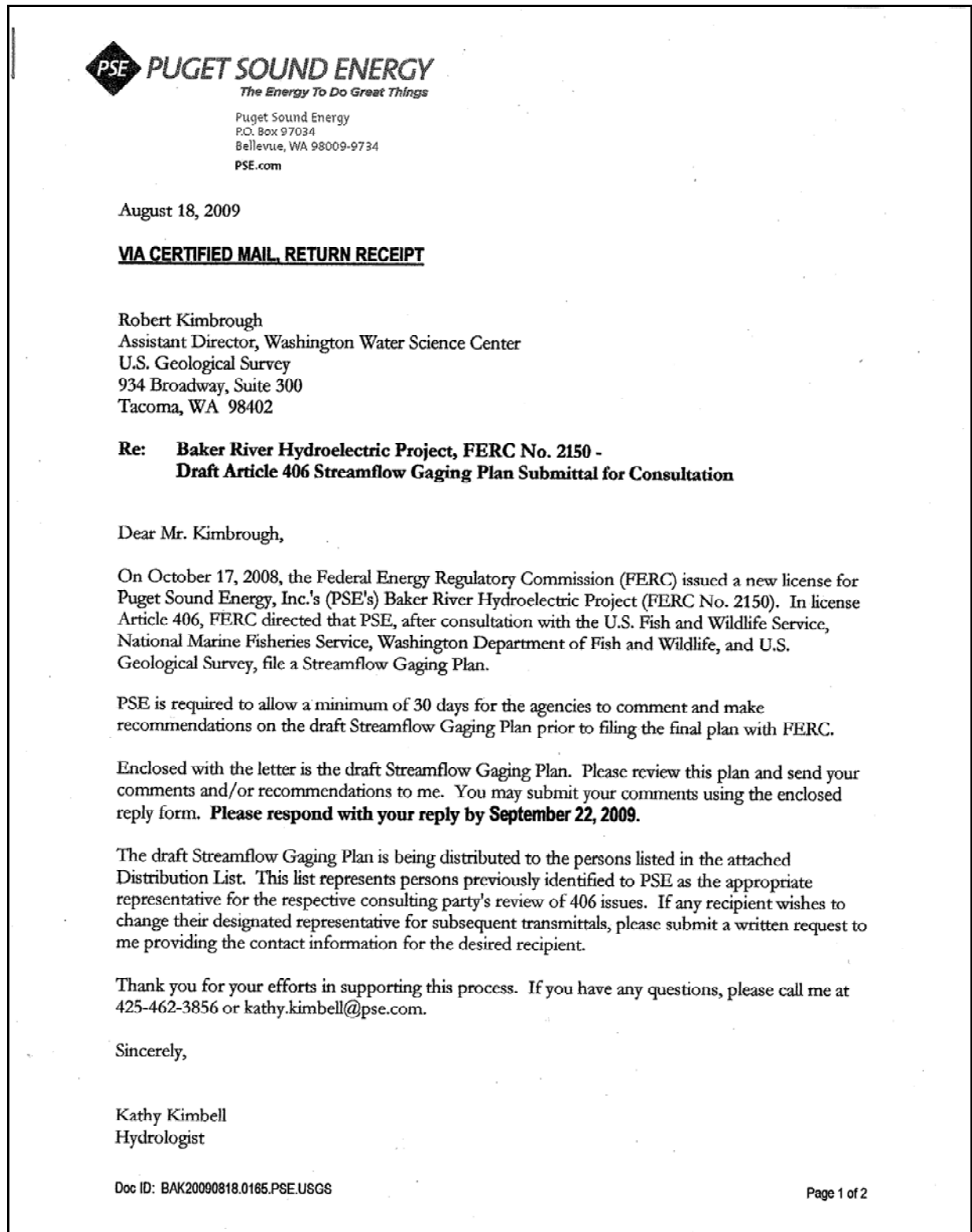


Figure 2. Sample cover letter from PSE.

6.3 Summary of Reviewer Replies

The following reviewer sent comments to PSE (see subsection 6.4 for details).

- Robert Kimbrough, U.S. Geological Survey

The following reviewers replied but had no comments.

- Brock Applegate, Washington Department of Fish and Wildlife
- Lou Ellyn Jones, U.S. Fish and Wildlife Service

The representative from the National Marine Fisheries Service, Steve Fransen, has not responded with comments even though several phone messages and emails have been placed to him. Based on this feedback, it is assumed there are no additional comments.

6.4 Reviewer Comments and PSE Responses

Table 2. Comments following formal review of the Streamflow Gaging Plan, August 18 – September 22, 2009.

Comment	Puget Sound Energy Response
Robert Kimbrough, U.S. Geological Survey, received September 21, 2009	
1. In sections 2.1.1, 2.2.1, .2.3.1, 2.3.2, 2.4.1, and 2.4.2, the term "Hydrologic Unit" is used incorrectly when referring to the individual gaging stations. I suggest the following: In section 2.1.1 "The USGS identifies this gage as Hydrologic Unit station 12191600 Baker Lake at Upper Baker Dam near Concrete, WA". Suggest similar wording in sections 2.2.1, 2.3.1 In sections [sic] 2.3.2 "Daily mean discharge data for this general location is available beginning 10-1-1910 as Hydrologic Unit under station 12193500 Baker River at Concrete, WA". Suggest similar change for section 2.4.2. In section 2.4.1, suggest the following; "... in Skagit County, Hydrologic Unit 12194000 , on the right bank at the Dalles Bridge ..."	Changes made as suggested.
2. In section 2.4.1, suggest adding as sentence no. 2; "The USGS identifies this gage as station 12194000 Skagit River near Concrete, WA."	Changes made as suggested.
3. It should be noted (perhaps in section 2.0 or 2.3.1) that station 12193400 replaced station 12193500 in May 2009. Then update Figure 1 and section 4.0.	Changes made as suggested.
4. In section 3.0, you may want to refer to the multiple gages rather than one. First sentence; "... to operate and maintain the gaging stations at associated with the Project..." Third sentence; "... to operate and maintain this the gages has is a fixed line item..."	Changes made as suggested.
5. In sections 3.0 and 5.0 capitalize "File" in "Open File Report".	Changes made as suggested.
6. In sections 3.0 and 5.0 probably don't need the word "September" when referring to the date of publication for Open File Report 03-490.	Changes made as suggested.

Comment	Puget Sound Energy Response
Robert Kimbrough, U.S. Geological Survey, received September 22, 2009	
I have one additional comment regarding the following sentence in section 2.3.2: "The data from this gage may be affected by backwater from the Skagit River when the stage of the Skagit River at this gage exceeds 29 feet <i>at station 12194000 Skagit River near Concrete, WA.</i> "	Changes made as suggested.