Dam and Reservoir Plan of Development

DRAFT

ORIGINAL SUBMITTED MAY 2010
REVISED OCTOBER 2013
REVISED NOVEMBER 2013

PREPARED BY

Cardno ENTRIX

Sha i

This page intentionally left blank

Table of Contents

Tables

Figures

This page intentionally left blank

S E C T I O N 1

Purpose and Need

1.1 WHAT WILL BE BUILT

[a. what will be built]

The Project for which this application is made is known as the Enloe Hydroelectric Project, located on the Similkameen River in Okanogan County, Washington near the Town of Oroville. The Project involves restoring hydroelectric power generation at Enloe Dam, an existing hydropower dam constructed between 1919 and 1923. The existing powerhouse that is located on the west bank of the river about 850 feet downstream of the dam initially contained one 1,600-kilowatt (kW) hydroelectric turbine-generator unit. In 1924 a second 1,600-kW unit was added. This existing powerhouse was decommissioned in 1958 because lower cost energy was available from other sources.

The present application proposes relocating the site for hydropower development to the opposite (east) bank. The proposed site is nearer to the dam and offers environmental and constructability advantages. The proposed 9.0 MW facility has a footprint that is about half the size of the existing facilities while providing nearly three times the generating capacity of the existing decommissioned plant and about twice the average annual energy output.

The proposed project arrangement would reduce the length of river affected by diversion of a portion of outflow from the reservoir through the power plant. The proposed project tailrace would return water diverted through the power plant to the river at a point some 480 feet downstream of the crest of the dam whereas the existing project tailrace returned water to the river some 930 feet downstream of the dam. The proposed design would release water from the reservoir to the pool below the falls through the new powerhouse instead of over the spillway. Relocating the tailrace exit further upstream about 450 feet closer to the falls provides for better circulation of water to the deep pool at the base of the falls, which provides a cool-water refuge for fish using the Similkameen River.

Construction access is also improved since the east bank of the river is readily accessible from existing roads and there is sufficient room for construction and maintenance of the facilities.

1.2 IDENTIFY USES

[b. identify the uses(s) of the dam and reservoir, such as fisheries, recreation, irrigation, stock water, wildlife, flood control, industrial or domestic water supply, hydropower, stream flow regulation, etc.]

The proposed use of Project is hydropower. The proposed project would utilize the hydroelectric potential of the approximate 80 feet elevation change between the surface of Enloe Reservoir and the pool downstream of Similkameen Falls.

1.3 PERIOD OF USE

[c. state the period of uses and the functional life of the structure]

The period of use is the FERC license period of the Enloe Hydroelectric Project, which is 50 years under the current license order, July 1, 2013 to June 30, 2063.

1.4 SIZE OF FACILITY

[d. describe the size of the facility, i.e., the dam dimensions, reservoir surface area, permanent storage capacity, flood storage capacity, related facilities, etc.]

1.4.1 Dam and Spillway

The proposed project would utilize the hydroelectric potential of the approximate 80 feet elevation change between the surface of Enloe Reservoir and the pool downstream of Similkameen Falls.

Enloe Dam is 315 feet long with an arch radius of 200 feet and a maximum hydraulic height of 54 feet. The central overflow spillway crest that occupies most of the dam has a length of 276 feet and a crest elevation of 1,044.3 feet. The dam structure is 40 feet thick at the base of the spillway tapering to a 6 feet thick rounded ogee at the crest of the spillway. The spillway has provision for installing 5-foot high flashboards which increase the spillway crest elevation to 1,049.3 feet. The short east abutment of the dam has a deck elevation of 1,049.3 feet. The west abutment of the dam has a deck elevation of 1,053.3 feet and a 4-foot high parapet wall on the downstream side of its crest.

Hydraulic energy in reservoir outflow that plunges about 54 vertical feet down the spillway chute is dissipated in a stilling zone downstream of the spillway in the river channel between the Dam and Similkameen Falls. About 340 feet downstream of the dam crest the river plunges 22 vertical feet over Similkameen Falls into a narrow deep plunge pool that has been eroded in bedrock at the toe of the falls. The elevation of the pool's water surface varies with river flow but is typically about elevation (El.) 966 feet under average flows.

1.4.2 Intake Canal

An intake canal would divert a portion of streamflow from the Similkameen River to the penstock intake structure that serves the proposed new powerplant. The canal is designed to be wide and shallow at the upstream end to minimize disturbance to existing sediment in the reservoir, and deep at the penstock intake structure to provide adequate submergence.

The intake canal would carry inflow from the river intake structure to the penstock intake structure. The canal would be a 190 foot long unlined trapezoidal cross section canal excavated in rock. The canal would taper from about 120 feet wide and 8 feet deep at the riverbank to about 30 feet wide and 26 feet deep at the penstock intake structure.

1.4.3 Penstock Intake

The penstock intake would be located at the downstream end of the intake canal, in a rock cut through the east abutment of the dam. The intake would be a 35 foot long by 30 foot wide reinforced concrete gravity type structure founded on bedrock and connected to two steel penstocks.

Two bell-mouthed entrances and transitions within the structure to the circular diameter of the penstocks would provide for smooth flow into the penstocks during plant operation, with adequate submergence and minimal hydraulic losses. Trashracks would be provided to protect the turbine water passages from

blockage by debris. The trashracks would be 22 feet high by 12.5 feet wide and would be constructed either from steel or high density polyethylene (HDPW) supported by a steel frame.

Two vertical-lift wheeled gates, approximately 10 feet high by 8.5 feet wide, would be provided for emergency closure at rated flow. Two bulkhead gate slots located upstream of the main gates, would be provided for dewatering of the main gates for maintenance. An enclosure on top of the intake structure would house the gate hoists and controls.

1.4.4 Penstocks

Two above-ground steel penstocks, 8.5 feet in diameter and approximately 150 feet long, would slope steeply from the intake to the powerhouse and would carry water to the turbines. The penstocks would be supported on concrete saddles and by concrete anchor blocks at the penstock bends. Both the exterior and interior of the penstock would be protected against corrosion.

1.4.5 Powerhouse

The proposed powerhouse location is sited in an alcove on the east bank of the Similkameen River about 230 feet downstream of the east abutment of Enloe Dam and 140 feet upstream of Similkameen Falls.

The reinforced concrete powerhouse structure would be about 70 feet long and 30 feet wide and would house two vertical axis Kaplan turbine/generator units, controls, switchgear and a repair bay. The reinforced concrete substructure would be founded in an open rock excavation in bedrock that outcrops in the banks of the river and the broad terrace upstream of the falls. To accommodate a large fluctuation in tailrace water level, the powerhouse walls would be of reinforced concrete to El. 995 feet. Above this elevation, the walls would be structural steel with insulated metal cladding. The repair bay and laydown area would be located at the east end of the powerhouse, with a floor elevation of approximately El. 995 feet.

A concrete training wall constructed at the west end of the powerhouse would separate the powerhouse and tailrace channel from the stilling basin area downstream of Enloe Dam.

Anadromous fish would be excluded from the draft tubes during periods of part load operation by a conical physical net barrier at the outlet of each draft tube. The barriers would be made of conventional heavy duty fishnet with one inch mesh. The area of each net would be about 600 square feet to achieve a design gross approach velocity of 1.25 fps. An escape exit comprised of a short tube with a narrow one-way exit would be provided at the apex of the conical net to allow small debris and any resident fish that pass through the turbine to escape downstream. The escape exit would be made of dark material and have a narrow flexible opening with trailing streamers to discourage upstream swimming fish from attempting to enter.

1.4.6 Tailrace

The tailrace channel would convey water a distance of about 180 feet from the powerhouse to the Similkameen River, downstream of the Similkameen Falls. It would be an unlined steep-sided trapezoidal channel excavated in rock by controlled blasting techniques. The channel width would taper from about 40 feet at the powerhouse to about 20 feet at a distance of about 75 feet downstream of the powerhouse. Downstream of this point, to the river, the channel width would be 20 feet. The invert of the channel would be about 30 to 40 feet below the existing rock terrace on the east side of Similkameen Falls.

1.4.7 Bypass Facilities

Structural modifications have been conceptually developed to reduce the heating of minimum flows through the bypass reach. Piping the water around the dam would eliminate the solar radiation input and heat transfer from warm air to the thin sheet of flow that would otherwise fall over the dam; and circulation would still be provided in the plunge pool and flows over the natural bedrock to the Falls. Due to the combination of heating and engineering concerns associated with warming and regulating small flow increments over the dam face, the District plans to route flows to the top of the falls through a subsurface pipe intake. The recommended design concept involves adding a conventional orifice controlled instream flow outlet to one of two existing penstock intakes in the right abutment of the dam. This source would pull water from lower, cooler strata in the reservoir, providing additional benefit to the cool water refugia below Similkameen Falls. The configuration both avoids heat gain and allows the flow to be accurately controlled and measured to ensure that the required minimum releases are provided under varying streamflow conditions. The low level outlet will be protected with a trashrack to avoid having debris clog the intake or valves. Final design will be agreed in consultation with resource agencies and tribes through the Fish Work Group. Implementation of the Fish Management Plan will be carried out in consultation with a Fish Work Group (FWG), made up of representatives from the various agencies that manage aquatic resources in the Project area, including BLM, as directed in the 401 Certification and FERC License Order.

1.5 EXISTING RIGHT OF WAY

[e. is this ancillary to an existing right-of-way]

The BLM issued a right-of-way grant to the District in 1989 as an interim measure to authorize the existing facilities at Enloe Dam. The current ROW grant covers approximately 49 acres of land within portions of Lots 1-7, Section 12, and portions of Lots 1-7, Section 13, Township 40 North, Range 26 East, Willamette Meridian. The right-of-way was renewed for five years on April 3, 2001, and expired in 2006. In October, 2007, the right-of-way was renewed for five years, eight months. The effective date of the renewal was April 3, 2006; expired on December 31, 2011. The ROW was again renewed on January 10, 2012, and expires December 31, 2016.

1.6 ALTERNATIVE LOCATIONS

[f. list any alternative locations]

In developing the proposed configuration of the Project the following alternative sites and development options were considered:

- Rehabilitation of the existing project facilities on the west bank of the river.
- Development of power facilities on the east bank of the river, with two options.

Of the two main options, redevelopment on the east bank of the river was found to be the most economically attractive while also offering environmental benefits.

In general, the attractiveness of rehabilitating an existing facility is in potential cost savings and fewer environmental impacts due to reuse of existing facilities. However, because the existing plant is over 80 years old and has been subjected to both vandalism and corrosion since its decommissioning almost 50 years ago, little of the remaining structure could be cost-effectively reused with the exception of the intake structure at the dam, surge tanks (which need extensive rehabilitation), and the powerhouse

excavation. Much of the remaining facility would have to be demolished and removed prior to constructing a new plant. Other issues including hydraulic limitations due to the waterway length/head ratio, limited intake capacity and difficult construction access issues also reduced the attractiveness of the rehabilitation option.

The main advantage of the redevelopment option on the east bank is that this site is suitable for a higher capacity powerplant that makes better use of the hydropower potential at Enloe Dam. From a constructability standpoint, the east bank also has better road access and better topography for gaining road access to the powerplant site.

From an environmental perspective, the redevelopment option involves additional land disturbance but provides benefit to the river environment by moving the powerhouse tailrace exit about 450 feet upstream to the pool at the base of Similkameen Falls.

Further evaluation of the redevelopment options on the east bank considered two potential powerplant sites:

- Upstream of Similkameen Falls with a tailrace channel below the falls. This is the Project as proposed in this license application.
- Downstream of Similkameen Falls.

The advantages of the upstream powerplant location are:

- Reduces length, hydraulic head losses and cost of the headworks.
- Reduces length of penstock, which affects head loss, hydraulic stability and transient pressures and obviates the need for surge tank or synchronous bypass valve.
- Improves construction access and constructability of the powerhouse sub-structure which is affected by proximity to the river channel.
- Improves construction access and constructability of the tailrace.
- Avoids congested area of river valley at the old Similkameen powerhouse.
- Maintains road access to the river bank downstream of the falls.

The advantages of the downstream location are:

- Utilizes disturbed site of the original (1905) powerhouse location.
- Reduces the length of the deep tailrace channel required for the upstream location.
- Reduces tailwater level which increases gross hydraulic head.
- Avoids disturbance to the east side of the falls for the new tailrace.

These and other issues are discussed below.

1.6.1 Comparison of Upstream and Downstream Sites

The upstream powerhouse site offers better potential road access for both construction and operations. The narrowness of the east bank between the river channel and the steep cliffs of the river canyon restricts the space available for both a penstock and an access road. In order to install both, there is a need to either cut into the steep slope or construct a retaining wall on the downslope side.

The upstream site with the longer tailrace channel also offers the potential for gaining vehicle access into the powerhouse excavation via a road excavated into the side of the tailrace channel.

Overall the upstream option offers the most cost effective waterway configuration. The main reason that the waterways for the upstream option would be less expensive than those for the downstream option is that the estimated unit cost of tailrace channel excavated in rock is less than half that of a steel penstock, including the excavation and supports required.

Hydraulic transient considerations in the penstocks also favor the upstream site. The longer penstock for the downstream option would probably require a synchronous bypass valve as was proposed in 1991 to help control hydraulic transients in the pipeline. Since few manufacturers of standardized turbine generator units offer such a valve as part of the design, it would have to be a custom-designed ancillary facility.

The penstocks for the upper option are short enough to not require a synchronous bypass valve. A double penstock configuration is also proposed for this option whereby each turbine has its own penstock and intake gate, which removes the need for a penstock bifurcation and turbine shutoff valves.

The proposed downstream option would take advantage of an existing excavation adjacent to foundations of the old Similkameen powerplant. However, the narrowness of the valley, steepness of the side slopes, and close proximity to the river channel pose construction challenges that would be difficult and potentially costly to solve. It would also be very difficult to gain vehicle access into the proposed powerhouse excavation. The downstream powerhouse site would not be accessible by road and would probably have to be accessed by crane the area of the old powerhouse, at considerable additional cost.

Risks associated with dewatering and construction at the downstream site are perceived to be higher than risks with the upstream option. Construction of the downstream powerhouse option would require the erection of a temporary cofferdam between the river and the proposed powerhouse site. It is expected that the riverbed at this location would consist of bedrock outcroppings and, therefore, would not be amenable to any form of driven piling. The cofferdam would have to be supported by cantilever piers drilled into rock, by an arched cofferdam, or by a braced cofferdam, which is supported by horizontal bracing that spans the powerhouse site.

The tailrace excavation required for the downstream option is shorter than that required for the upstream option since the downstream side is immediately adjacent to the river channel. For the upstream alternative, the location for the outlet of the tailrace channel relative to the downstream powerhouse site may decrease the gross hydraulic head available at the upstream site. On the other hand, the hydraulic head losses in the waterways for the upstream option are expected to be slightly less than those of the downstream option due to the shorter penstock combined with reduced hydraulic loss in an open channel versus a closed pipeline. Therefore, for the purposes of comparison the hydraulic head and estimated average annual power generation is assumed to be the same.

In summary, engineering design, constructability and economics issues favor the upstream powerhouse location.

SECTION 2

Right of Way Location

[will include legal description and maps and drawings]

2.1 LEGAL DESCRIPTION

Lands of the United States that are enclosed within the Project Boundary total 56.62 acres (all under the jurisdiction of BLM), being portions of lots within sections 11, 12, and 13, Township 40 North, Range 26 East, Willamette Meridian.

2.2 MAPS AND DRAWINGS

Maps in Exhibit G, attached as Appendix A show the ownership of all parcels within the Project Boundary and delineates those that are overlain by the Project Boundary. The maps also show the relevant portion of the BLM's Master Title Plat.

These revised maps were filed with FERC in October 2013.

This page intentionally left blank.

S E C T I O N 3

Facility Design Factors

3.1 DESIGN STANDARDS

[a. must be designed by a Federal Agency professional or a professional engineer licensed by the appropriate state authorities; design criteria are based on State and Federal standards]

The Public Utility District No. 1 of Okanogan County (District) proposes to restore hydropower generation at Enloe Dam on the Similkameen River. The proposed project is located at Enloe Dam, an existing concrete gravity-arch dam designed and constructed in the period 1919 -1920.

Conceptual design of the proposed new hydroelectric powerhouse at this existing dam has been developed under the oversight of a professional engineer with over 35 years of experience in planning and design of hydroelectric power facilities. The proposed conceptual design of the project is described in the License Application, which was prepared under the Federal Power Act (Federal Energy Regulatory Commission (FERC) Project No. 12569). Information provided in this right of way application has been extracted from the License Application (as amended), the 401 Water Quality Certification, the FERC Environmental Assessment, and the FERC License Order. These documents were developed in consultation with federal, state, and local resource agencies, including the Bureau of Land Management (BLM) copies of any documents not in BLM possession will be provided.

Detailed design drawings and specifications for the Enloe Hydroelectric Project will be prepared by a licensed professional engineer, according to State and Federal Standards, consistent with the requirements of the FERC license.

Primary standards for the design of hydroelectric power facilities are listed below and will be utilized where applicable:

1. Terms and conditions of the license issued by FERC pursuant to the Federal Power Act.
2. FERC design guidelines for dams and hydraulic structures.
3. Applicable terms and conditions of other permits and regulatory approvals.
4. American Society of Civil Engineers (ASCE) design guidelines for hydroelectric facilities.
5. U.S. Army Corps of Engineers (USACE) and U.S. Bureau of Reclamation (USBR) engineer manuals and guidelines for design of hydroelectric facilities.
6. International Building Code
7. American Society for Testing and Materials (ASTM) codes applicable to construction methods and materials.
8. American Society of Mechanical Engineers (ASME) codes and standards applicable to design of hydraulic turbines and mechanical equipment.

9. Institute of Electrical and Electronics Engineers (IEEE) and National Electrical Manufacturers Association (NEMA) codes and standards applicable to design of electrical generators and equipment

10. Occupational Safety and Health Administration (OSHA) occupational health and safety codes.

11. Prudent Utility Practices as applied to design of electric generation and transmission facilities.

3.2 DESIGN MAPS

[b. maps showing the location and detailed engineering plans and specifications; these should show the location of the structure and outlet works, the high water line, current location of streams and rivers, ancillary facilities, section corner ties, legal description, and acreage by land status]

Figure 3.2-1 shows the project boundary and conceptual design for the project. Maps showing the project location and boundaries, including current location of streams and rivers, ancillary facilities, section corner ties, legal description, and acreage by land status can be found in Appendix A, Exhibit G. Engineering drawings that show the project configuration, including the location of the structure and outlet works are not included in this Plan of Development because they are considered critical energy infrastructure information to be protected from public disclosure (pursuant to 18 CFR §388.113).

3.2.1 Enloe Dam and Spillway

The proposed project would utilize the hydroelectric potential of the approximate 80 foot elevation change between the surface of Enloe Reservoir and the pool downstream of Similkameen Falls.

Enloe Dam is a concrete gravity arch dam that was constructed during the period 1919-1923 as part of the second power development constructed at Similkameen Falls. The dam is 315 feet long with an arch radius of 200 feet and a maximum hydraulic height of 54 feet. The central overflow spillway crest that occupies most of the dam has a length of 276 feet and a crest elevation of 1044.3 feet. The dam structure is 40 feet thick at the base of the spillway and tapers to a 6 foot thick rounded ogee at the crest of the spillway. The spillway provides for the installation of 5-foot high flashboards, which increase the spillway crest elevation to 1,049.3 feet.

Hydraulic energy in reservoir outflow that plunges about 54 vertical feet down the spillway chute is dissipated in a stilling zone downstream of the spillway in the river channel, between Enloe Dam and Similkameen Falls. Approximately 340 feet downstream of the dam crest, the river plunges 22 vertical feet over Similkameen Falls into a narrow deep plunge pool that has been eroded in bedrock at the toe of the falls. The elevation of the pool's water surface with average river flows is (El.) 966 feet and varies with river flow.

The short east abutment of the dam has a deck elevation of 1049.3 feet. The west abutment of the dam has a deck elevation of El. 1,053.3 feet and a 4-foot high parapet wall on the downstream side of its crest. When the Enloe 1920 powerhouse was operating, a gated intake structure in the west abutment block controlled flow from the impoundment into two above-ground woodstave penstocks. The penstocks delivered water to the Enloe powerhouse. One of these two original penstocks has been removed. The old intake gates appear to be partially covered with sediment. Although a small amount of gate leakage is evident downstream of the dam, the leakage is not sufficient to inundate the area and has not created new wetlands. The District intends to decommission the old intake by backfilling the conduits with concrete through the dam.

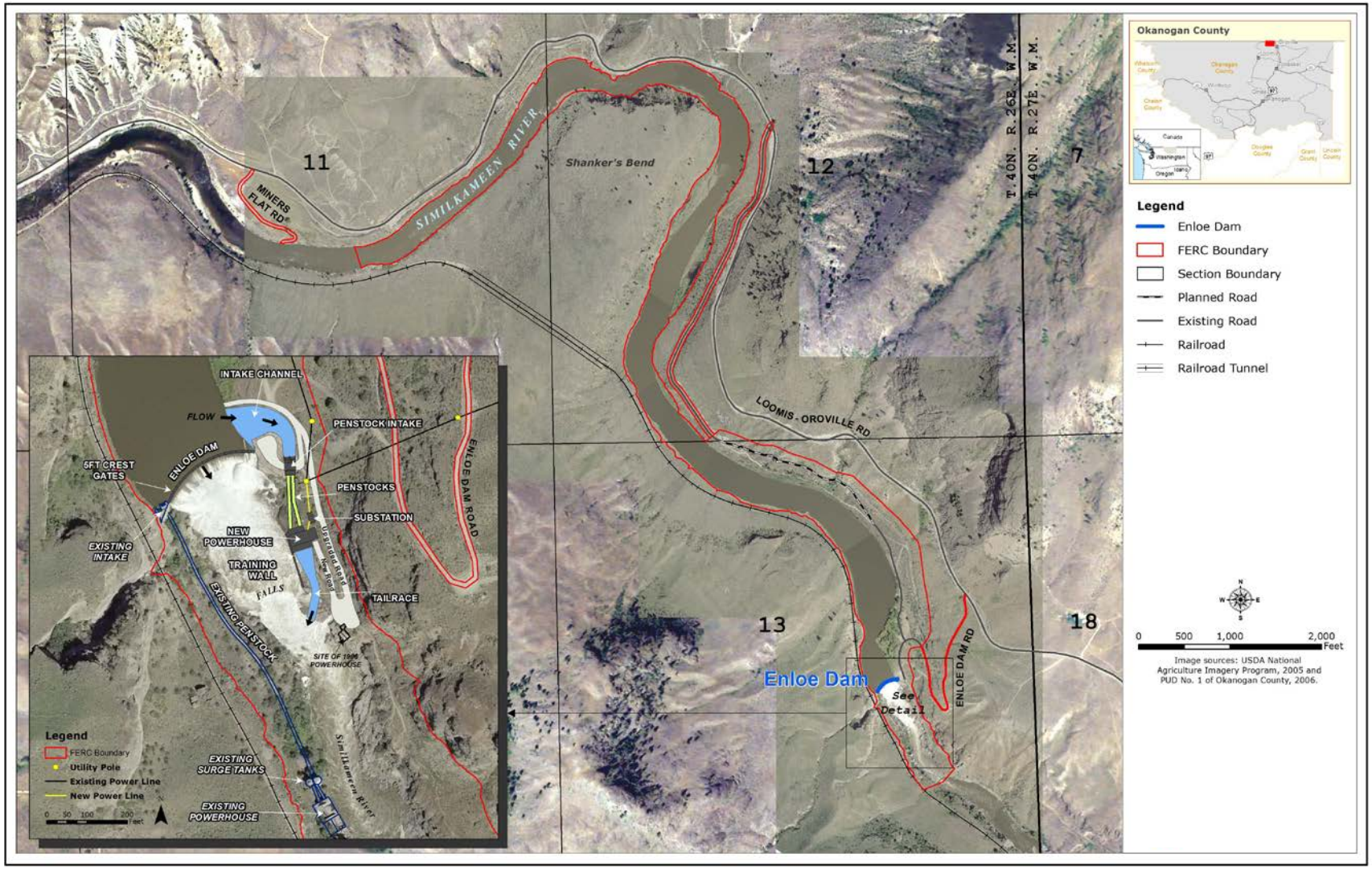


Figure 3.1-1 Boundary and Conceptual Design

The proposed project includes restoring the functionality of the flashboards on the crest of the existing spillway by retrofitting with crest gates. The retrofitted gates would be 5 feet high and would increase the water level upstream of the dam and the hydraulic head available for power generation. Due to the curvature of the crest, the steel flap gates would be installed in short straight sections with flexible connections. The gates would be raised by air bladders installed between the gate and the spillway crest. Two small piers would be added to the spillway crest to divide the crest into three gated sections and provide air intakes for the spillway overflow.

3.2.2 Intake Canal

An intake canal would be constructed as part of the project in order to divert a portion of streamflow from the Similkameen River to the penstock intake structure that serves the proposed new power plant. The intake canal is designed to be wide and shallow at the upstream end to minimize disturbance to existing sediment in the reservoir, and deep at the penstock intake structure to provide adequate submergence.

The intake canal would carry inflow from the river intake structure to the penstock intake structure. The canal would be a 190 foot long unlined trapezoidal cross section canal excavated in rock. The canal would taper from about 120 feet wide and 8 feet deep at the riverbank to about 30 feet wide and 26 feet deep at the penstock intake structure.

3.2.3 Penstock Intake

The penstock intake would be located at the downstream end of the intake canal, in a rock cut through the east abutment of the dam. The intake would be a 35 foot long by 30 foot wide reinforced concrete gravity-type structure, founded on bedrock and connected to two steel penstocks.

Two bell-mouthed entrances and transitions within the structure to the circular diameter of the penstocks would provide for smooth flow into the penstocks during plant operation, with adequate submergence and minimal hydraulic losses. Trashracks would be provided to protect the turbine water passages from blockage by debris. The trashracks would be 22 feet high and 12.5 feet wide and would be constructed either from steel or high density polyethylene (HDPE) supported by a steel frame. A one-inch clear spacing is proposed between trashrack bars to prevent adult resident fish in the reservoir and small debris from entering the intake. A motorized trashrack mounted on a monorail would be provided to remove accumulated trash and debris.

Two vertical-lift wheeled gates, approximately 10 feet high by 8.5 feet wide, would be provided for emergency closure at rated flow. Two bulkhead gate slots located upstream of the main gates, would be provided for dewatering of the main gates for maintenance. An enclosure on top of the intake structure would house the gate hoists and controls.

3.2.4 Penstocks

Two above-ground steel penstocks, 8.5 feet in diameter and approximately 150 feet long, would slope steeply from the intake to the powerhouse and would carry water to the turbines. The penstocks would be supported on concrete saddles and by concrete anchor blocks at the penstock bends. Both the exterior and interior of the penstock would be protected against corrosion.

3.2.5 Powerhouse

The proposed powerhouse is located in an alcove on the east bank of the Similkameen River, approximately 230 feet downstream of the east abutment of Enloe Dam and 140 feet upstream of Similkameen Falls.

The reinforced concrete powerhouse structure would be approximately 70 feet long and 30 feet wide, and would house two vertical axis Kaplan turbine/generator units, controls, switchgear, and a repair bay. The reinforced concrete substructure would be founded in an open rock excavation in bedrock that outcrops in the banks of the river and the broad terrace upstream of the falls. To accommodate a large fluctuation in tailrace water level, the powerhouse walls would be constructed of reinforced concrete to El. 995 feet. Above this elevation, the walls would be structural steel with insulated metal cladding. The repair bay and laydown area would be located at the east end of the powerhouse, with a floor elevation of approximately El. 995 feet.

A concrete training wall constructed at the west end of the powerhouse would separate the powerhouse and tailrace channel from the stilling basin area downstream of Enloe Dam.

Anadromous fish would be excluded from the draft tubes during periods of part-load operation by a conical physical net barrier at the outlet of each draft tube. The barriers would be made of conventional heavy duty fishnet with one inch mesh. The area of each net would be about 600 square feet to achieve a design gross approach velocity of 1.25 fps. An escape exit comprised of a short tube with a narrow one-way exit would be provided at the apex of the conical net to allow small debris and any resident fish that pass through the turbine to escape downstream. The escape exit would be made of dark material and have a narrow flexible opening with trailing streamers to discourage upstream swimming fish from attempting to enter.

3.2.6 Tailrace

The tailrace channel would convey water a distance of about 180 feet from the powerhouse to the Similkameen River, downstream of the Similkameen Falls. The tailrace channel would be an unlined steep-sided trapezoidal channel excavated in rock by controlled blasting techniques. The channel width would taper from about 40 feet at the powerhouse to about 20 feet at a distance of about 75 feet downstream of the powerhouse. Downstream of this point, to the river, the channel would be 20 feet wide. The invert of the channel would be approximately 30 to 40 feet below the existing rock terrace on the east side of Similkameen Falls.

The tailrace is designed to discharge to the deep pool at the base of the falls, so that water temperature and dissolved oxygen are not adversely affected. An open tailrace channel offers an aesthetic advantage over a pipe from the Key Observation Points. The tailrace channel would be generally similar in appearance to the natural gorge that has been excavated by the river and to the existing channels cut through the east terrace for the early 1900s power development site.

3.2.7 Bypass Facilities

Structural modifications have been conceptually developed to reduce the heating of minimum flows through the bypass reach. Piping the water around the dam would eliminate the solar radiation input and heat transfer from warm air to the thin sheet of flow that would otherwise fall over the dam; and circulation would still be provided in the plunge pool and flows over the natural bedrock to the Falls. Due to the combination of heating and engineering concerns associated with warming and regulating small flow increments over the dam face, the District plans to route flows to the top of the falls through a subsurface pipe intake. The recommended design concept involves adding a conventional orifice controlled instream flow outlet to one of two existing penstock intakes in the right abutment of the dam. This source would pull water from lower,

cooler strata in the reservoir, providing additional benefit to the cool water refugia below Similkameen Falls. The configuration both avoids heat gain and allows the flow to be accurately controlled and measured to ensure that the required minimum releases are provided under varying streamflow conditions. The low level outlet will be protected with a trashrack to avoid having debris clog the intake or valves. Final design will be agreed in consultation with resource agencies and tribes through the Fish Work Group.

3.3 MITIGATION, EMERGENCY, AND ANCILLARY ELEMENTS

[c. design must include special mitigation facilities/requirements such as fish ladders, controlled discharge, minimum flow requirements; it must also include emergency spillway and outlet works, design frequency storm, area capacity curves/charts, hydropower potential, planned recreation facilities, e.g. boat ramps, parking lots]

Table 3.3-1 lists the proposed Protection, Mitigation, and Enhancement measures (PM&Es), which have been developed through extensive environmental studies and consultation with resource agencies.

Table 3.3-1 List of Proposed Mitigation Measures

Resource	Mitigation Measure	Issue/Expected Outcome
Water Quality	Temperature Monitoring	Effect of crest gates on water temperature
	Location of the Powerplant Tailrace	Bypass reach water quality
	Provide Aeration in Flow Tubes	Reduction in Dissolved Oxygen below the dam
	Dissolved Gas Monitoring (Total Dissolved Gas and Dissolved Oxygen)	Reduction in Dissolved Oxygen and Total Dissolved Gas below the dam
	Headworks Design	Minimize sediment disturbance
	Erosion and Sediment Control Plan	Erosion control during construction
	Spill Plan	Reduce impacts from accidental spills
	Construction Sediment Management Program	Minimize sediment disturbance and maximize sediment containment
	Spill Prevention Containment and Countermeasures Plan	Minimize spills and the risk of contamination
	Petroleum Product Monitoring	Minimize the risk of contamination
	pH Monitoring During Construction	Minimize the risk of contamination
	Instream Flow	Provide an instream flow in the bypass reach as required under the 401 Certification
	Water Level Sensor	Monitor water level for the instream flow release
Fish	Erosion and Sediment Control Plan	Reduce impacts of sedimentation on fish
	Blasting Plan and Best Management Practices	Reduce impacts of blasting on fish
	Transport of Large Woody Debris	Prevent the loss of Large Woody Debris from downstream habitats
	Intake Trashrack	Protect upstream fishery
	Entrainment Studies and Fish Monitoring	Assess the impact of entrainment on the upstream fishery
	Plant Riparian Vegetation Along the Reservoir	Vegetation will benefit aquatic resources
	Tailrace Net Barriers	Prevent fish in the tailrace from swimming upstream into the draft tubes during periods of low flows
	Tailrace Video Monitoring	Monitor effectiveness of net barriers
	Run of River Operations	Avoid flow fluctuations that might adversely affect downstream resources

Resource	Mitigation Measure	Issue/Expected Outcome
	Relocation of Tailrace	Avoid impacts to fish that use the holding area below the falls
	Side Channel/Off Channel Development/Enhancement	Phases 1 and 2 - collect background information, evaluate and chose sites
		Phase 3 - Build, operate and monitor
	Gravel Supplementation	Replace gravels may be held behind Enloe Dam reducing the gravel supply to the lower river.
	Biological Review Process	Provide for ongoing refinement and measure of effectiveness of the PM&Es
	Fisheries Monitoring Database	Database will be used to examine long-term trends and support decision making
	Invasive Species Monitoring	Monitoring for aquatic invasive species will be completed
	Fish Adaptive Management Plan	Planning to protect and mitigate impacts to fish and wildlife
	Bypass Reach Snorkel Surveys	Determine fish use in the bypass reach
	Monitor Stranding in the Bypass Reach	Determine stranding in the bypass reach
	Project Operations and Compliance Monitoring Plan	Ensure that project operations are clearly defined and that compliance can be demonstrated
	Biological Opinion Reporting	Reporting to NMFS for compliance with the BO will be completed
Wildlife	Abandon Existing Shoreline Road	Substantially improve habitat along the reservoir for wildlife
	Plant Riparian Species Along the Corridor	Substantially improve habitat along the reservoir for wildlife
	Transmission Line Pole Relocation	Reduce the effects of construction on bald eagles and other wildlife
	Construction Timing	Reduce the effects of construction on bald eagles and other wildlife
	Soil Disposal – Pre-disposal Site Survey and Vegetation Clearance	Conduct pre-construction surveys at the spoil disposal sites
Botanical	Prepare a Mitigation and Monitoring Plan	Monitor effectiveness of habitat restoration
	Plant Riparian Vegetation	Net increase in riparian habitat over what currently exists
	Abandon Existing Shoreline Road and Restore Existing Road	Net increase in riparian habitat over what currently exists
	Plant Riparian Species Along Abandoned Road Corridor	Net increase in riparian habitat over what currently exists
	Plant Riparian Species on East and West Banks Downstream of Shanker's Bend	Net increase in riparian habitat over what currently exists
	Install grazing Control Measures	Net increase in riparian habitat over what currently exists
	Monitor Restored Areas and Replant if Necessary	Monitor effectiveness of habitat restoration
	Employ Best Management Practices s to Protect Riparian and Wetland Vegetation	Impacts associated with construction activities will be avoided or reduced
	Environmental Training Program	Impacts associated with construction activities will be avoided or reduced
	Provide a Biological Construction Monitor	Impacts associated with construction activities will be avoided or reduced
	Implement a Noxious Weed Control Program	Herbicide Program
		Re-establish grass using native grass mix[4]
		Remove and stockpile soil and plants
		Avoid use of fertilizer in reclaimed areas
		Use only certified weed-free straw bales for sediment barriers or mulch

Resource	Mitigation Measure	Issue/Expected Outcome
	Survey Disposal Sites and Control Noxious Weeds	Reduce impacts associated with construction activities
	Hydroseed Disposal Sites	Reduce impacts associated with construction activities
	Erosion and Sediment Control Plan	Impacts associated with construction activities will be avoided or reduced
	Spill Plan	Impacts associated with construction activities will be avoided or reduced
	Conduct Surveys for Ute Ladies' Tresses	Additional 3 years of surveys will be completed
	Ute Ladies Tresses Plan	Ensure that the surveys are adequate and that appropriate measures to avoid impacts to the species
	Additional Monitoring at Restored Areas	Additional monitoring will be completed at restored areas.
Historical	Solicitation for Powerhouse Ownership	Alternative use for the building
	Demolition and Site Closure	Careful demolition of the powerhouse to create an interpretive site and site closure
		Site Closure
	Install Interpretive Panels	Preserve information on the current powerhouse
	Review and Agreement on the Draft Historic Properties Management Plan	Concurrence by the Cultural Resources Working Group on the Historical Properties Management Plan and incorporation of this information within the PA
Archaeological	Conduct Monitoring of Shoreline Areas	Minimize or avoid adverse impacts to archaeological resources, both documented and unrecorded
	Avoid Known Eligible Sites	Avoidance of adverse impacts to any sites eligible for listing on the National Register of Historic Places (NRHP).
	Monitor Eligible Sites During Construction	Monitor construction areas to prevent damage to NRHP-eligible archaeological site(s)
	Inadvertent Discovery Plan	Protection of unidentified archaeological sites and Traditional and Cultural Properties and the minimization of adverse effect to sites inadvertently disturbed by construction activities
	Determine Potential Recreational Impacts to Archaeological Sites	Determine if there will be impacts to archaeological sites in the vicinity of the recreation facilities
	Revise HPMP	Include the site channel enhancement site in the HPMP
Geology and Soils	Erosion and Sediment Control Plan	Erosion control during construction
	Construction Sediment Management Program	Minimize sediment disturbance and maximize sediment containment
	Develop a Spoil Disposal Plan	Minimize effects of excavated materials on water quality or the surrounding environment.
Recreation		
	Install Barricades and Fencing to Prevent Unauthorized Access [1]	Improve public safety by limiting access to dangerous project features
	Provide Recreation Access Below Enloe Dam	Foot access to the area below the dam will be improved
	Transfer Ownership of Trestle Bridge	Facilitate the County's plans to improve access for recreational purposes
	Improve Existing Informal Boat Ramp	Facilitate access to the river
	Clean Up and Restore Wooded Area on East Bank	Enhance visitor experience
	Develop an Interpretive Publication	Enhance the recreational experience by making it easier to find recreational resources
	Remove Existing Trash and Conduct Annual Cleanup	Improve the aesthetic value of the recreational experience,

Resource	Mitigation Measure	Issue/Expected Outcome
		improve public safety, and remove potential public health issues.
	Develop Parking Area	Substantial improvement in the recreational resources available in the vicinity of the Project
	Install Picnic Tables	Substantial improvement in the recreational resources available in the vicinity of the Project
	Develop Primitive Campsites	Substantial improvement in the recreational resources available in the vicinity of the Project
	Interpretive Signs	Enhance the recreational experience by making it easier to find recreational resources
	Information Board	Enhance the recreational experience by making it easier to find recreational resources
	Recreation Management Plan	Provide an assessment of changes in recreational use to determine how well the new facilities are meeting demand
	Maintain warning signs, safety cable, grab ropes, and a log boom	Improve overall safety at the site
	Limited public access during construction	Improve overall safety at the site
	Prevent public access to old powerhouse	Improve overall safety at the site
	Miners Flat Boat Take Out and Access Road Improvement	
	Recreation Monitoring	Create a record of visitor use
	Building Removal at Enloe Dam Site	Enhance recreational opportunities at the site
	Snow Plow Schedule	Improve recreational access to the site during the winter
Aesthetics	Use Visually Compatible Colors and Building Materials	Outcome would be a landscape that resembles the natural vegetation community
	Revise Aesthetics Management Plan	Ensure that the AMP is consistent with other Project plans
	Plant Riparian Vegetation	Outcome would be a landscape that resembles the natural vegetation community
	Monitor Restored Areas and Replant if Necessary	Outcome would be a landscape that resembles the natural vegetation community
	Employ Best Management Practices to Protect Riparian and Wetland Vegetation	Outcome would be a landscape that resembles the natural vegetation community
	Consult with the Colville Confederated Tribes During Restoration Activities	Colville Confederated Tribes should be consulted during the restoration activities as there are known Traditional and Cultural Properties
	Use Non-Reflective Surfaces Where Possible During Construction	Reduction of visual impacts during construction
	Install Interpretive Panels	Provide historic images of water over the dam
Safety	Maintain Warning Signs, Safety Cables, and Grab Ropes	Improve overall safety at the site
	Allow Limited Public Access to the Project Area During Construction	Improve overall safety at the site
	Install Barricades and Fencing to Prevent Unauthorized Access	Improve overall safety at the site.
	Identify Options for Preventing Public Access to the Old Powerhouse	Improve overall safety at the site
	Fire Suppression Program	Improve overall safety at the site
	Safety During Construction Plan	Improve overall safety at the site

Note: [1] See figure 3.3-1

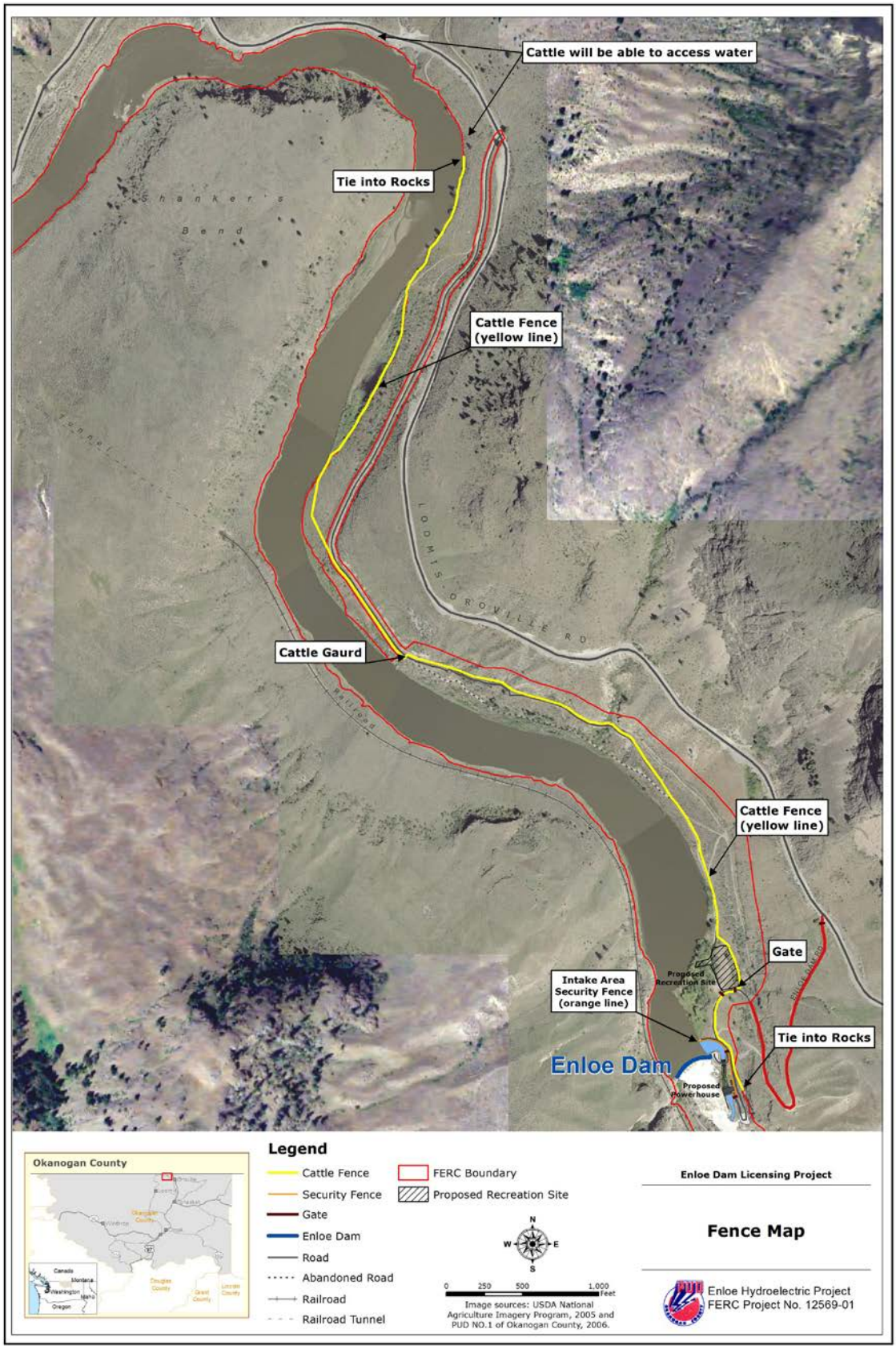


Figure 3.3-1 Fence Map

3.4 TEMPORARY USE AREAS

[d. list any temporary use areas that will be needed]

During construction of the project, several areas on the east bank of the Similkameen River, upstream and downstream of the Enloe Dam will be used as construction areas, construction staging and storage areas, and spoil disposal areas for excavated overburden and rock. Proposed locations for these temporary use areas are shown on Figure 3.4-1 and are further described below.

The construction area at Enloe Dam would include the existing dam and land on the east abutment, both upstream and downstream of the dam. This construction area is expected to be approximately 2.5 acres, with an additional 2.3 acres located immediately upstream of the construction area for the proposed construction staging and storage area. The five proposed spoil disposal areas would cover approximately 5.5 acres on the east bank of the river. Table 3.4-1 lists these five areas.

Table 3.4-1 Proposed Spoil Disposal Areas

Spoil Disposal Area	Locations	Area (acres)
1	Upstream of construction staging area	1.9
2	Road construction	1.1
3	Backfill existing canal	0.5
4	Backfill existing borrow pit	0.5
5	Road construction	1.5
Total	-	5.5

During construction, proposed dust control and erosion control measures would minimize soil erosion and stormwater pollution. These measures are further described in the Erosion and Sediment Control Plan. Upon completion of project construction, temporary use areas would be regraded and revegetated by hydroseeding with approved plant species.

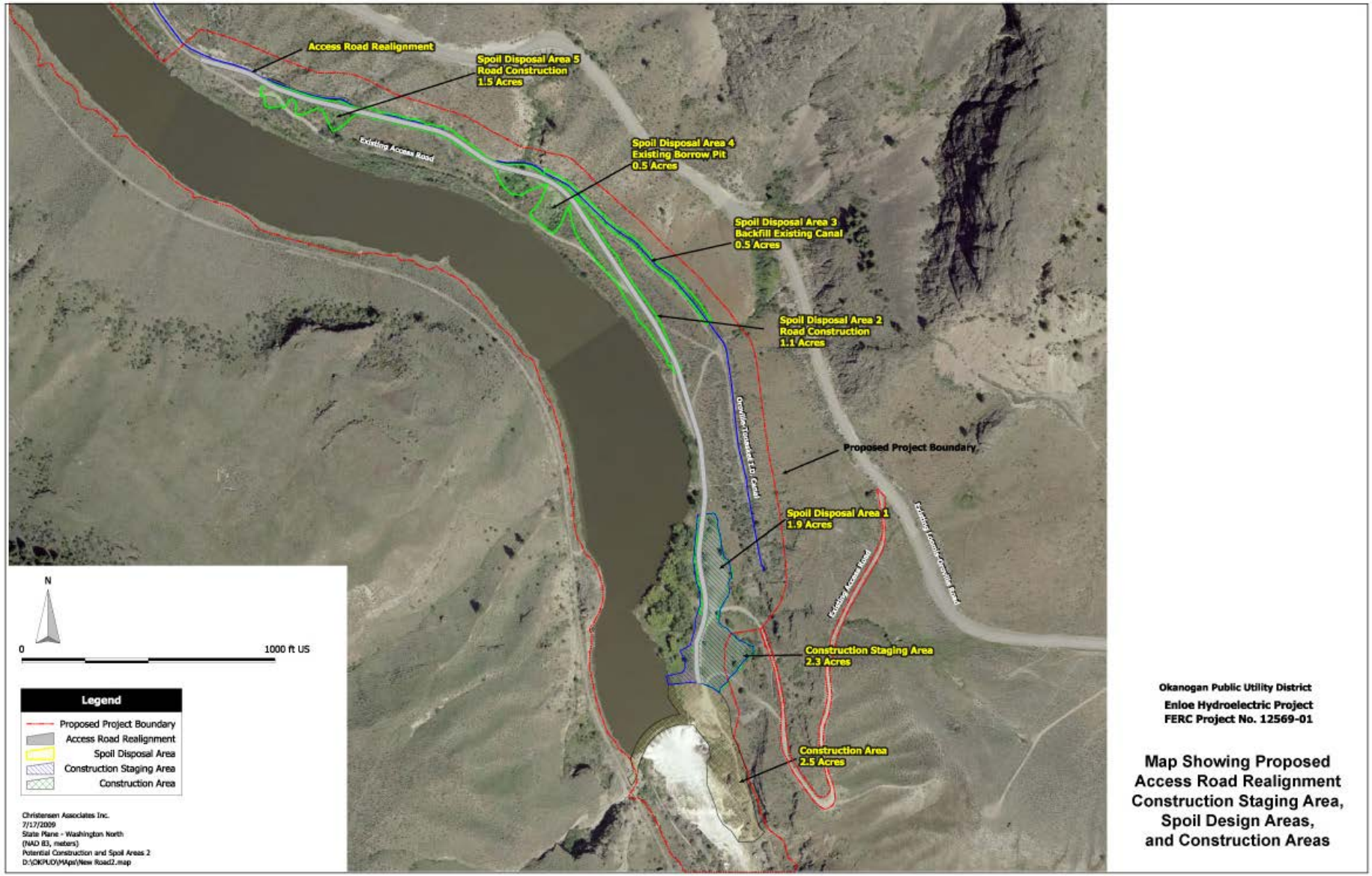


Figure 3.4-1 Map Showing Proposed Access Road Realignment Construction Staging Area, Spoil Design Areas, and Construction Areas

This page left intentionally blank

S E C T I O N 4

Additional Components of the Right of Way

4.1 WATER RIGHTS

[a. state water rights involved]

The Enloe Hydroelectric Project would not change, injure, or affect any existing water rights because it is a non-consumptive run of river project that would not change flows in the Similkameen River other than in the 370 foot bypass reach. There are no water right certifications that divert in the bypass reach. Table 4.1-1 lists certificated water rights on the Similkameen River above the Enloe Dam and within the FERC Project Boundary. The District holds two senior water rights on the river for power generation purposes, a 750 cfs water right with a priority date of 1901 and a 250 cfs water right with a priority date of 1905. The Washington Department of Ecology has issued a Record of Examination dated August 6, 2013 recommending that water rights be issued to the District allowing diversion of 898 gpm for fish and wildlife maintenance and enhancement at the proposed Similkameen River side channel enhancement site (a PM&E proposed in the Enloe license application) (WRTS File #G4-35343), and allowing diversion of an additional 600 cfs for nonconsumptive hydropower generation at the Enloe project site (WRTS File #S4-35342). Permits for these water rights will be issued by the Department of Ecology after the 30-day appeal period expires (September 5, 2013).

Table 4.1-1 Similkameen River Water Rights above Enloe Dam and within the FERC Project Boundary

Document Number	Status	Priority (year)	CFS	AFY	Purpose	Acres Irrigated	Owner
S4-*01001ADJWRIS (Adjudication Certificates No. 1 and 1-a)	Certificate	1901	750		PO		Okanogan Public Utility District No. 1
S4-*01001BDJWRIS (Adjudication Certificates No. 1 and 1-a)	Certificate	1905	250		PO		Okanogan Public Utility District No. 1
S3-+22053GWRIS	Certificate	1973	1.5	372	IR ST	80	Private
CS4-ADJ01P2	Change/ ROE	1912	0.6	150	IR	30	Oroville Tonasket Irrigation District
Total Active Water Rights			1,002.1	522		110	-
Note: ROE = Record of Examination.							

In addition to the District water rights, two other potentially active water rights, listed in Table 4.1-1, exist within the FERC Project Boundary. Both water rights are for small quantities and total 2.1 cfs or 522 acre feet per year (AFY). Neither would be affected by the Project. The first water right is used for stock watering by a rancher who holds one of the Bureau of Land Management (BLM) grazing leases within the proposed FERC boundary. As part of the PM&E BOTA-06, fencing will be necessary along a section of the eastern side of the

Enloe Dam to assure that livestock do not enter recreation and other protected areas. In order to mitigate for the loss of grazing access to the water due to the proposed fencing, the District is working with this affected BLM lessee and water right holder to provide a new stock watering tank in an upslope area on the east side of the river. Under that arrangement, water will be pumped from the river to the stock watering tank using an existing pump and pipe system owned by the grazing lessee. The rancher holds sufficient water rights for this purpose.

The second water right is part of the water right owned by the Oroville-Tonasket Irrigation District (OTID) through Certificate #2, one of a number of certificates held by OTID. The Oroville Golf Club diverts this water to irrigate the 30-acre golf course from April 1 to October 15. Certificate #2 has a priority date of March, 1912. The Oroville Golf Club can use a maximum of 0.6 cfs (51,840 cf per day) and pump a maximum of 269 gallons per minute (gpm) (387,800 gallons per day).

Table 4.1-1 does not include records of certificates and permits known to be inactive and probably relinquished, or known to have been transferred to other sources. These include rights owned by OTID that are in the process of being transferred. The two active water rights within the FERC Project Boundary discussed in this section would not be affected by the Project, which operates in a run-of-river mode, using such flow as arrives at the Enloe Dam.

4.2 DAM SAFETY STANDARDS

[b. dam safety standards 1) hazard rating and emergency action plan]

Enloe Dam is rated by the Washington Department of Ecology Dam Safety Office as a Class 1C hazard dam. This downstream hazard classification corresponds to having an estimated 7 to 30 lives at risk in the event of a dam failure. The District maintains an emergency action plan which delineates potential inundation areas downstream of Enloe Dam in the event of dam failure. As a FERC licensed project, all project structures are subject to FERC's comprehensive dam safety requirements and oversight under the Federal Power Act. The District shall comply with the current requirements of the Federal Guidelines for Dam Safety (including FEMA 64, FEMA 65, FEMA 93, FEMA 94, FEMA148, and FEMA 333) for dam site investigation, design, construction, operation and maintenance, and emergency preparedness.

The FERC License Order includes Articles 306 and 307, requiring preparation of an Owner’s Dam Safety Plan and a Public Safety plan, each within 90 days of the issuance of the order. Article 307 requires consultation with BLM, the Washington Recreation and Conservation Office and the Washington DAHP. Copies of these plans will be filed with FERC and transmitted to BLM.

4.3 TEMPORARY AND PERMANENT ACCESS ROADS

[c. temporary and permanent access roads]

Two unpaved roads shown in Figure 4.3-1 provide access to the dam site: Enloe Dam Road and the old Oroville-Tonasket Irrigation District (OTID) Ditch Road. In addition to improving these roads, the District will improve access to the Miner’s Flat takeout, as required by Article 410 of the FERC License Order.

Enloe Dam Road is a county road, designated by Okanogan County as an unmaintained primitive road. Due to its steep grade, deep ruts and loose gravel surfacing the road is only suitable for careful use by vehicles with four-wheel drive. The District proposes to work with the County and BLM to close Enloe Dam Road to public use and convert it to District and Authorized Personnel Only access. The Enloe Dam Road would be

maintained for use only by the District to provide maintenance access to the power distribution line. It would be gated at the Loomis-Oroville Road intersection (Figure 4.3-1)

Weather-permitting access would be provided by rehabilitating the OTID Ditch Road. Currently, the OTID Ditch Road provides access for Oroville Golf Club personnel to reach an irrigation diversion upstream of Enloe Dam, as well as informal access for recreationists, ranchers, agencies, and tribes.

No public vehicle access would be provided beyond the proposed parking and recreation area shown on Figure 4.3-1; access beyond this point would be limited to authorized vehicles for security reasons. The OTID Ditch Road would be improved to a single lane gravel surface road with sufficient shoulder width to permit two vehicles to pass each other.

The OTID Ditch Road enters the Project Area from the Loomis-Oroville Road (County Road #9425) approximately 1.3 miles northwest of Enloe Dam Road. From its intersection with the Loomis-Oroville Road, the OTID Ditch Road travels approximately 1.5 miles to the proposed Project recreation site. Although the OTID ditch is no longer in use, the ditch and some associated structures remain in place. Several small informal spur roads lead from the OTID Ditch Road. None of these are maintained for passenger vehicles.

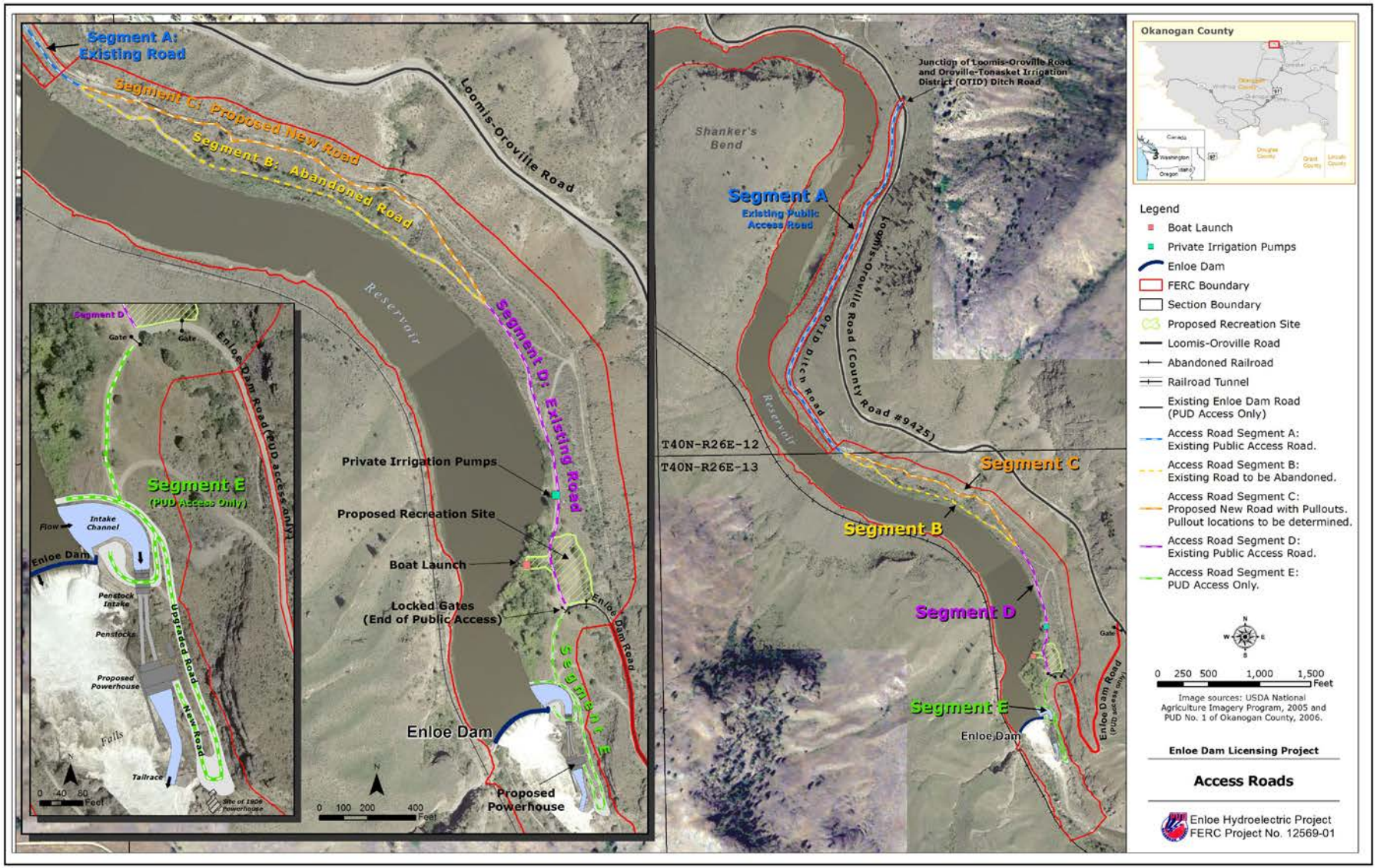


Figure 4.3-1 Access Roads

This page intentionally left blank.

From its intersection with the Loomis-Oroville Road, the OTID Ditch Road parallels the now decommissioned OTID concrete lined canal for about 0.7 miles to a point just past the FERC boundary (Segment A, see Figure 4.3-1). At this point the road bifurcates with one leg descending to a wide riverbank terrace that lies within the flood pool of the reservoir (Segment B, see Figure 4.3-1). This lower leg of the OTID Ditch Road traverses a riparian area and is impassable in spring and early summer due to a seasonally inundating water table. It parallels the reservoir for about 0.6 miles; the first 0.2 miles of Segment B is normally flooded during high water.

The proposed access road improvements include improving the existing OTID Ditch access road by straightening its horizontal and vertical alignment and increasing its width using rock spoil from construction of the Enloe Hydroelectric Project. As stated above, the proposed road will be a single lane gravel surface road with sufficient shoulder width to permit two vehicles to pass each other. The planned formation width is 20 feet with a single travel lane (14 feet wide in most places) and two 4 foot wide shoulders.

The upper leg of the OTID Ditch Road is the abandoned irrigation canal and is not useable for motorized transportation (Segment C, see Figure 4.3-1). Segment C would be reconstructed over the abandoned irrigation canal as the primary Project access road, while the lower leg of the road (Segment B) would be abandoned to a point downstream of the inundated riparian area. Segment C crosses several small gullies in short lengths of elevated concrete flume. At each of the three existing draws the road will cross on an elevated embankment crossing constructed adjacent to the elevated concrete flume structure. The first crossing will have a maximum height above existing grade at road centerline of 20 feet. The second crossing will have a maximum height of 25 feet. The third crossing will have a maximum height of 20 feet. Each crossing will have a culvert traversing under the embankment following the natural watercourse to provide for stormwater drainage.

The reconstructed upper leg (Segment C) would travel along the ditch for 1530 feet before descending 475 feet to an existing spur road to rejoin Segment B at a point beyond the inundated riparian area. Segment D would continue from that point 1375 feet to terminate public access at a proposed recreation site near the dam, as illustrated in Figure 4.3-1.

The OTID Ditch Road traverses the Project boundary. The FERC boundary was drawn to include the portion of this road which would be reconstructed (Segments C and D), as described above. The portion of the road that would not be reconstructed (Segment A) would be improved as a graveled, single-lane road with turnouts.

The headworks and the east abutment of the dam would be accessible to the District from a 400 foot long section of road (Segment E) that would run east then south along the east side of the intake channel then turn west to cross the penstock intake structure to end at a turnaround area near the east abutment of the dam.

District vehicle access to the penstocks, powerhouse and tailrace downstream of the dam would be developed by realigning and widening an existing road that runs south along the east bank of the river downstream of the dam to a point about 500 feet downstream (also Segment E). At this location the road would turn back upstream and a 230 foot long section of new road would run along the east side of the tailrace channel to the new powerhouse.

4.4 POWER LINES

[d. power lines]

The new powerhouse would interconnect with the existing District distribution system. A new 13.2 kilovolt

(kV) primary transmission line, approximately 100 feet in length, would be constructed and connected to the District's existing distribution system at an existing pole immediately to the east of the proposed Project location. This new line would require only one new wood pole and would be the Project's primary transmission line (see Figure 3.2-1).

A new substation adjacent to the powerhouse would step up the voltage of the output from 4.6 kV to 13.2 kV. The substation would also house isolating breakers, current and potential transformer instrumentation and lightning arrestors.

The proposed primary transmission line would interconnect with the District's existing 13.2 kV distribution line, which follows the Loomis-Oroville Road immediately east of the Project. The existing overhead power line is suspended on wood poles and would not need to be replaced for the Project.

4.5 IRRIGATION DITCHES

[e. irrigation ditches]

As stated in the FLA, the District plans to construct an access road in a portion of the OTID right-of-way. The District has consulted and coordinated with the BLM Wenatchee field office a number of times over the past year on this issue. OTID has agreed that the Project will not conflict with the OTID's interest or affect any OTID facilities. The OTID Board voted to transfer a portion of the OTID's ROW to the District. The District will continue to consult with OTID and BLM on the existing ROW for the canal.

The OTID water right has been transferred downstream to Lake Osoyoos and the OTID irrigation ditch is abandoned and in disrepair. Parts of the conveyance have disintegrated. In a Joint Agency Meeting held at BLM on June 18, 2010, the BLM indicated to the District that it was aware of this situation and in discussion with OTID regarding decommissioning of its abandoned facilities. Subsequent to that meeting, the District obtained a letter from the OTID regarding their interest in giving up their ROW within the project boundary, and copied it to BLM.

4.6 PUBLIC RECREATION AVAILABILITY

[f. availability of the reservoir for public recreation purposes]

The District has prepared a Recreation Management Plan (RMP) which was filed with FERC on February 28, 2009 (RMP 2009). The RMP includes a number of Protection, Mitigation and Enhancement (PM&E) Measures intended to improve the availability of the reservoir and surrounding upland areas for public recreation purposes. The recreation improvements directly related to improving access to the reservoir include restoration and upgrade of the main access road to the dam, upgrade a primitive boat launch, new campsites, picnic tables, and restroom facilities. These improvements are described further below.

4.6.1 Access Road Improvements

The District will restore the one lane access road (i.e. Oroville-Tonasket Irrigation District Road) that extends approximately 1.3 miles from the Loomis-Oroville Road (County Road #9425) to the dam (see Figure 4.3-1). The District will improve the road surface by smoothing out bumps, filling potholes and adding a new layer of crushed rock, where required. A 2,000 foot long segment of the existing access road located along the east bank of the impoundment will be relocated approximately 200 feet up slope to protect wetlands, reduce

impacts to cultural resources, and make the road more accessible during spring, summer and fall months. The new roadway segment will follow the alignment of an old irrigation canal road.

Because the restored access road will remain a one-lane road (approximately 14 feet wide in most places), vehicle turnouts will be constructed in appropriate locations to allow vehicles traveling in opposite directions to safely pass one another. The number and spacing of vehicle turnouts will be determined during the design phase, based on standard safety and sight distance requirements. If an existing bridge is used to cross an abandoned irrigation canal or natural draw, the bridge will be evaluated to ensure that it can safely accommodate anticipated loads. Additional design details on the access road and any proposed crossing structures will be provided to the BLM and other recreation stakeholders when available.

As required by FERC License Order Article 10, the District will develop a snow plow schedule for the OTID Ditch Road with signage to accommodate recreational use during the winter.

4.6.2 River Access

The District will install a new boat launch at the Project site in approximately the same location as the primitive put-in/takeout area now used by recreational boaters. The new ramp will improve boat put-in, take-out and provide access to camping sites, picnic areas, restrooms and parking at the Project site. The boat launch will be accessed from a loop road at a new recreation site (described below). The road to the boat ramp will be approximately 14 feet wide and surfaced with gravel. The road will be accessible to both vehicles with trailers and individuals carrying watercraft on foot. A vehicle and trailer parking area will be located a few yards away in the new recreation site. These improvements will facilitate access for current and future users and will enhance efforts to improve the Greater Columbia River Water Trail for the benefit of its future users.

As required by FERC License Order Article 410, the District will develop a river access take-out at the Miners Flat site and include the approximate 1-acre site within a revised project boundary.

4.6.3 Recreation Site

The District will develop a new 1-acre recreation site near the dam that includes parking, camp sites, picnic area, vault toilet and other recreation amenities. The recreation site is located in a relatively flat area next to the riparian woodland just upstream from the dam. The design concept for the recreation site is based on a one-way loop road that will circulate traffic in a counter clock-wise direction. The loop road will be approximately 14 feet wide and will be surfaced with gravel. A gravel surfaced parking area able to accommodate up to five standard vehicles and two vehicles with trailers will be located on the southern half of the site. Because space is limited, vehicles with boat trailers will be required to pull-in and back-out of the parking area.

The District will install picnic tables in two areas on the east side of the new recreation site near the parking area. The areas will be designated for day-use picnicking, although overnight campers will be able to use the picnic facilities as well. The first site (Picnic Area I) is located in the southeast corner of the recreation site outside of the loop road. This area is slightly wooded providing natural shade and views toward the dam. Two tables will be spaced approximately 25 to 50 feet from each other to provide privacy. The second picnic area (Picnic Area II) will be located in the northeast corner on the outside of the loop road. This area will serve both day users and overnight campers. This site provides overlooking views of the placid water of the reservoir. Two picnic tables will be clustered together to accommodate larger groups. Parking for both picnic areas will be provided in the parking area located at the south end of the recreation site inside the loop road.

The District will also develop four primitive campsites near the parking and picnic areas, described above. Each campsite will be approximately 25 feet wide and 50 feet long. The campsites provide for pull-in parking and include ample space to accommodate a tent site. Rock barriers will be installed to serve as curbstops and to define the boundaries of individual campsites. A picnic table and steel fire ring will be provided at each campsite. Campsites will be available on a first-come-first serve basis and overnight stays will be limited to a maximum number of 14 consecutive stays.

The proposed access improvements in the Project Area would offer improved opportunities for walking, nature activities, canoeing/kayaking, sightseeing, picnicking, and camping. Proposed improvements to the main access road would also improve opportunities for hunting and fishing. Figure 4.6-1 is a schematic site plan of the recreation site.

An additional recreation improvement will be the development of a formal boater take-out area at Miner's Flat, upstream of the Enloe Dam recreation area. This improvement will include an upgrade to the existing informal boater take out area, as well as improvements to the access road. The total size of this improvement will include approximately 1 acre of land located within the Project boundary.

4.7 PUBLIC LAND

[g. list any existing components on and off public land]

[h. list possible future components on and off public land]

As shown in the attached Exhibit G maps (Appendix A), BLM administers most of the land that the District is proposing for use as part of the Enloe Project. The existing (original) project facilities are located on BLM lands, and all feasible project alternatives are also situated on BLM land. The FERC boundary extends one-quarter (0.25) mile downstream from Enloe Dam, following the 1,055 foot elevation contour to include Similkameen Falls and the site of the proposed powerhouse, tailrace, and associated facilities. The FERC boundary deviates from the 1,055 foot elevation contour to accommodate rehabilitation of the OTID Ditch Road (see Exhibit A for a detailed description of proposed access road improvements). In that area, the FERC boundary has been set 100 feet landward of the OTID Ditch Road upper leg (Segment C, see Figure 4.3-1); it does not maintain a specific elevation.

The FERC Project Boundary encompasses approximately 152.31acres including the Enloe reservoir, the area in which the District proposes to build a new access road, and the river corridor extending downstream from the dam one-quarter mile. This boundary area includes Washington Department of Natural Resources (WDNR), private, and BLM land (see Exhibit G maps included as Appendix A). The Project Boundary is the 1057.7 contour line based on the North American Vertical Datum of 1988 (NAVD 88).

The District has utilized a contour line at elevation 1052.7 (NAVD88 Datum), which is 6 feet vertically above the spillway crest elevation (and based on having 5 feet high crest gates/flashboards) as the "with Project" proxy for the OHWM. The District has re-surveyed the Project Area to produce revised Exhibit G maps submitted to FERC (Attachment A to this Document), and has identified 56.62 acres of land in BLM ownership within the FERC Project Boundary area, based on the current understanding of the location of the OHWM. A total of 49 acres of BLM land ownership are identified in the current (2007) ROW Grant. Differences between this number and the newly surveyed number are related to Project Boundary refinements as well as additions to the Project Boundary in response to FERC's requests in the EA and the License Order.

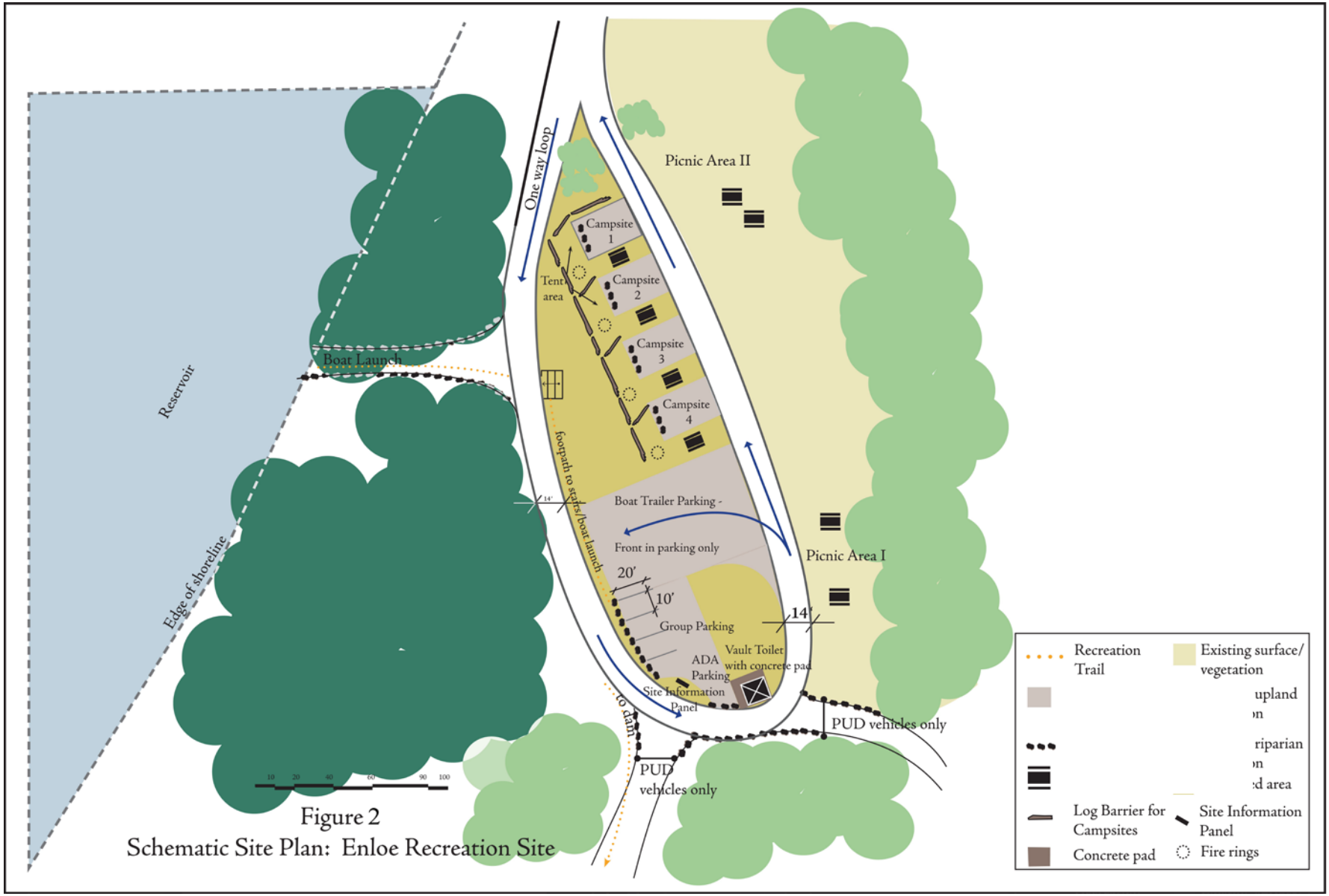


Figure 4.6-1 Schematic Site Plan: Enloe Recreation Site

This page intentionally left blank

4.8 EQUIPMENT STORAGE AREAS

[i. location of equipment storage areas]

Generation equipment will be housed in a reinforced concrete powerhouse constructed on the east bank of the river downstream of the dam. The powerhouse will have space for storage of special tools and equipment.

Transformers and switchgear will be located in a small substation adjacent to the powerhouse.

Parking areas near the powerhouse and dam will be used for unloading heavy vehicles and temporary storage of materials and equipment.

S E C T I O N 5

Site Selection

5.1 WATER QUALITY MONITORING

[a. water quality monitoring]

5.1.1 Completed Water Quality Monitoring Programs

Water quality studies were conducted as a part of the FERC licensing process. These studies were described in detail in a Quality Assurance Project Plan (QAPP) and are summarized here. These studies were proposed to provide more information related to the following potential water quality effects of the Project:

- Entrainment of legacy sediment contaminants in the water column upstream from Enloe Dam during project construction.
- Water temperature increases through the project area during summer months, and
- Increased concentrations of total dissolved gas below the dam and tailrace.

Results from these studies, as well as other water quality data for the Project area are discussed in Section 5.2 Hydrological Data and 5.7 Water Quality.

5.1.2 Future Water Quality Monitoring Programs

As discussed in section 5.7 below, Exhibit E-2 of the FLA, and the project's CWA Section 401 Water Quality Certification (including the Project's Water Quality Management Plan, Construction QAPP, and Operations QAPP), potential water quality issues identified for the Enloe Hydroelectric Project were increased water temperatures through the Project Area, low DO concentrations, and high TDG supersaturation below the dam, and disturbance of contaminated sediment. The following PM&Es will address these issues.

- **PM&E WQ-01: Temperature Monitoring Water.** Temperatures will be monitored at three locations for a period of 5 years to determine if the operation of crest gates causes an increase in the 7-DADMax water temperatures compared to upstream of the reservoir.
- **PM&E WQ-02: Location of the Powerplant Tailrace.** To preserve water quality in this habitat, the powerplant tailrace was located such that the discharge circulates water to the pool preventing stagnation and consequent water quality degradation (i.e., high water temperatures and low dissolved oxygen) of the pool habitat. The tailrace is included in the project costs (see Exhibit D).
- **PM&E WQ-03: Provide Aeration in Flow Tubes.** To minimize the loss of aeration by diverting water around the dam and to maximize DO concentrations during the critical summer season, aeration will be provided in the flow tubes of the turbines. The aeration vents will be blocked during high spring flows when high TDG is a concern and DO concentrations are not low. Adaptive management monitoring during the first five years of project operations will determine the optimal time to provide aeration in the flow tubes.

- **PM&E WQ-04: Dissolved Gas Monitoring (TDG and DO).** Dissolved gas concentrations will be monitored at the Project intake and in the pool below the falls to determine TDG under project operations. Monitoring will be as follows:
    - Hourly monitoring of DO at four locations from July 1 through September 30, the months when the Similkameen River has the potential to drop below the minimum DO criterion. Monitor at the same locations specified for temperature monitoring.
    - Hourly monitoring of TDG at three locations from April 1 through June 30, the snowmelt season when the Similkameen River has the potential to exceed TDG criteria. The locations are (1) the forebay, (2) in the pool at the base of the dam; and (3) downriver from the Project tailrace.
- **PM&E WQ-05: Headworks Design.** Project design incorporates a broad, shallow headworks to minimize sediment disturbance, as described in Exhibit A. The cost of this PM&E is incorporated in the project cost shown in Exhibit D.
- **PM&E WQ-06: Erosion and Sediment Control Plan.** A draft Erosion and Sediment Control Plan (ESCP) has been prepared, and will be updated when designs have been finalized. The ESCP addresses site-specific mitigation measures to minimize effects of construction, repair and operation of the dam and intake, penstocks, powerhouse, tailrace, impoundment, access roads, powerline and construction camp. Critical areas within the project footprint identified as sensitive to erosion, slope failure and mass wasting will be identified and a plan will be developed to minimize effects from these areas.
- **PM&E WQ-07: Spill Plan.** A Spill Response Plan (SRP) was prepared and filed with FERC in response to an Additional Information Request. The District prepared the SRP based on consultation with Ecology, Washington DFW, FWS, NMFS, Washington DNR, BLM, and the CCT. Consultation occurred through a conference call held on November 18, 2008 to discuss the proposed SRP. Comments were considered in the development of the SRP. The SRP includes methods of spill prevention and spill containment if needed; locations of spill containment equipment; an outline of the employee training program; a list of agencies to be notified in the event of a spill; and an implementation schedule. Consultation with the CCT, BLM, Washington DOE, Washington DNR, NMFS, FWS, and Washington DFW, and Commission approval will be completed prior to implementation of the plan to ensure it was developed with the expertise and recommendations from the stakeholders. Further details are available in the draft SRP. The plan will be implemented during construction.
- **PM&E WQ-08: Construction Sediment Management Program.** The Construction Sediment Management Program (CSMP) was filed with AIR responses. The plan was developed in consultation with Ecology, Washington DFW, FWS, NMFS, Washington DNR, BLM and CCT. Consultation was conducted during a conference call with these agencies held on November 18, 2008. The CSMP was then revised in response to Ecology's requests during the 401 process, and a revised version was filed with the 401 plans. The CSMP provides a detailed description of site conditions and introduces BMPs that would be utilized during construction to minimize sediment mobilization and maximize sediment containment within the Similkameen River and impoundment above Enloe Dam. BMPs are adapted from Ecology's Stormwater Management Manual for Eastern Washington (2004) and WSDOT's Regional Road Maintenance Endangered Species Act Program Guidelines. As detailed construction plans are finalized, the erosion and sediment control measures may need modification; if so, the District will revise and file amended copies of the ESCP and CSMP.
- **PM&E WQ-09-401: SPCC.** A Spill Prevention, Control, and Countermeasures Plan (SPCC) will need to be developed and approved by Ecology prior to operations. This PM&E was added as a component of the Project's 401 Certification.

- **PM&E WQ-10-401: Petroleum Product Monitoring.** During operations, at least weekly visual monitoring of the powerhouse tailrace for a visible sheen indicating petroleum products. More frequent observations will be made whenever the dam operator or other District personnel are on site, and anytime when equipment maintenance indicates that a leak of lubricant or other petroleum product may have occurred. A report of an apparent sheen on the water surface will be provided to Ecology within 48 hours, with an explanation of cause and notification for any course of action. Sampling procedures to be taken regarding the potential for petroleum spills in surface water bodies or on uplands is addressed in the Spill Response Plan (District 2009b). At a minimum, water will be inspected daily during project construction for the presence of sheen or for other indications that a petroleum spill has occurred in the Similkameen River. This PM&E was added as a component of the Project's 401 Certification.
- **PM&E WQ-11-401: pH Monitoring During Construction.** In the event that stormwater contacts newly poured concrete, pH sampling would be conducted at the identified upland construction site discharge points after each 24-hour rainfall event of 0.5 inch or greater, or if construction site discharge to the Similkameen River is observed. A calibrated portable pH meter or multi-parameter water quality meter will be used to measure pH using the electrometric method (Standard Method 4500-H+B, APHA 1998). If the pH of discharge water is determined to be outside 6.5 to 8.5 units, Ecology will be notified and steps will be taken to prevent it from entering surface water bodies. Construction using concrete within the Similkameen River will be isolated from river water until the concrete has cured for at least seven days, thus there will be no contact between newly poured concrete and river water that would require river monitoring for pH. Construction monitoring data will be posted to the District's Project website following sample collection for turbidity and/or pH throughout the construction monitoring period. Evidence of oil sheen, if observed, will be reported by telephone and e-mail within 48 hours after observation. This PM&E was added as a component of the Project's 401 Certification.
- **PM&E WQ-12-401: Instream Flow.** The PUD shall provide a minimum flow of 10 cfs from September 16 to July 15 and of 30 cfs from July 16 to September 15 for the duration of the License, for aesthetic purposes as well as fish and other aquatic life. This PM&E includes the cost of implementing the 10/30 cfs instream flow. This PM&E was added as a component of the Project's 401 Certification.
- **PM&E WQ-13-401: Water Level Sensor.** This PM&E includes the cost and operations of the water level sensor in the bypass reach.

5.2 HYDROLOGICAL DATA

[b. hydrological data such as rainfall, stream flow, sedimentation]

5.2.1 Stream Flow

Minimum flows on the Similkameen River occur between late summer (August) and stay low through early spring (March) until the snowmelt season begins in April, peaking in late May or early June. The maximum average monthly flow was 24,900 cfs in June 1972, while the minimum average monthly flow was 191 cfs in September 2003 (Table 5.2-1).

Table 5.2-1 Summary of Similkameen River Flows at USGS Nighthawk Station, 1929-2005

Month	Mean	Median	Max Daily	Min Daily
October	697	576	8430	161
November	938	681	14400	160

Month	Mean	Median	Max Daily	Min Daily
December	798	576	12400	120
January	659	540	5270	120
February	682	551	7790	140
March	746	600	5260	290
April	2086	1390	26400	297
May	7825	6720	39000	539
June	8597	7580	44800	1160
July	2965	2220	15800	408
August	916	764	3770	195
September	596	514	2430	164

The maximum recorded average daily flow was 44,800 cfs on June 1, 1972, when the peak instantaneous flow was estimated to be 45,800 cfs at a stage height of 18.0 feet above datum (or the approximate channel bottom). The minimum recorded daily flow was 65 cfs on January 3, 1974; this abnormally low flow was attributed to ice effects. The mean annual flood (at Nighthawk), between 1929 and 2005, was 16,100 cfs.

Annual maximum mean daily discharges have ranged from a low of 4,590 cfs (June 8, 1941) to a high of 44,800 (June 1, 1972). The calculated return period of the 1972 flood is approximately 180 years. The water level was recorded at 13 feet above the spillway crest at Enloe Dam during the 1972 flood.

Annual instantaneous peak flows at the Nighthawk station have occurred almost exclusively (except for October 21, 2003) during spring or early summer for the period of record. The earliest recorded peak event occurred on April 26, 1934, while the latest occurred on June 23, 1967. The mean/median peak flow day for the period of record is May 28, although for the last 20 years (1987-2006) the mean/median peak flow day is about one week earlier (May 22). However, winter floods associated with the inland penetration of coastal storms have occasionally been of similar magnitude to these spring and early summer freshets. The winter floods, although less common, are usually associated with ice flows and snowmelt runoff.

5.2.2 Sedimentation

Contamination from historical mining operations in the Similkameen River watershed has resulted in arsenic concentrations exceeding water quality criteria in samples from Chopaka Bridge, British Columbia (RM 36.1) and Oroville, Washington (RM 5.0). The Washington Department of Ecology has completed a Total Maximum Daily Load (TMDL) evaluation (Johnson 2002) and prepared a draft implementation plan (Peterschmidt 2005) to address the arsenic contamination. Because arsenic levels naturally exceed water quality criteria, the loading capacity for the river was set equal to the natural background concentration of arsenic (i.e., 0.4 to 0.6 µg/L total recoverable arsenic). The greatest amount of arsenic loading identified by the TMDL evaluation was resuspension of sediments in the vicinity of Palmer Creek (RM 20), approximately 10 miles upstream from the Enloe Project Area. An analysis of shallow sediment core samples for trace metals, performed for the Colville Confederated Tribes (CCT), confirmed arsenic contamination in the Similkameen River and Palmer Creek upstream from Nighthawk, Washington (Hurst 2003). Copper also exceeded a CCT Sediment Quality Standard in several samples and cadmium exceeded the standard in one sample. (See Figure E.2-13 of the FLA for sediment and water quality monitoring locations).

A one-dimensional hydraulic model was used to characterize annual patterns of sediment transport through the impoundment and estimate changes that would result from proposed operations. Such a model does not

have the ability to capture the changes in flow patterns that are likely to occur in the forebay with the addition of an inlet channel on the east bank just above the dam spillway. As can be seen in Figure E.2-16 of the FLA (at cross-section 24), the shallowest part of the forebay is adjacent to the proposed intake location, and there is concern that sediments in this location could be mobilized by proposed operations. To estimate the likelihood of this occurring we constructed a two-dimensional hydraulic model of the reservoir using the program River 2D. The River 2D model, methods, and results are detailed in Section 4.2.6 of Appendix E.2.3 of the FLA.

Models were developed for five combinations of flow and forebay geometry: 2,200 cfs under existing and proposed conditions; 10,200 cfs under existing conditions; and 16,100 cfs under existing and proposed conditions. The modeled range of flows spans the range of flow magnitudes over which the 1-D impoundment hydraulic model predicted a transition from potential deposition to potential erosion.

This model incorporates the following assumptions:

1. Horizontal flow direction does not change with changes in bed topography.
2. Threshold velocities do not change with depth.

The volume and weight of potential erosion/deposition were estimated for each flow condition, assuming a characteristic grain size of approximately 0.6 mm, an erosion/ transport threshold of 1 feet/second and a deposition threshold of 0.1 feet/second, and a constant bulk density of sand equal to 100 lb ft^3.

The results of the River 2D model (Figure E.2-17 of the FLA) are consistent with the expectation that the addition of the inlet channel would change flow velocities within the forebay. The intake channel causes the flow to veer southeast towards the intake at both 2,200 and 16,100 cfs. The model also indicates that with the addition of the proposed intake increased velocities are likely just upstream of the pinch point that defines the upstream end of the forebay. The model predicts very high velocities in the intake channel, which suggests that sedimentation there is unlikely during normal operations.

The increase in velocities towards the southeast corner of the forebay in the proposed configuration leads to an increase in potential erosion there at both modeled flow velocities for proposed conditions. This is best illustrated by the maps of equilibrium bed elevation (Figure E.2-18 of the FLA). However, at the higher flow the equilibrium bed elevation is much lower than the bed elevations mapped in 2006 during low-flow conditions. (Note that 16,100 cfs is the median annual flood, the discharge that occurs on average once every two years.) Similarly, the equilibrium bed elevation for 10,200 cfs under existing conditions is considerably lower than that mapped in 2006 (10,200 cfs is the 5 percent exceedance daily mean discharge, and occurs almost every year).

Table 5.2-1 presents the estimated depth, volume and weight of sediment that would be mobilized to bring the bed elevations to the equilibria depicted in Figure E.2-18 of the FLA.

The results of this model-based analysis suggest that the Enloe impoundment forebay undergoes an annual cycle of erosion and deposition, and that the additional erosion that would occur due to project operations at relatively low flows is minimal compared to the amount of erosion that occurs every year during peak flows. The mound of sediment observed in the forebay during low-flow bathymetric surveys is likely to be a transient feature that does not contain legacy sediments from early in the impoundment's history (and thus would not mobilize any contaminants from those sediments).

Although there are uncertainties associated with this analysis and the estimates presented in Table 5.2-1, the general pattern is probably robust: sediment builds up in the forebay during relatively low-flow portions of the year and is largely flushed out during annual peak flows, and this pattern would continue during proposed project operations.

Table 5.2-2 Potential Erosion and Deposition Depth, Volume, and Weight

Flow [cfs]	Condition	Max. Erosion [ft]	Min. Erosion (Deposition) [ft]	Avg. Depth of Erosion (Deposition) [ft]	Potential Erosion (Deposition) [yd^3]	Potential Erosion (Deposition) [tons]	Estimated Sediment Supply[1] [tons/day]
2,200	Existing	2.84	(4.20)	(0.05)	(387)	(523)	95
2,200	Proposed	8.49	(7.11)	0.72	6,003	8,103	95
10,200	Existing	29.96	1.14	14.58	121,908	164,576	2,256
16,100	Existing	39.50	4.73	24.42	204,245	275,731	5,790

Note: [1] Sediment supply estimated using sediment rating curve (see Appendix E.2.3 of the FLA)

There is potential for landsliding and soil erosion both from the uplands and along the banks of the Similkameen River. Based on field survey and review comparing aerial photographs from 1953 and 2000, 14 separate upland sediment sources in the study area were identified. These sources include badlands, gullies, streambeds (wet or dry), and minor landslides. These features are shown in Figures 1A – 1D of the Bank Erosion Assessment Technical Report (Appendix E.6.2 of the FLA).

PM&Es WQ 06 (Erosion and Sediment Control Plan) and WQ 08 (Construction Sediment Management Program) would help to mitigate erosion effects. Drafts of the Erosion and Sediment Control Plan and the Construction Sediment Management Plan were filed with FERC in response to Additional Information Requests, then updated and refilled as a part of the Project's 401 Water Quality Certification. Both plans will be updated after design plans are finalized. Implementation of erosion BMPs will avoid discharges of sediment-laden water during Project construction that would violate criteria.

5.3 MAJOR GEOLOGIC AND SOIL FEATURES

[c. major geologic and soil features, including sand and gravel deposits, clay sources, siltation, soil susceptibility to piping or settling]

5.3.1 Geology

Along the narrow valley section of the Similkameen River downstream of Palmer Lake and upstream of the Enloe impoundment, the uplands are composed primarily of Triassic-Permian metasedimentary and metavolcanic rocks of the Kobau Formation, interspersed with Jurassic metavolcanic, intrusive, and sedimentary rocks, Eocene conglomerate and Eocene intrusive dacite (Figure E.6-2 of the FLA). Much of the valley and sideslopes are mantled in Quaternary glacial drift. The complicated structure is the result of Late Triassic or Early Jurassic accretion of Paleozoic and Mesozoic volcanic archipelagos accompanied by regional metamorphism and plutonism, subsequent overlayering of Late Cretaceous and early Tertiary volcanic and sedimentary rocks, and Quaternary erosion and deposition resulting from continental glaciation (Stoffel 1990).

In the immediate vicinity of the impoundment, highly deformed Triassic/Permian metamorphic rocks of the Kobau and Spectacle Formations are unconformably overlain by Jurassic/Cretaceous metaconglomerate and metavolcanic rocks of the Ellemeham Formation. These are in turn are unconformably overlain by Eocene sandstone and conglomerate, and the latter are again unconformably overlain by Quaternary glacial drift, colluvium, and alluvial deposits (Villalobos 1982).

Within the impoundment itself, from Shanker's Bend downstream to approximately 1600 feet above the dam, the Similkameen River lies at the boundary of the Kobau and Ellemeham Formations; between 1600 feet

above and 1,000 feet below the dam the river flows over Eocene sandstone and conglomerate. Enloe Dam is located above the Similkameen Falls on resistant Eocene granitic-clast conglomerate. Downstream of the dam and falls the river again flows over Triassic/Permian metamorphic rocks of the Kobau and Spectacle Formations (Villalobos 1982).

5.3.2 Soils

Most of the soils present within or adjacent to the FERC boundary are classified as Nighthawk loam or Nighthawk extremely stony loam. Ewall loamy fine sand and Lithic Xerochrepts – Nighthawk complex soils and riverwash and rock outcrop areas are also present within or adjacent to the FERC boundary in the study area.

Nighthawk loam soils are formed in glacial till deposited over shale and are present just upstream of the dam and upstream of Shanker's Bend. These soils are deep and well-drained. Nighthawk loam soils with 3 to 8 percent slopes (map symbol 131) are characterized by slow runoff and present a slight erosion hazard. Nighthawk loam soils with 8 to 15 percent slopes (132) are characterized by medium runoff and present a moderate erosion hazard.

Nighthawk extremely stony loam soils are generally formed in glacial till and are located adjacent to the dam and powerhouse and a portion of Shanker's Bend. These soils are deep and well-drained. Nighthawk extremely stony loam soils with 8 to 25 percent slopes (134) are characterized by medium runoff and present a high to very high erosion hazard. When slopes reach 25 to 65 percent (135) these soils are characterized by rapid to very rapid runoff and present a high to very high erosion hazard.

Ewall loamy fine sand soils are formed in glacial outwash sand and are located in a small area immediately downstream of Shanker's Bend. These soils are deep and excessively drained. Ewall loamy fine sand soils with 0 to 15 percent slopes (53) are characterized by slow runoff, and present a slight erosion hazard and a high soil-blowing hazard.

Lithic Xerochrepts soils are generally shallow and well-drained and are located downstream of the dam in the study area. Lithic Xerochrepts-Nighthawk complex soils with 15 to 45 percent slopes (93) are characterized by medium runoff and present a moderate erosion hazard.

Areas classified as riverwash and rock outcrops are also present within or adjacent to the FERC boundary. Riverwash (161) consists of coarse sand and gravelly alluvium. Rock outcrop areas (162) contain little or no shallow soil material.

The soils within or adjacent to the FERC boundary and in the surrounding area are listed in Table E.6-2 of the FLA. Detailed soil characteristics including selected physical properties, chemical properties, and soil features are presented in Appendix E.6.1 of the FLA.

5.4 ALTERNATIVE LOCATIONS AVAILABLE

[d. alternate locations available]

See Section 1.1.6 of this Plan of Development, which describes alternative locations.

5.5 SEISMIC CONSIDERATIONS

[e. seismic considerations]

The Enloe impoundment is located in an area of historically low seismicity. Peak ground acceleration with a 2 percent probability of occurrence in 50 years is approximately 0.16 g, and peak ground acceleration with a 10 percent probability of occurrence in 50 years is approximately 0.07 g (USGS 2002). Localized faults have been mapped in upland areas adjacent to the Similkameen valley (Stoffel 1990). An inactive fault is presenting the conglomerate bedrock approximately 100 feet downstream of the proposed tailrace outlet (Villalobos 1982). The fault does not displace overlying glacial drift, which indicates that it has not been active in over 10,000 years.

No significant historical earthquakes (magnitude 5.5 or intensity VI or larger) have been recorded within 50 miles of the dam site since 1568. (USGS-NEIC 2007a,b). The impoundment area was designated "Zone 2 – Moderate Damage" under the Uniform Building Code, and a less conservative designation of "Zone 1 – Minor Damage" has been given to the project site on the basis of regional intensity records (Rasmussen, 1967).

There are no karst-forming limestone deposits in the vicinity of the Project Area, so the presence of solution cavities is highly unlikely, and there is minimal likelihood of subsidence. Although joints are common in the Permian/Triassic metamorphic rocks that underlie the middle section of the impoundment, they are not common in the Tertiary conglomerate upon which the dam and proposed power-generation facilities are located (Villalobos 1982). During geological field mapping conducted in December of 2006, some seepage was detected along joints and bedding planes in the conglomerate and sandstone that forms the east abutment of the dam (Christensen Associates 2007). These areas would be grouted and stabilized during the construction of proposed facilities.

5.6 DOWNSTREAM DEVELOPMENTS AND LAND USE

[f. downstream developments and land use]

The District will provide public access to the river downstream from the dam via an improved access road between the proposed recreation site and the new powerhouse. The road section will be approximately 14 feet and the surface will be surfaced with crushed rock. The District will allow hikers and visitors portaging watercraft or recreational mining equipment (on foot) to use the improved access road to access areas downstream from the dam. A path would be created to provide access for those on foot. This path would circumvent a locked gate installed at the entrance to the access road; the locked gate would prevent unauthorized vehicles from accessing areas below the dam.

The District will also improve approximately 350 feet of the existing trail located south of the improved access road. The trail will be widened to approximately 6 feet, leveled, smoothed and surfaced with gravel to provide barrier free access to all users. The District will also make limited improvements to an existing footpath that extends between the improved trail and the edge of the river by removing obstacles and adding signs to increase its visibility and enhance public safety. Figure 5.6-1 shows downstream developments.

This page intentionally left blank.

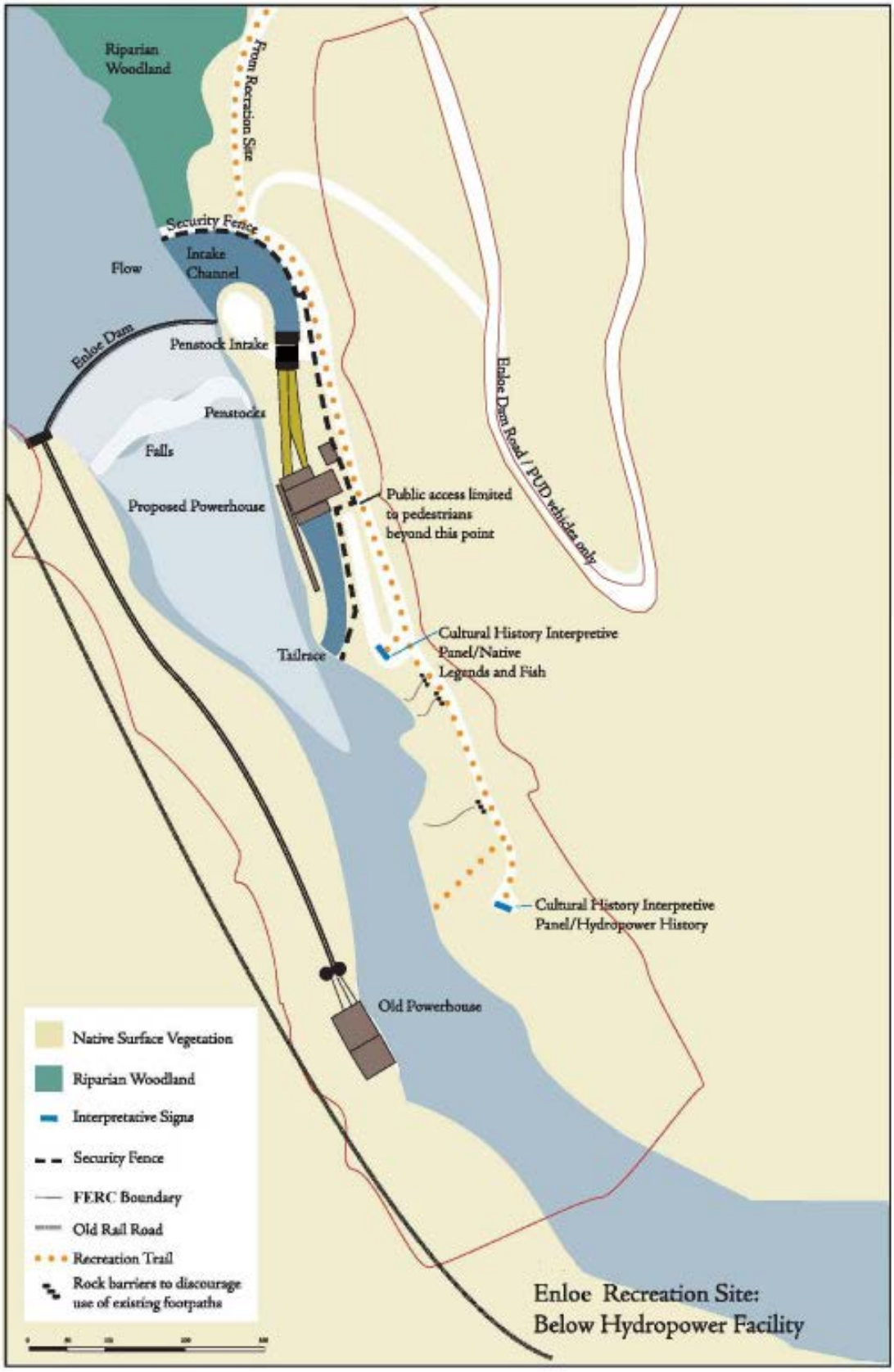


Figure 5.6- 1 Enloe Recreation Site Below Hydropower Facility

This page intentionally left blank.

5.7 WATER QUALITY

[g. water quality]

This section describes existing water quality and potential Project impacts to water quality in the lower Similkameen River and is focused on water quality characteristics that could be influenced by Project construction or operation: temperature, dissolved gas concentrations, and contaminants associated with river sediment.

5.7.1 Water Temperature

Past Lower Similkameen River monitoring indicated that water temperatures near the Canadian border and at Oroville typically exceed freshwater aquatic life criteria during the summer months, and water temperatures increase as the river flows downstream (Ecology 2005, Webber and Stewart 2001). Water temperature monitoring was conducted to document water temperature conditions in the Project Area from late spring through early fall of 2006, and to provide indications of the potential Project effects on the water temperature regime. The temperature monitoring study was designed to measure changes in water temperatures in the Similkameen River as it flowed through the Project area

Based on results of the 2006 water temperature monitoring, the following conclusions were reached related to compliance with water quality standards for temperature:

- The 17.5°C temperature criterion, measured by the 7-DADMax, was exceeded both upstream and downstream from the Project Area from late June through mid-September in 2006
- Comparisons of 7-DADMax temperatures measured at the head of the reservoir pool with measurements from the lower reservoir and from below the dam, indicate that water temperatures did not increase through the Project Area more than 0.3°C at any time during the 2006 monitoring season. In summary, summer water temperatures in the lower Similkameen River naturally exceed the 17.5°C criterion and June water temperatures naturally exceed the 13.0°C spawning criterion below the falls. Monitoring results from 2006 indicate that water temperatures do not increase significantly through the Project Area and construction of the run-of-river hydroelectric facility is not expected to adversely impact water temperatures and compliance with water quality standards for water temperature (Chapter 173-201A WAC).
- The 7-DADMax temperatures decreased through the Project Area after August 4th, at times by more than 1.6°C
- The 7-DADMax temperatures in the Similkameen River exceeded the spawning temperature criterion of 13.0°C between June 7 and June 15, 2006, where this criterion applies below the falls and at the Oroville Bridge. However, water temperatures did not increase through the Project Area more than 0.1°C during this period (a difference that is insignificant given the accuracy of monitoring equipment)
- The high temperatures recorded upstream near China Rock and the lack of warming through the reservoir pool indicate that exceedances of the 17.5 and 13°C criteria are due to conditions unrelated to Enloe Dam
- Because the 7-DADMax temperature of the Similkameen River did not increase more than 0.3°C through the Project Area at any time during the study, there were no exceedances of the water

quality standards; therefore, the presence of Enloe Dam did not contribute to the ambient water quality exceedances

- Although not used for determining compliance with water quality standards, mean daily temperatures were also examined to see if there was evidence of warming through the reservoir reach during the summer warm period. Similar to the comparison between 7-DADMax temperatures in the upper and lower reservoir, there was no evidence of warming.

5.7.1.1 Bypass Temperature

The District worked with the departments of Ecology and Fish and Wildlife through the 401 Water Quality Certification process to set flows in the bypass reach that meet State narrative standards for aesthetics and numeric standards for water quality. Providing minimum instream flows required analysis of the amount of heat that would be delivered by these flows to the cool water refugia below Similkameen Falls if they were passed over the dam or over hot rock in the bypass. The objective was to avoid an increase in temperature in the water passed through the bypass reach, an objective that was confirmed in the Order of the Pollution Control Hearings Board on appeal. Based on these criteria, 10 and 30 cfs flows were selected; the30 cfs flows would be implemented from mid-July to mid-September, and the 10 cfs flows would apply for the remainder of the year. As described previously in this POD, a strategy was adopted of taking cooler water from depth in the Enloe reservoir and piping it around the dam and hot rock in the bypass reach to the head of the falls. These flow levels and bypass approach will be revisited after project construction in studies ordered by FERC (License Order Article 411) and the PCHB Order.

The same factors influencing the temperature patterns that were observed in the 2006 monitoring results were considered in evaluating the probable effects of crest gate operations. Streams with smaller volumes of water change temperature faster than streams or rivers with larger volumes of water (Moore and Miner 1997). The crest gates will sustain a small increase in surface area (less than 12 percent) and larger increases in average depth (20 percent) and volume (21 percent). The small increase in surface area will increase heating from direct sunshine and also result in more heat loss through advection (e.g. wind-driven evaporative cooling). Because deeper waters will have less penetration of solar radiation and because larger water volumes require more heat input to effect a change in temperature, net incremental increase in heat gain, if any, is not expected to raise water temperatures. More importantly, the increased hydraulic residence time (approximately 31 rather than 22 hours over two miles at 300 cfs) will provide for more mixing of warm and cool inflows and likely extend the number of days when peak temperatures are moderated.

The fact that the water temperature in the lower reservoir did not peak until after midnight during August 2006 monitoring showed that, during critical summer low flows when hydraulic residence time is highest, river inflow temperatures were a greater determinant of temperatures in the forebay than localized heat gain and loss in the reservoir from solar radiation and advection. Overall, maximum daily temperatures are not expected to increase as a result of crest gate operations because the reservoir will continue to moderate temperatures by providing the increased hydraulic residence time for mixing of warm daytime inflows with cool nighttime inflows.

Results of vertical temperature profile measurements, taken on September 14 and 15, 2006, show that water temperature varied less than 0.6°C from near surface to near bottom and indicate that the reservoir was only weakly stratified in late summer. For the previous license application, a U.S. Army Corps of Engineers procedure was used to determine whether the reservoir was likely to be well-mixed or thermally stratified as a result of the replacement of 5-foot flashboards on the existing dam (HDR 1991). Following the Corps procedure, densimetric Froude numbers were calculated for a variety of flow scenarios for both existing conditions and with flashboards. When Froude numbers greatly exceed the

inverse of water density, it can be concluded that the reservoir will remain well mixed and will experience no significant thermal stratification. Results indicated that this would be the case for all flow scenarios. This conclusion also applies to the current project proposal, which will have a similar effect on water depth and hydraulic residence time with the installation of crest gates rather than flashboards. In any case the reduction in reservoir depth, due to sedimentation since the 1991 HDR study, will make the reservoir even less susceptible to thermal stratification.

Because the water quality standards state that human actions considered cumulatively may not cause the 7-DADMax temperature of that water body to increase more than 0.3 °C, it is also necessary to consider whether the river cooled naturally through the reservoir reach before the dam was constructed. As seen on aerial photographs of the river from Shanker's Bend upstream toward Nighthawk, the river has a relatively uniform width and a valley form similar to the reservoir reach. Most likely the average water depth in the reservoir reach was only a few feet during low flows and much less than the existing mean depth of 8.4 feet in the reservoir, and the river was about half as wide as the current impoundment. As discussed above, because the water was much shallower, solar radiation likely had a greater warming effect on water in the pre-dam reservoir reach. Hydraulic residence time in this reach before the dam (approximately 1.6 hours over two miles at 300 cfs) was never long enough to provide the mixing of cool overnight inflows with warm afternoon inflows. Topographic shade modeling shows that the maximum difference in duration of direct solar radiation through the reservoir reach is not much different than the reach upstream, so the cooling effect that was seen in monitoring data cannot be explained by more shade. Finally, a comparison of average temperatures above and below the dam (Figure E.2-19 of the FLA) indicates that there is no consistent cooling that might indicate a substantial groundwater influx that would also have been present pre-dam. All together, these factors indicate that the river was probably more subject to warming in the reservoir reach before the dam was constructed.

5.7.2 Dissolved Gas

No existing information on dissolved gas conditions in the Lower Similkameen River was available prior to the 2006 studies described below.

5.7.2.1 Dissolved Oxygen

DO profile measurements on Sept 14 and 15, 2006 in the vicinity of Enloe Dam were all in compliance with the 8.0 mg/L minimum water quality standard. Although 2006 monitoring did not find any DO levels less than 8.3 mg/L, monitoring was limited to a short period in mid-September and it is likely that DO dropped below the 8.0 mg/L minimum criterion earlier in the summer when the river was warmer – both upstream and downstream from the project.

There is an increased potential for DO to drop below the minimum standard in the bypass reach when most of river flow is diverted for power production. In the July through September period when warmer temperatures and lower DO occur, virtually all flows will be directed through the powerhouse and, generally, water will not be flowing over the dam. A mid-August 1990 study found that sites downstream of the dam and falls were approximately 1 mg/L higher in DO than upstream sites due to significant aeration at the dam and falls (HDR 1991). To offset the reduced aeration that would otherwise occur with water flowing over the dam, the powerhouse flow tubes will be equipped with aeration vents and operated to increase DO during critical periods. Adaptive management monitoring will determine when the aeration vents should be opened after high flows have receded in the early summer.

The 8.0 mg/L minimum standard was developed to protect salmon fisheries. Potential impacts from future low-DO episodes in the bypass reach are expected to be negligible because: (1) the falls prevent upstream fish passage into the bypass reach, (2) habitat surveys indicated very limited potential for fish to live in the bypass reach, and (3) 2006 fish surveys did not locate any fish in the bypass reach.

5.7.2.2 Total Dissolved Gas

TDG monitoring in 2006 resulted in the following conclusions regarding water quality impacts:

- TDG levels measured between May 26 and May 30, 2006, remained below the 110 percent saturation water quality criterion in the lower reservoir and between the dam and the falls. However, TDG levels exceeded the criterion below the falls and below the railroad trestle at the mouth of the canyon downstream from the Project Area. A generalized longitudinal profile adapted from a 1934 USGS survey indicates that the river dropped approximately 46 vertical feet over one and two-thirds mile upstream from the base of the dam (Nelson 1972), a steep gradient that suggests the river was likely turbulent before it plunged over the falls pre-dam. The steep gradient river reach that was inundated by the original Enloe Dam construction likely also created aeration and may have contributed to increased TDG saturation during high flows above the 110 percent criterion. A 1905 photograph looking downstream toward the original powerhouse shows that, before Enloe Dam was constructed, the Similkameen River was extremely turbulent and aerated immediately upstream from the falls during a high flow period (Figure E.2-12 of the FLA).
- TDG concentrations declined each day as the Similkameen River receded from the annual snowmelt peak flows.
- When the project is diverting up to 1,600 cfs through the powerhouse, those flows will be less aerated than they would have been, had they passed over the dam. More importantly, the diverted flows will be returned near the water surface rather than plunging deeply over the falls where gas bubbles become dissolved. Further, the lower TDG water exiting the powerhouse will dilute whatever higher TDG water has passed over the falls. The beneficial reduction in TDG is relative to the proportion of river flow that is diverted through the powerhouse. Most of the year when most of the river flow is diverted through the powerhouse, TDG supersaturation will be greatly reduced. During the highest river flows when most water still passes over the dam and falls, the reduction in TDG will be less. Figure E.2-20 of the FLA shows annual hydrographs for the most recent 11 years of available data, together with projections for the portion of flows that would have been bypassed through the powerhouse if it had been operating during that period. In low water years such as 2001 and 2005, spill will be greatly reduced throughout the high flow period and TDG exceedances may be eliminated, even during the peak annual flow. For high flow years such as 1997, most of the river will spill over the dam and TDG reductions from the bypass will be minor during the week or two of highest flows, but substantial reductions will occur when flows are rising and receding from the peak and the duration of TDG exceedances will be greatly reduced. For normal years, substantial reductions in TDG can be expected during all but a few days around the annual peak flow.
- Except when aeration is introduced through a vent, the turbines themselves will not increase TDG. However, the turbines will be designed to allow aeration to be provided in the flow tubes to help increase DO concentrations during the warm summer period after high flows have receded and high TDG is no longer a concern.

- In conclusion, the proposed project is not expected to degrade water quality from current conditions because the water diverted for power production will be discharged below the falls and dilute the high TDG caused by water plunging over the falls.

5.7.3 Sediment Contamination

Contamination from historical mining operations in the Similkameen River watershed has resulted in arsenic concentrations exceeding water quality criteria in samples from Copake Bridge, British Columbia (RM 36.1) and Oroville, Washington (RM 5.0). The Washington Department of Ecology has completed a Total Maximum Daily Load (TMDL) evaluation (Johnson 2002) and prepared a draft implementation plan (Peterschmidt 2005) to address the arsenic contamination. Because arsenic levels naturally exceed water quality criteria, the loading capacity for the river was set equal to the natural background concentration of arsenic (i.e., 0.4 to 0.6 µg/L total recoverable arsenic). The greatest amount of arsenic loading identified by the TMDL evaluation was resuspension of sediments in the vicinity of Palmer Creek (RM 20), approximately 10 miles upstream from the Enloe Project Area. An analysis of shallow sediment core samples for trace metals, performed for the Colville Confederated Tribes (CCT), confirmed arsenic contamination in the Similkameen River and Palmer Creek upstream from Nighthawk, Washington (Hurst 2003). Copper also exceeded a CCT Sediment Quality Standard in several samples and cadmium exceeded the standard in one sample. (See Figure E.2-13 of the FLA for sediment and water quality monitoring locations).

The potential for water quality standards for copper to be exceeded from sediment disturbance during Project construction was indicated by sediment elutriate analyses. Of the chemicals analyzed, only copper exceeded water quality criteria and it exceeded both the chronic and acute criteria in 5 of 8 samples. Although sediment disturbance and transport occurs every year during high flows in the Similkameen River, these results indicate the need to minimize sediment disturbance during project construction to avoid exceedances of the water quality criteria.

The District will comply with regulatory requirements applicable to sediment removed by project construction and operations. Similkameen River sediments are not on the Hazardous Sites List required by the Model Toxics Control Act (Chapter 173-340 WAC, Ecology 2008), and the District is not undertaking a cleanup action as part of the Enloe project. However, disposal of dredged material is potentially regulated under the dangerous waste regulations, Chapter 173-303 WAC. If analyses of required samples from the dredged material do not exceed criteria in the dangerous waste regulations, then the material will be deemed suitable for disposal at an approved mixed waste landfill.

5.8 ALL KNOWN WATER RIGHTS

[h. all known water rights]

All water rights in the State of Washington are owned by the state, and only held by the water right holder. All known water rights are described in Section 4.1 of this Plan of Development.

5.9 ACCESS

[i. access and whether is exists or needs to be developed]

Access is discussed in Section 4.3 Temporary and Permanent Access Roads of this Plan of Development.

5.10 WHAT WILL BE INUNDATED

[j. a description of what will be inundated]

The Enloe Project utilizes the existing impoundment created by Enloe Dam as its headpond. The reservoir (impoundment) occupies the narrow river channel and is fairly shallow due to accumulation of sediment. Because it has a very high inflow/volume ratio, the reservoir is more riverine (i.e., river-like) than lacustrine (i.e., lake-like) in character.

The existing reservoir is approximately 2 miles in length and varies from about 120 feet wide to 440 feet wide. Its surface area at spillway crest elevation of 1,044.3 feet is estimated to be 60.1 acres, with a storage capacity of 507 acre-feet, and a mean depth of 8.4 feet. The area and volume increase to 67.1 acres and 613 acre-feet, respectively, at the mean annual flow of 2290 cfs (at 1,046 feet water surface elevation).

Installation of the crest gates will not create additional inundation areas because the current Ordinary High Water line is above the proposed crest gate elevation, which would be El. 1,049.3 feet. The maximum reservoir elevation with no spill would be El. 1,049.3 feet and the water surface elevation would normally be kept just below the crest of the gates at about El. 1,048.3 feet to avoid uncontrolled spill due to surge or waves. At the elevation associated with mean flows, the pool extends about 2.2 miles upstream from the dam, has a surface area of 76.6 acres, a mean depth of 10.1 feet, and a volume of 775 acre-feet.

During spill periods which normally occur during the spring and early summer, the water surface elevation would be controlled at El. 1,050.3 feet by progressively lowering the crest gates. At this elevation the pool extends about 2.3 miles upstream from the dam, has a surface area of 88.3 acres, a mean depth of 10.6 feet, and a volume of 938 acre-feet. Once the crest gates are fully lowered the water surface elevation would be controlled by the stage discharge relationship of the spillway crest with the gates down.

Operation of the proposed crest gates would result in the permanent inundation of 12.2 acres along the shoreline of the reservoir that are only seasonally inundated under current conditions. Of these 12.2 acres, 1.1 acres supported upland vegetation in 2007, and 5.1 acres supported herbaceous wetland or riparian vegetation in 2007. Some of the shallower inundated areas may continue to support or develop herbaceous wetland vegetation after the crest gates become operational. Fringe riparian scrub is expected to develop along the new waterline, resulting in a temporary loss of most of this type of habitat. The increase in the water elevation may enable herbaceous wetland vegetation to dominate on benches that currently support upland meadow.

S E C T I O N 6

Government Agencies Involved

[6. Government Agencies Involved]
[a. other Federal offices that are involved]
[b. state and local agencies that are involved]

The Enloe Final License Application was prepared in consultation with the following agencies:

6.1 ALL FEDERAL AGENCIES INVOLVED

- Federal Energy Regulatory Commission (FERC)
- US Department of the Interior: Bureau of Land Management (BLM) and Bureau of Indian Affairs (BIA)
- United States Fish and Wildlife Service (USFWS)
- NOAA National Marine Fisheries Service (NMFS)
- US Army Corps of Engineers (USACE)
- National Park Service (NPS)
- Bonneville Power Association (BPA)
- Federal Emergency Management Agency (FEMA)
- US Environmental Protection Agency (EPA)

6.2 TRIBAL ENTITIES INVOLVED

- Colville Confederated Tribes (CCT)
- Lower Similkameen Indian Band
- Upper Similkameen Indian Band
- Okanagan Nation Alliance
- Confederated Tribes of the Umatilla Indian Reservation
- Yakama Nation

6.3 OSOYOOS INDIAN BANDSTATE AND LOCAL AGENCIES INVOLVED

- Washington State Department of Ecology
- Washington State Department of Natural Resources
- Washington State Department of Fish and Wildlife
- Okanogan County
- City of Oroville

- Oroville-Tonasket Irrigation District
- Washington State Historic Preservation Office
- Washington State Department of Archaeology and Historic Preservation (DAHP)
- Washington State Recreation and Conservation Office
- WA State Parks and Recreation Commission

6.3.1 Regional Governmental Agencies

- Upper Columbia Regional Fisheries Enhancement Group

6.3.2 Canadian Governmental Agencies

- BC Ministry of the Environment
- Department of Fisheries and Oceans Canada

6.3.3 Non-Governmental Organizations

- Columbia River Inter-Tribal Fisheries Commission (CRITFC)
- Upper Columbia Regional Fisheries Enhancement Group
- American Rivers
- Hydropower Reform Coalition
- Washington Water Trails Association
- Pacific NW Trail Association
- Borderlands Historical Society
- Okanogan Historical Society
- Extreme Adventures
- Sierra Club – Cascade Chapter and Northwest Regional Office
- Canadian Parks and Wilderness Society
- American Whitewater
- North Cascades Conservation Council
- Columbia River Bioregional Education Project
- Center for Environmental Law and Policy
- Okanogan Highlands Alliance
- Outdoor Recreation Council of BC

S E C T I O N 7

Construction of the Facilities

7.1 CONSTRUCTION

[a. construction (brief description)]

7.1.1 Major Facilities

Construction of major facilities that are part of the project will require typical heavy construction equipment used for earthwork, rock excavation, and construction of reinforced concrete structures, construction of access roads, transportation of construction materials, transportation of heavy equipment and transportation of construction personnel. Such equipment includes trucks, trailers, excavators, bulldozers, scrapers, graders, rock drills, compressors, cranes, concrete trucks, portable barges, boats, office trailers, temporary sanitary facilities etc.

7.1.2 Ancillary Facilities

[2) ancillary facilities (including vehicles and number of tons and loads)]

Construction of ancillary facilities would be completed in conduction with construction of major facilities and is discussed in Section 7.1.1 above.

7.2 WORK FORCE

[b. work force (number of people and vehicles)]

Preliminary estimates for Project construction employment have been developed with the following stipulations:

- Estimates were developed solely for the socioeconomic analysis in the FLA;
- Actual schedule and crew sizes will be decided by the Contractor after the Project has been licensed, bid, and a contract awarded;
- Labor wage rates are approximate and depend on the contractor's work plan, degree of subcontracting, and reimbursement structure; and
- Project costs are also affected by risk, environmental constraints, and supply and demand of construction services at the time the Project is bid.

With these stipulations in mind, the preliminary estimates for construction employment indicate a small increase in engineering and construction management employment of 1 person or 0.4 Full-Time Equivalents (FTE) in year one, ramping up to 3.5 FTE at the start of year two. It will peak at 4 FTE during that year, and then stabilize throughout year three at 3 FTE. Construction employment requirements begin at the start of year two, with 2.5 FTE, increasing to 46.5 FTE near the end of year two. Year three indicates a requirement of 27 FTE for construction at the start of the year, ramping down to 9 FTE by the end of the three-year

construction phase. Figure E.5-2 of the FLA exhibits the on-site construction employment, both construction management and construction workers, by month during the construction phase.

Enloe will be an unmanned power station. The increased man-hours associated with the operation and maintenance of the project is 8,000 hours (or approximately 4 FTE) per year. However, due to the ability of current District staff to accommodate these needs, there will be no long term increase in on-site employment or payroll within the Impact Area due to the operation of the Project.

7.3 FLAGGING OR STAKING THE RIGHT-OF-WAY

[c. flagging or staking the right-of-way]

The proposed right of way boundaries will be flagged prior to construction.

7.4 CLEARING AND GRADING

[d. clearing and grading]

For the approach-channel, intake structure, intake canal, and penstock intake, soils and bedrock will be permanently displaced from the location of these facilities. The volume of excavation is expected to be around 11,000 cubic yards. Nighthawk extremely stony loam has a high to very high erosion hazard rating, so erosion potential during construction is a concern; mitigation measures may include the installation of silt-fences, check-dams, and/or geotextile surface protection. A detailed Erosion and Sediment Control plan will be prepared as part of final design. Excavated materials will be disposed of in accord with permit requirements, and the District will comply with all regulatory requirements applicable to sediment removed by project construction and operations.

Construction of the powerhouse will require the excavation of approximately 2,300 cubic yards of rock and soil. After the surface layer of soil is removed, the tailrace will be excavated in bedrock using controlled blasting techniques. Approximately 5,300 cubic yards of rock and soil will be excavated.

Road improvement and rehabilitation of the OTID Ditch Road, together with associated culverts, will require minor amounts of cut and fill. In total, approximately 110,000 square feet of soil would be permanently covered by the new section of road.

Additional clearing and grading will be required to complete the improvements at the one-acre recreation site. The site is relatively flat and is located next to a riparian woodland area just upstream from the dam. The design concept for the recreation site is based on a one-way loop road that will circulate traffic in a counter clock-wise direction. The loop road will be approximately 14 feet wide and will be surfaced with gravel. A gravel surfaced parking area able to accommodate up to five standard vehicles and two vehicles with trailers will be located on the southern half of the site. Minor clearing and grading would also be required to prepare four primitive camp sites, two picnic areas, and improvements at the boat launch. Mitigation measures similar to those mentioned above would be implemented in order to reduce erosion potential.

7.5 FACILITY CONSTRUCTION DATA

[e. facility construction data]

7.5.1 Construction Process

[1. description of construction process]

Implementation of the Enloe Hydroelectric Project is scheduled to take about four years from the issuance and acceptance of the FERC license and other necessary regulatory approvals, as follows.

Year 1 – Engineering design and permits.

Year 2 - Preparation of Bid Documents, Turbine Generator and major equipment procurement.

Year 3 – Start Construction.

Year 4 – Complete construction and plant commissioning.

Construction of power facilities is expected to last 18 months. Road access improvements, installation of a temporary cofferdam, and construction of the training wall would occur prior to a three month shutdown during the first winter.

Most of the site excavation and concrete construction would be accomplished during the following construction season, with installation of electrical and mechanical equipment occurring in fall and through the second winter. When the plant is substantially complete, it would then be tested and commissioned. The plant would then be scheduled to commence operations in early spring.

Installation of the crest gates would occur during the subsequent fall season when river flows are low. At this time, the new power plant would be used to draw down the reservoir to an elevation just below the crest of the spillway. A temporary siphon would be installed on the spillway crest to maintain downstream flow in the event of an unplanned plant outage.

Further detailed information can be found in Exhibit C of the FERC License Application.

7.6 RIGHT-OF-WAY ACCESS DURING CONSTRUCTION

[f. access to and along right-of-way during construction]

Initial construction will modify the access roads as described in Section 4.3. Access during construction would be via the modified access roads.

7.7 CONTINGENCY PLANNING

[g. contingency planning]

Not applicable.

7.7.1 Holder Contracts

[1) holder contracts]

Not applicable.

7.7.2 BLM Contracts

[1) BLM contracts)

Not applicable.

7.8 SAFETY REQUIREMENTS

[h. safety requirements]

The proposed construction work will primarily be carried out in compliance with applicable construction safety regulations under the Washington Industrial Safety and Health Act (WISHA) administered by the Washington State Department of Labor and Industries, and the Owners Dam Safety Program and Public Safety Plan developed under FERC License Articles 306 and 307.

7.9 INDUSTRIAL WASTES AND TOXIC SUBSTANCES

[i. industrial wastes and toxic substances]

Industrial wastes and toxic substances used during construction will be handled in accordance with manufacturers MSDS sheets, terms of environmental permits, applicable governmental regulations and the District's policies for protecting personnel, the public and the environment.

A spill prevention, containment, and clean-up plan will be prepared and implemented at Project initiation, in order to reduce potential impacts from accidental spills when heavy machinery is operated near the river and reservoir. If other hazardous materials are identified at a later time, these materials will be included in the Response Plan. Material Safety Data Sheets would be on site and included as part of the Response Plan.

S E C T I O N 8

Resource Values and Environmental Concerns

8.1 MUTUALLY AGREEABLE TERMS & CONDITIONS

The District and the BLM have collaborated to develop mutually agreeable terms and conditions to address questions and concerns raised by BLM regarding the FERC EA and the Project plans, set forth in Section 8.1 through 8.4, Table 8.1 presents a summary of resource values and environmental concerns documented in the various project licensing documents. Emphasizing consultation and collaboration further developing a better understanding between the District and BLM

8.2 RECREATION

8.2.1 Recreation Monitoring

The BLM and the District acknowledge that FERC has an established process that addresses project recreation throughout the term of the license. This process requires monitoring and consultation, and reserves the authority to order modifications to the license's recreational articles. FERC License Order Articles[1] 410 and 411 and PM&E **REC-15-EA: Recreation Monitoring** sets forth requirements for annual visitor use monitoring in consultation with BLM and preparation of a FERC Form 80 recreation monitoring report every six years. Working within that established process, the District agrees to consult with BLM prior to submitting any changes to the Recreation Management Plan (RMP). The BLM and the District further agree to review the RMP annually during the initial period after the commencement of construction and through the start of commercial operation. The RMP will also be reviewed every 6 years during operations, as required by Article 410.

8.2.2 Recreation O&M

The BLM and the District acknowledge that the District will maintain and operate project recreation facilities as set forth in the RMP, throughout the life of the license. The District agrees that the RMP will include plans for repair and replacement of these facilities throughout the life of the license.

8.2.3 Tracking Visitation

The District will file the initial FERC Form 80 one year after construction of the Project recreational facilities. After the initial one year filing, the District will submit the FERC Form 80 every six years. The District will consult with BLM on these reporting activities, which incorporate monitoring on an informal basis during

[1] All references to "Articles" mean the Federal Energy Regulatory Commission's License Order Articles

routine site visits to track visitation and enable the Parties to make management decisions according to visitor use patterns.

8.3 FIRE SUPPRESSION

8.3.1 Fire Suppression Program

PM&E **Safety-04-EA Fire Suppression Program** provides that a fire suppression program will be developed in consultation with BLM. The BLM and the District agree that this plan will meet the requirements of Article 412 and address:

- how and where fuels will be treated,
- the extent of fire suppression within the project area,
- fire rehabilitation specifics: seeding mixes, planting, erosion control,
- fire prevention actions (at camp areas) to include mowing camp areas, graveling roads, parking lots and around campfire rings, posting and enforcing fire closures, posting informational signing about fires and rehabilitation efforts, removing brush around recreation sites, eliminating visitor-created campfire rings, and
- funding of fire prevention and the roles of BLM and the District.

8.4 CONSTRUCTION

8.4.1 Construction Specifics

The BLM is particularly interested in construction specifics for the Enloe Dam entrance road and the Miners Flat site from a visitor's access standpoint. The BLM has already developed a conceptual plan for the Miners Flat site and the District will consider this conceptual plan in the development of the construction plans for the Miners Flat site within the framework of the RMP to be prepared under Article 410. The District will provide copies of preliminary design submissions for the Miner's Flat site to the BLM and will consider any design review comments made by the BLM.

8.5 VEGETATION AND WILDLIFE

8.5.1 Sensitive Species

The BLM and the District agree that:

- The District will survey for all BLM Sensitive Species, including but not limited to Utes ladies' tresses as provided in Article 408, during the next three surveys the District states will be undertaken in the USFWS Biological Evaluation (Page 43). Additionally, the District will survey for all BLM sensitive species in areas converted to a new wetland vegetation community annually for 5 years and then once at 8 years, as described in the USFWS Biological Evaluation (Pages 43 and 44).
- Surveys will be conducted during the May-July and July-September time windows when Snake River Cryptantha and Utes ladies' tresses, respectively, are recognizable.

8.5.2 Habitat Mitigation and Monitoring

The BLM and the District agree that if federally threatened, endangered or BLM Sensitive Species are located as part of the above surveys or at any time prior to or during construction, then the impact to those populations or to the habitat of those populations will be mitigated and the results monitored for success. While it is generally preferable to adjust the construction "footprint" to avoid adverse effects, some project elements cannot be moved and this approach provides a pathway for appropriate mitigation.

8.5.3 Sensitive Wildlife Species

The BLM and the District agree that Sensitive Species include both plants and animals as noted in the BLM 6840 Manual and the Inter-agency Special Status/Sensitive Species Program lists (ISSSSP). The ISSSSP list currently includes 92 species of terrestrial and aquatic vertebrate and invertebrate species, and is updated periodically. While not all of these species have potential to occur within the project area, many of the species do have potential to occur based on geographic distribution of the species and available habitat. Furthermore, some of the species, including but not limited to bald eagle or Townsend's big-eared bat, have been documented in or adjacent to the project area. However, since no major issues regarding ISSSSP wildlife species have been identified within the project area, the District agrees to record incidental observations of wildlife as opposed to conducting formal surveys. Should any newly documented ISSSSP wildlife species or issues regarding these species be identified, the District agrees to consult with BLM within the framework of the Wildlife Plan to be prepared under Article 409 to determine appropriate next steps.

Table 8-1 summarizes resource values and environmental concerns associated with the Enloe Hydroelectric Project. These include geology and soils; water; wildlife, vegetation, and federally listed species; cultural resources; aesthetics; land use and BLM; and recreation activities. Air and noise are not included because these resources will be minimally affected by the project. The table also includes a numbered reference to the specific areas of concern raised by BLM and above between the District and BLM.

The affected resources and environmental concerns are addressed and fully mitigated by:

- the District's program of Protection, Mitigation and Enhancement (PM&E) measures proposed in the Enloe Hydroelectric Project Final License Application (as amended);
- the mitigation measures adopted by FERC in its Environmental Assessment under NEPA;
- the terms and conditions ordered in the Washington Department of Ecology's 401 Water Quality Certificate, including the appended 401 Plans; and
- the terms and conditions ordered in the FERC's Order Issuing New License (Project 12569-001, dated July 9, 2013)

Table 8.5-1 Summary of Resource Values and Environmental Concerns

Resource Value	Environmental Concern	Discussion
Geology and Soils	Erosion may occur during construction	Soils may be eroded during construction where vegetation is removed and heavy construction equipment operates. Construction activities may mobilize sediment to Project waters during construction and prior to the development of vegetation to cover bare soil. Sediments in the Similkameen River, including the reservoir above Enloe Dam may contain trace levels of arsenic, cadmium and copper. Implementation of erosion BMPs will avoid discharges of sediment-laden water during Project construction that might violate criteria. Spoils disposal will be addressed in a Plan to be filed with FERC within 90 days prior to construction. Implementation of proposed Construction Sediment Management and Erosion and Sediment Control plans and PM&Es will avoid and mitigate discharges of sediment-laden water during Project construction and comply with water quality standards.
Water	Water rights may be affected	The Enloe Hydroelectric Project will not change any existing water rights or the consumptive use of water for any purpose.

Resource Value	Environmental Concern	Discussion
	Water temperature may be affected in the cool water refugia below Similkameen Falls	Bypass facilities (described in Section 1.4.7) have been added to the project to avoid an increase in water temperature associated with providing flows over Similkameen Falls.
	Water quality may be affected below the Falls	The Project tailrace has been relocated to avoid effects to water quality in the pool at the base of Similkameen Falls.
	Dissolved oxygen may be reduced	Diverting water through the powerhouse that would otherwise flow over the dam and Falls may reduce DO concentrations by approximately 1 mg/L. Providing aeration in the flow tubes of the turbines during low flows will minimize the reduction in DO concentrations below the project during the critical summer season.
	Total dissolved gas naturally exceeds saturation criteria	At times, total dissolved gas measurements downstream of the Falls exceed the 110% saturation water quality criteria. This occurs when aerated water plunges deeply at the base of the falls and gas bubbles become dissolved in the water. Diverting water through the Project turbines and discharging the tailrace downstream from the falls will reduce the flows that will otherwise plunge deeply over the falls where bubbles currently become dissolved in the water column.
Wildlife, Vegetation, and Fish	Wildlife and Vegetation may be affected during construction and operations. Sections 8.42 and 8.43	Construction of access roads, excavation of the intake channel, penstock foundations, powerhouse foundation, and the tailrace channel could directly affect vegetation or result in indirect impacts through soil erosion. Construction and operation of the project will be consistent with a Wildlife Management Plan as provided under FERC License Article 409; a Vegetation Mitigation and Monitoring Plan as proposed in the FLA; and a Riparian and Wetland Management Plan as required by the 401 Certificate, as well as numerous other environmental plans that will serve to protect these resources and in accordance with the Sections 8.42 and 8.43..
	Fish may be affected by blasting during construction	Excavation for project facilities will be accomplished using excavators and controlled blasting. Blasting could affect fishery resources, including sensitive and federally listed species. Implementation of plans and BMPs for blasting, including removal and exclusion of fish present is expected avoid or minimize mortality and injury associated with blasting in and adjacent to aquatic habitat.
	Large woody debris may be trapped upstream of the dam	The existing reservoir has the potential to trap LWD that is transported from upstream sources.
	Fish may be entrained at the Project intake	During operation of the Project, there is a potential that fish will become entrained in water diverted for power generation. Smaller fish (100 mm or less) that pass through the project intake will have a high survival rate through the turbine and will become part of the downstream fishery population. Larger fish will remain in the upstream fishery. In fact, given the significant reduction frequency of unrestricted spills over the dam per year, it is reasonable to assume that loss of larger fish from the reservoir will be reduced as compared natural unrestricted spills in the absence of the Project.
	Loss of fish to reservoir population	Entrainment and passage through the turbine will remove fish from the reservoir population. Entrainment studies and fish monitoring will assess the effects of entrainment on the upstream fishery, and the impact of turbine mortality on the recruitment of upstream species to the downstream fishery.
	Riparian vegetation may be affected upstream of the dam 8.41 Sensitive Species	The larger reservoir will permanently inundate vegetation and wetland along the shore of the current impoundment that is only seasonally inundated under current conditions. Riparian plantings will benefit aquatic resources through contributing organic input (e.g., leaf litter) that is important to insect production, shade that is important for reducing water temperatures, and cover for fish to hide and rest in terms of wood that falls in the water or overhanging vegetation. Surveys will be conducted for Ute ladies' tresses in areas along the reservoir that will be affected by the project to avoid impacts to these ESA-listed plants, as provided in FERC License Article 408 and Section 8.41.
	Fish may enter the tailrace	Fish may be attracted into the tailrace and potentially travel into the draft tubes. Tailrace net barriers tailrace video monitoring will allow fish to safely occupy the tailrace. During periods of low flow when the draft tube environment could be hazardous because they might be able to swim upstream and reach the turbines, fish will be prevented from entry into the draft tubes. During high turbine flow operation, the velocity through the turbine and draft tube will prevent fish from moving sufficiently far upstream into the draft tubes to reach the turbine.
	Downstream flows may fluctuate	Operation of the crest gates may cause flow fluctuation downstream of Similkameen Falls. Run-of-river operations will avoid flow fluctuations that might adversely affect downstream resources through ramping rates and monitoring of effects of flow changes.
	Downstream habitat may be	Effects to instream habitats downstream of Similkameen Falls are avoided through relocation of

Resource Value	Environmental Concern	Discussion
	affected	the tailrace, surveys, monitoring and adaptive management.
	Bypass reach aquatic resources may be affected	The bypass reach will experience reduced flow, and will be protected by minimum flows ordered under the 401 Certificate (30 cfs during mid-July to mid-September and 10 cfs the remainder of the year). Fisheries enhancement will benefit the native species found in the Similkameen River, by increasing spawning and rearing habitat for federally-listed species and species of special concern that inhabit the river downstream of the Project.
Cultural Resources	Historic values associated with the Enloe dam and powerhouse and associated objects and structures may be affected; archeological resources may be affected	Character-defining features of the dam, powerhouse, and associated objects and structures could be demolished or lost. The original Enloe powerhouse is deteriorating and has been vandalized. These effects are addressed through completion of the Section 106 process and the development and implementation of an HPMP and a PA in consultation with a Cultural Resources Working Group. The documentation of the powerhouse and the interpretive panels will provide access to the information on this early example of a hydroelectric development.
Aesthetics	Visual resources may be affected	Demolition of the existing historic powerhouse, construction of new facilities on the east side of the Similkameen River and the construction of facilities related to a new recreational area north of the dam will impact visual resources. BMPs applied both to the new facilities themselves and to the natural environment (e.g., plantings) together with consultation with the CCT and other stakeholders during restoration activities will create a landscape that resembles the natural vegetation community as facilities are removed and construction areas restored. The new facilities will be made visually compatible through the use of building materials and paint that help the facilities harmonize with the landscape and through compatible site location, and design.
	Aesthetic effects to recreational users below the dam	Aesthetic effects of reduced flow over the dam and through the bypass reach were balanced with effects to fisheries caused by aesthetic flows delivering heat to the cool water refugia below Similkameen Falls through the 401 process. The 401 Certificate ordered minimum flows of 30 cfs from mid-July to mid-September, and 10 cfs flows the rest of the year. Ruling on an appeal of the 401 Certificate, the PCHB has ordered that aesthetic flows not increase water temperature, and that Ecology further monitor and evaluate these flows, consulting with the Fish Advisory Work Group after the project begins operation. FERC has also ordered post-construction user surveys to evaluate satisfaction with the views of flows. The results of these studies and evaluations will be transmitted to BLM.
Land Use, Access and Safety	Project use of land	The District proposes to rehabilitate the Enloe Dam Project by building a new intake structure, intake canal, penstocks, powerhouse, appurtenant distribution line, and tailrace. The facilities are described in greater detail in Exhibits A and F in the FLA. The Project will be operated with 5-foot crest gates from approximately mid-July through mid-April of each year. The crest gates will result in permanent inundation of land that is currently seasonally inundated, including 5.1 acres of wetlands (0.2 acres of Riparian Forested wetland, 2.8 acres of Riparian Shrub wetland, and 2.1 acres of Herbaceous wetland). With the proposed crest gates, the reservoir surface area will increase by about 12.2 acres during low flow (approximately mid-July through mid-April). Figure E.9-3 of the FLA shows the reservoir inundation zone with and without crest gates. The area that will be inundated during the spring and early summer high-flow period will not change. The District proposes to connect to its existing power distribution line immediately east of the proposed new power generation facilities. The FERC License Order Article 203 requires the District to file revised Exhibit G maps within 90 days of license issuance, showing all lands and works within the project boundary. These revised maps will be transmitted to BLM when they are filed with FERC.
	8.21 Fire Suppression Program	Fire suppression is needed as part of site management. The District will implement a Fire Suppression Program as described in Section 8.21.
	Road access to Enloe Dam and immediate vicinity	The District plans to close the low-lying leg (Segment B) of the OTID Ditch Road that leads from the Loomis-Oroville Road (County Road #9425) to Enloe Dam, improve access to the east side of the dam, and improve safety associated with road access. In addition, abandonment of Segment B of the OTID Ditch Road will benefit the botanical and wildlife resources by providing additional habitat and removing disturbances from the adjacent habitats. The District will also improve road access to Miner's Flat, as ordered by FERC.
	Safety of public access at Enloe Dam and lower impoundment	The District will improve public safety by limiting vehicle access to the shoreline area immediately adjacent to Enloe Dam and to the lower reaches of the impoundment. This will also protect wetlands in the area from damage associated with vehicles and foot traffic. Fences and barricades will improve public safety by limiting access to dangerous Project features.
	Access to the Similkameen River Corridor below Enloe Dam (east bank)	The construction of the new power generation facilities will require replacement of portions of an abandoned road and foot trails which currently provide foot access to areas below Enloe Dam, including Similkameen Falls and the lower reaches of the Similkameen River, with a new access road and improved trails. The segment of the road closest to the dam will be upgraded during construction of the proposed new power generation facilities. Improved foot access to

Resource Value	Environmental Concern	Discussion
		the area below the dam will be provided for recreational boaters, anglers, hikers and others participating in nonconsumptive environmental recreation activities such as bird watching or photography.
	Access to the river corridor from the west bank	Visitor access to Enloe Dam and the immediate vicinity is primarily from the east. Access from the west is limited by steep rugged terrain and the absence of a public road. The west bank of the Similkameen River is extremely steep and rocky. Game trails provide some access to the old powerhouse and associated facilities and to the river below the dam. An abandoned railroad bed at the top of the bank provides vehicle access to the area; however, it is not open to the public. The railroad bed traverses private land, and access is controlled by locked gates at both ends. Parts of the railroad bed lie within the Project Area. The District has supported Okanogan County plans to develop a public, non-motorized recreational use trail on the grade by transferring a trestle bridge owned by the District.
	Illegal trash dumping	Illegal trash dumping has been a problem in the Project Area. The District will remove existing trash and conduct annual cleanup to improve the aesthetic value of the recreational experience. In addition, it will improve public safety and remove potential public health issues.
Recreation	Displacement of recreational use 8.31 Miners Flat Site Construction Specifics	The proposed Project includes crest gates, which will raise the water level in the impoundment above Enloe Dam at certain times of year. The increased water level will inundate parts of an area of riparian woodland that includes an informal, user-developed hand-launch/take-out ramp and is occasionally used as a primitive campsite. The District will enhance the recreational experience in the Project Area by improving the aesthetic quality of the experience, making it easier to find recreational resources, and making it easier for recreators to park, load and unload recreational equipment and enjoy the interpretive signs that add to the experience. Improvements such as the boat launch and parking area will enhance efforts to improve the GCRWT. In addition, the District will improve the Miner's Flat take-out as provided under the FERC License Order Article 410 and Section 8.31.
	Potential changes in type and intensity of recreational use 8.1 Recreation	The proposed project and attendant changes in accessibility of the site are likely to result in an increase in intensity of recreational use, but there is little indication that the type of recreational use will change. The amount of increase is difficult to predict, because recreational use of the Project Area and Vicinity had not been quantified prior to development of the District's license application. The 2006 Recreational Use Survey found that more than 95 percent of visitors to the Study Area were Washington residents, and more than one-third live in Okanogan County. Therefore, the increase in recreational use of the Project Area will probably be similar to the rate of population growth locally and in the State. The number of recreational users may increase as a result of development of the proposed non-motorized recreational use trail on the west bank of the Similkameen River, described under the heading "Access to the river corridor from the west bank" above. The District will improve the recreational resources available in the vicinity of the Project; monitor recreation, track visitation, and develop, implement and regularly update a Recreation Management Plan in consultation with BLM as provided under FERC License Articles 410 and 411 and Section 8.1.

S E C T I O N 9

Stabilization and Rehabilitation

9.1 SOIL REPLACEMENT AND STABILIZATION

[a. soil replacement and stabilization]

An Erosion and Sediment Control Plan (ESCP) has been prepared, and will be updated when designs have been finalized. Standard erosion and sediment control measures and site-specific BMPs would be used.

9.2 DISPOSAL OF VEGETATION REMOVED DURING CONSTRUCTION

[b. disposal of vegetation removed during construction (i.e., trees, shrubs, etc.)]

Woody vegetation would be disposed of on-site at the soil disposal locations and covered with spoils. Any weedy vegetation removed would be disposed of off-site, as required by BLM.

9.3 SEEDING SPECIFICATIONS

[c. seeding specifications]

A native grass mix such as the western native grass mix described in Table 9.3-1 would generally be used to reestablish vegetative cover in weed-control or other disturbed areas. Where weed control is conducted in developed recreational use areas, a grass mix that includes non-native species may be used if approved by BLM for this purpose. The rate of seed per acre will depend on the type of seed mix used.

Table 9.3-1 Grass Mix Species Composition – Western Native Grass Mix

Species	Proportion
Idaho fescue	25%
Sandberg bluegrass	25%
Indian ricegrass	20%
Bluebunch wheatgrass	10-15%
Prairie junegrass	10-15%

9.4 FERTILIZER

[d. fertilizer]

Fertilizer application should be avoided in reclaimed areas with known weed infestations because nutrients can enhance the growth of weeds. Because most of the upland areas support some cheatgrass, as well as other weeds, fertilizers would not be used for this Project.

9.5 LIMITING ACCESS TO THE RIGHT-OF-WAY

[e. limiting access to right-of-way]

Not applicable.

S E C T I O N 1 0

Operation and Maintenance

10.1 SAFETY

Prior to the submittal of the FLA, the existing dam fell under the jurisdiction of the State of Washington, Department of Ecology, Dam Safety Office, which is responsible for ensuring the safety of existing dams in the State. When the FLA was submitted, the Dam became subject to FERC's jurisdiction. Under the FERC license issued for the Project, all existing and to-be-constructed project works will be subject to FERC's comprehensive dam safety regulation and oversight. Additionally, the District is required to comply with the current requirements of the Federal Guidelines for Dam Safety (including FEMA 64, FEMA 65, FEMA 93, FEMA 94, FEMA148, and FEMA 333) for dam site investigation, design, construction, operation and maintenance, and emergency preparedness.

10.2 INDUSTRIAL WASTES AND TOXIC SUBSTANCES

Industrial wastes and toxic substances will be handled in accordance with applicable governmental regulations and the District's policies for protecting personnel, the public and the environment.

10.3 INSPECTION AND MAINTENANCE SCHEDULES

The proposed hydropower plant will be unmanned and remotely monitored from the District's control center. Routine operation and maintenance activities will be carried out by local District personnel and journeymen technical staff. Annual planned maintenance of equipment will typically be carried out during low flow periods that occur in fall and winter. Occasional major overhaul of equipment occurs with a frequency of 10 to 30 years and would also be scheduled during low flow periods.

For recreation facilities, the District will be responsible, either directly or indirectly through a formal partnership, for maintaining recreational assets in an acceptable condition through routine maintenance, repair and replacement. Routine maintenance serves only to keep the facility in an ordinary, efficient operating condition and includes activities such as minor repairs, painting, replacement of minor parts and minor structural components. Routine maintenance neither materially adds to the value of the property nor appreciably prolongs its life. Routine maintenance excludes activities aimed at expanding the capacity of an asset or otherwise upgrading it to serve needs different from, or significantly greater than those originally intended.

Repair and replacement activities occur less frequently and are the result of wear from normal use, naturally occurring damage, and/or acts of vandalism. Facilities and features have been selected that are resistant to damage or vandalism, or relatively inexpensive to repair or replace. The repair of recreation features, which could include the replacement of certain items, will be conducted on an as-needed basis as soon as practical after being identified through regular facility inspections. Recreation features will be inspected during normal maintenance visits and any recreation features that are identified as broken or in need of repair will be repaired or replaced.

Routine maintenance and site inspections of all recreation-related facilities and project features will be conducted on year-round basis by authorized District personnel. Each year, prior to the start of the recreation season, the District will conduct a more extensive repair and replacement effort to ensure all facilities are operational and in good condition.

Table 10.3-1 Maintenance Features and Activities

Project Feature	Activity
Access Roads	Pick up litter (as needed) Fill potholes and ruts with gravel (as needed, weather permitting) Regrade surface (annually)
Security Fence and Barricades	Inspect and repair (as needed)
Cattle Fencing, Cattle Guard, Stock Watering Tank, Pump Enclosure, Water Line Extension	Inspect and repair (as needed)
Trails	Pick up litter (as needed) Smooth surface and add gravel (as needed)
Boat Launch and Parking Area	Pick up litter (as needed) Inspect and repair as needed (annually) Fill potholes with gravel (annually) Inspect and repair trash deflector (as needed)
Primitive Campsites	Pick up litter (as needed) Fill potholes and ruts with gravel (as needed)
Picnic Area and Tables	Clean tables (bi-weekly)[1] Ensure tables are secured (bi-weekly)[1] Ensure tables are level (bi-weekly)[1] Remove large weed clumps and trim overhanging branches (annually) Mow or "weed eat" recreation area, around picnic tables, fire rings and campsites to reduce fire danger and improve ease of access (as needed)
Vault Toilet	Wash all inside surfaces (bi-weekly)[1] Check and refill toilet paper (bi-weekly)[1] Inspect for vandalism and other damage, repair as needed (bi-weekly)[1] Pump tank (annually)
Interpretive Signs and Information Board	Inspect for vandalism or other damage, repair as needed (monthly) Replace missing/torn signs on information board (monthly) Paint or stain (annually)
Warning Signs, Safety Cable, Grab Ropes and Log Boom	Inspect for vandalism or other damage, repair as needed (annually)
Annual Clean-up	Collect trash and illegal dumping from within entire Project Area (annually)

Note: [1] During recreation season as defined by the Recreation Management Plan.

10.4 WORK SCHEDULES

Since the proposed plant will be unmanned, work schedules at the facility will be on an as-needed basis, to be determined by plant operation and maintenance needs.

Typical work activities include frequent visual inspection of equipment, checking of automatic screen cleaning equipment, checking plant operations logs, checking plant monitoring, lubrication and auxiliary systems, and troubleshooting electrical or mechanical faults.

10.5 FIRE CONTROL

The proposed powerhouse will have an automatic fire suppression system inside the facility. As required by FERC License Order Article 412, the District will prepare a Fire Suppression Plan within one year of license issuance. The plan will be developed after consultation with BLM and WDNR. It will be filed with FERC and a copy will be provided to BLM.

10.6 LONG TERM ACCESS

The Loomis-Oroville Road would provide long term road access to the facility from existing access roads to the dam. These existing access roads will be upgraded.

10.7 SIGNS

FERC requires that licensees develop a Public Safety Plan at projects where public safety measures are necessary. The Public Safety Plan will address the needs for safety signage at the project consistent with FERC guidance regarding safety signage.

10.8 INSPECTIONS

Pursuant to the FERC license, the proposed project will be regularly inspected by FERC engineering staff.

10.9 CONTINGENCY PLANNING

The District maintains an Emergency Action Plan that identifies potential emergency conditions at Enloe Dam and specifies actions to be taken in the event of an emergency to minimize loss of life and property damage.

This page intentionally left blank

SECTION 11

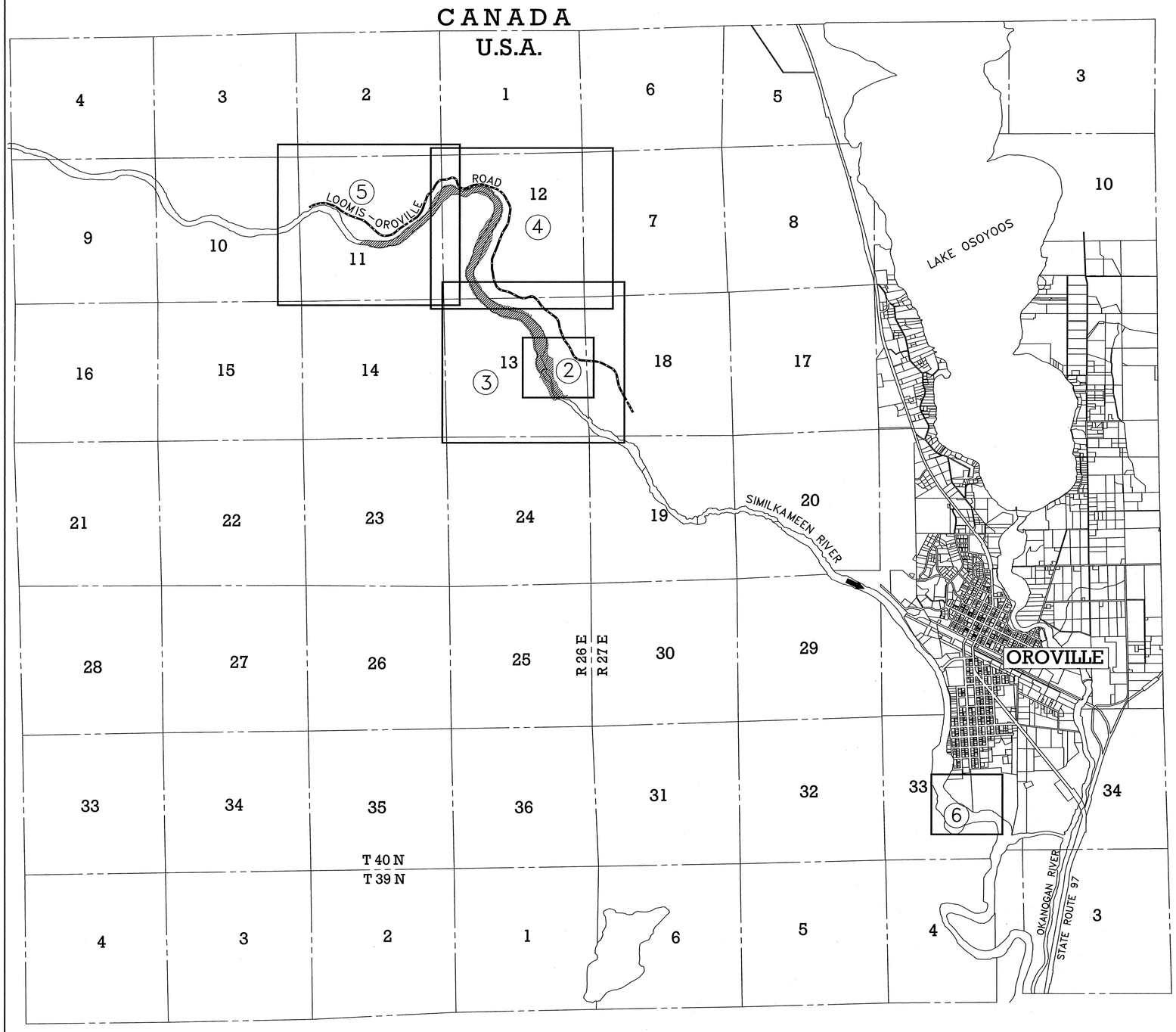
Termination and Restoration

Decommissioning of the project and restoration of the site will be subject to regulation by FERC. Prior to decommissioning the District will need to file an application with FERC to terminate generation, decommission the licensed facility and restore the site. At that time the District will need to consult with Federal, State and Local resource agencies including the Bureau of Land Management.

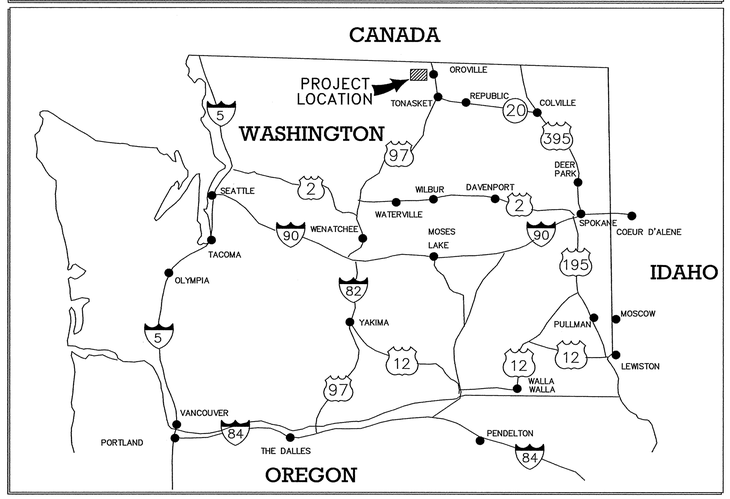
FERC will require a full license surrender application, comparable to the license application, to approve the surrender of the license and decommissioning of the project. FERC regulations at 18 CFR Part 6.2 require lands of the United States to be restored to a condition satisfactory to the Department having supervision over such lands (which would be BLM in the case of this project).

Appendix A

Exhibit G Maps



VICINITY MAP



LEGEND

- FOUND MONUMENT AS NOTED
- FOUND REBAR AS NOTED
- CALCULATED POINT ONLY, NOTHING FOUND OR SET
- SET 5/8" X 24" REBAR & CAP, L.S. 33096
- ( ) RECORD DEED DATA
- [ ] RECORD G.L.O. DATA
- FERC PROJECT BOUNDARY
- SECTION LINE
- QUARTER SECTION LINE
- 1/16 SECTION LINE
- CENTERLINE OF ABANDONED RAILROAD
- OKANOGAN COUNTY ROAD NO. 9425
- ELEVATION CONTOUR, 10 FOOT INTERVAL

BASIS OF BEARINGS

WASHINGTON STATE PLANE COORDINATE SYSTEM, NORTH ZONE, NAD 83/2007 ADJUSTMENT; DERIVED FROM GPS OBSERVATIONS.

VERTICAL DATUM

ELEVATIONS ARE BASED ON THE NORTH AMERICAN VERTICAL DATUM, 1988 ADJUSTMENT (NAVD 88).

PROJECT BOUNDARY DESCRIPTION

THE PROJECT BOUNDARY IS THE 1057.7 CONTOUR LINE BASED ON THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD 88). THIS IS DERIVED BY A DIRECT COMPARISON OF THE DAM CREST ELEVATION AS SHOWN ON THE 1953 EXHIBIT K DRAWINGS AND THE DAM CREST ELEVATION AS PER THE NAVD 88 DATUM THAT THESE EXHIBIT G DRAWINGS ARE BASED ON AS ILLUSTRATED IN THE FOLLOWING TABLE:

DATE	DATUM	DAM CREST ELEVATION	PROJECT BOUNDARY CONTOUR
1953	UNKNOWN	1044.0'	1055.0'
2013	NAVD 88	1046.7'	1057.7'

PROJECT BOUNDARY ACREAGE

TOTAL LAND WITHIN PROJECT BOUNDARY:	152.31 ACRES
PUBLIC LAND (BLM) WITHIN PROJECT BOUNDARY:	56.62 ACRES

NOTE: WITHIN THE PROJECT BOUNDARY, ALL LAND ABOVE THE ORDINARY HIGH WATER MARK (OHWM) IS BLM, EXCEPT AS SHOWN WITHIN SECTION 11, T40N R26E, W.M., (SHEET 5) AND WITHIN SECTION 33, T40N R27E, W.M. (SHEET 6).

TOTAL PRIVATE LAND WITHIN PROJECT BOUNDARY:	3.18 ACRES

Public Utility District No. 1 of Okanogan County
Enloe Hydroelectric Project
FERC No. 12569

Exhibit G
Sheet G-1

SCALE 1"=100'
0 50 100 200

TRUE NORTH
MAGNETIC
16°2'

TIMOTHY R. POCHA
STATE OF WASHINGTON
33096
REGISTERED
PROFESSIONAL LAND SURVEYOR
DATE SIGNED 9-30-13

NW Land Surveying, LLC
SURVEYING * PLANNING

1105 KOALA DRIVE
OMAK, WA
(509) 826-1763

DRAWN BY:	TRP	SCALE:	1" = 2000'
DATE:	09-24-2013	JOB NO:	11069
DWG NAME:	EXHIBIT G V1.DWG		

B.L.M.

GOV'T LOT 4

GOV'T LOT 5

GOV'T LOT 6

GOV'T LOT 7

LOOMIS - ORVILLE ROAD (O.C.R. NO. 9425)

N: 720810.43
E: 1961138.15

N: 720129.97
E: 1,961,862.61

S 76°37'09" W
1375.07'

N 10°53'25" W
301.84'

N 18°38'11" W
272.58'

N 12°11'43" E
84.49'

N 38°48'34" E
9.37'

N 38°36'15" E
30.03'

N 38°36'15" E
30.03'

N 81°30'35" E
90.78'

N: 22°14'55" E
58.66'

N 02°07'14" E
81.54'

N 18°59'03" W
181.50'

N 12°50'29" E
109.05'

N: 720000.00
E: 1960000.00

N: 719000.00
E: 1960000.00

N: 719000.00
E: 1961600.00

LOG BOOM

PROJECT BOUNDARY
1057.7' CONTOUR

ENLOE DAM

PROPOSED PENSTOCKS

PROPOSED POWERHOUSE

EXISTING PENSTOCKS

TAILRACE

UPGRADED ROAD

NEW ROAD

℄ ABANDONED RAILROAD

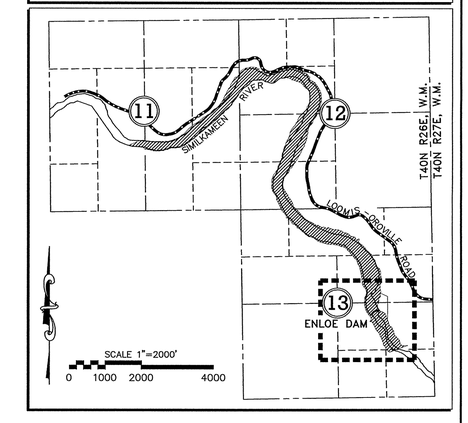
50'

OLD POWERHOUSE

EDGE OF WATER FROM OKANOGAN COUNTY G.I.S.

END OF PROJECT BOUNDARY

VICINITY MAP



ACCESS ROAD CENTERLINE DATA

BEARING TABLE

LINE NO.	BEARING	DISTANCE
L1	S 18°03'36" E	139.40'
L2	S 11°10'00" E	101.92'
L3	S 01°17'04" E	118.42'
L4	S 36°43'08" E	151.27'
L5	N 16°00'23" W	118.03'
L6	N 04°59'12" W	29.52'
L7	N 23°02'01" E	81.84'
L8	N 31°19'39" E	184.63'
L9	N 08°43'02" W	89.57'
L10	N 52°04'03" E	12.16'

CURVE TABLE

NO.	RADIUS	ARC LENGTH	CENTRAL ANGLE	CHORD BEARING	CHORD LENGTH
C2	185.00'	50.14'	15°31'41"	S 25°49'27" E	49.98'
C3	200.00'	24.06'	6°53'36"	S 14°36'48" E	24.05'
C4	200.00'	34.50'	9°52'56"	S 06°13'32" E	34.45'
C5	200.00'	123.69'	35°26'04"	S 19°00'06" E	121.73'
C6	37.00'	102.86'	159°17'14"	N 63°38'14" E	72.79'
C7	300.00'	180.31'	34°26'13"	N 01°12'44" E	177.61'
C8	300.00'	122.61'	23°25'02"	N 06°43'19" E	121.76'
C9	400.00'	195.62'	28°01'13"	N 09°01'25" E	193.67'
C10	500.00'	72.38'	8°17'38"	N 27°10'50" E	72.31'
C11	200.00'	139.78'	40°02'40"	N 11°18'19" E	136.95'
C12	50.00'	53.04'	60°47'05"	N 21°40'31" E	50.59'

LEGEND

- FOUND MONUMENT AS NOTED
- FOUND REBAR AS NOTED
- CALCULATED POINT ONLY, NOTHING FOUND OR SET
- SET 5/8" X 24" REBAR & CAP, L.S. 33096
- ( ) RECORD DEED DATA
- [ ] RECORD G.L.O. DATA
- FERC PROJECT BOUNDARY
- SECTION LINE
- QUARTER SECTION LINE
- 1/16 SECTION LINE
- CENTERLINE OF ABANDONED RAILROAD
- OKANOGAN COUNTY ROAD NO. 9425
- ELEVATION CONTOUR, 10 FOOT INTERVAL

BASIS OF BEARINGS

WASHINGTON STATE PLANE COORDINATE SYSTEM, NORTH ZONE, NAD 83/2007 ADJUSTMENT; DERIVED FROM GPS OBSERVATIONS.

VERTICAL DATUM

ELEVATIONS ARE BASED ON THE NORTH AMERICAN VERTICAL DATUM, 1988 ADJUSTMENT (NAVD 88).

Public Utility District No. 1 of Okanogan County
Enloe Hydroelectric Project
FERC No. 12569

Exhibit G
Sheet G-2

SCALE 1"=100'
0 50 100 200

TRUE NORTH
MAGNETIC 16°2'

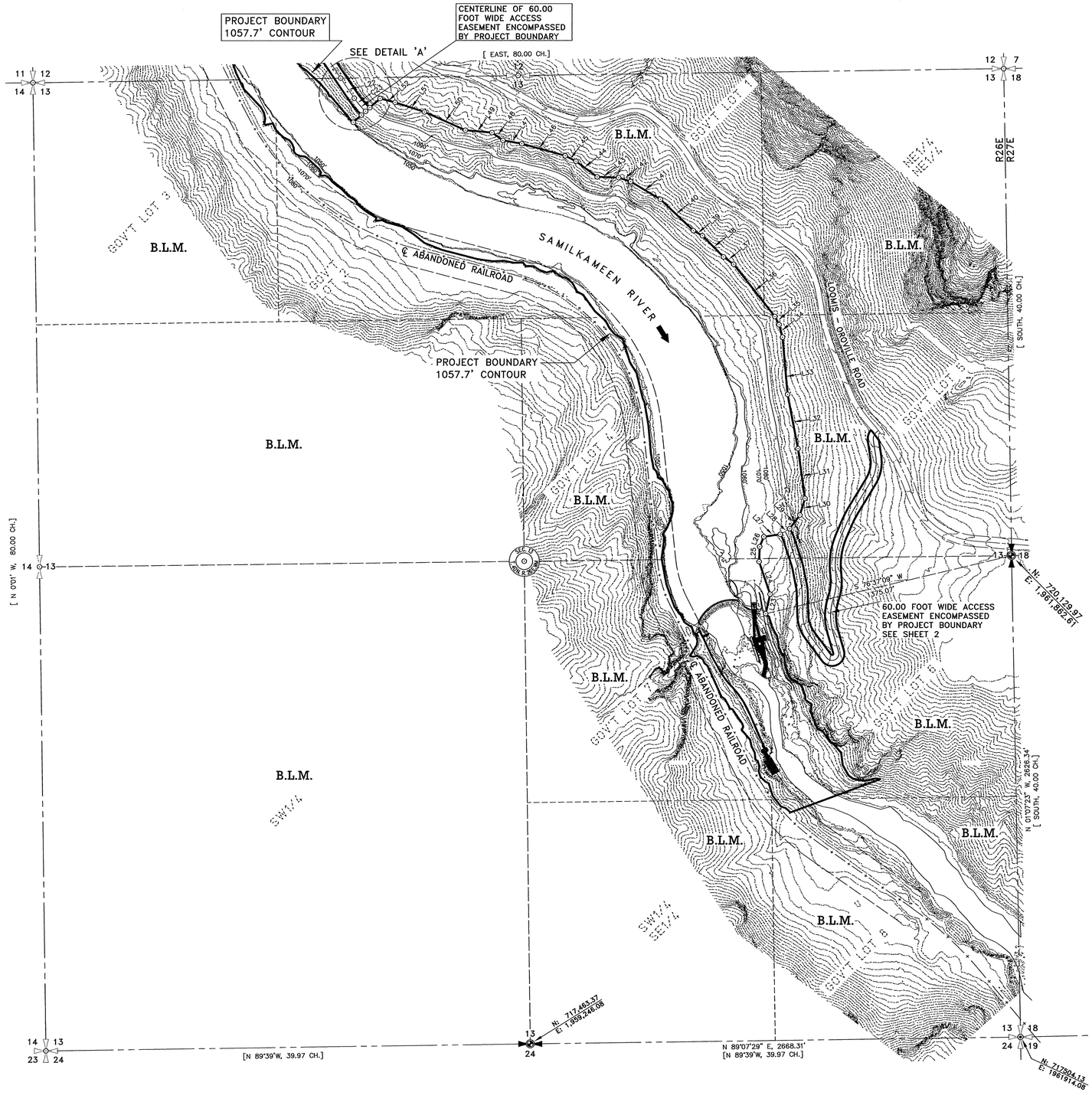
TIMOTHY R. PORTA
STATE OF WASHINGTON
33096
REGISTERED
PROFESSIONAL LAND SURVEYOR

DATE SIGNED 9-30-13

NW Land Surveying, LLC
SURVEYING * PLANNING

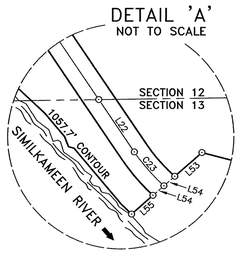
1105 KOALA DRIVE
OMAK, WA
(509) 826-1763

DRAWN BY:	TRP	SCALE:	1" = 100'
DATE:	09-24-2013	JOB NO:	11069
DWG NAME:	EXHIBIT G V1.DWG		

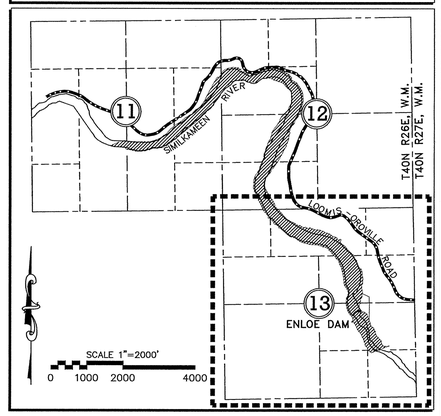


DETAIL 'A'

NOT TO SCALE



VICINITY MAP



BEARING TABLE

LINE NO.	BEARING	DISTANCE
L22	S 34°06'38" E	131.86'
L23	N 12°50'29" E	109.05'
L24	N 18°39'05" W	187.50'
L25	N 02°07'14" E	81.54'
L26	N 22°14'55" E	58.68'
L27	N 81°30'35" E	90.78'
L28	N 58°36'15" E	60.05'
L29	N 36°48'30" E	92.37'
L30	N 17°11'43" E	94.42'
L31	N 08°06'11" W	273.38'
L32	N 10°53'25" W	301.64'
L33	N 05°09'09" W	313.25'
L34	N 15°29'23" W	70.52'
L35	N 27°12'28" W	50.10'
L36	N 38°22'43" W	361.69'
L37	N 54°12'46" W	68.33'
L38	N 44°50'17" W	162.98'
L39	N 60°35'45" W	56.73'
L40	N 46°28'59" W	247.84'
L41	N 58°53'43" W	189.14'
L42	N 72°14'22" W	68.84'
L43	N 88°06'53" W	116.64'
L44	N 53°48'21" W	143.39'
L45	N 62°42'58" W	66.12'
L46	N 74°33'35" W	245.02'
L47	N 79°44'40" W	104.68'
L48	N 54°41'03" W	72.96'
L49	N 84°59'21" W	144.87'
L50	N 66°04'23" W	244.84'
L51	N 72°04'52" W	167.29'
L52	N 75°22'40" W	84.66'
L53	S 48°26'53" W	75.34'
L54	S 48°26'53" W	30.17'
L55	S 48°26'53" W	59.32'

LEGEND

- FOUND MONUMENT AS NOTED
- FOUND REBAR AS NOTED
- CALCULATED POINT ONLY, NOTHING FOUND OR SET
- SET 5/8" X 24" REBAR & CAP, L.S. 33096
- ( ) RECORD DEED DATA
- [ ] RECORD G.L.O. DATA
- FERC PROJECT BOUNDARY
- SECTION LINE
- QUARTER SECTION LINE
- 1/16 SECTION LINE
- CENTERLINE OF ABANDONED RAILROAD
- OKANOGAN COUNTY ROAD NO. 9425
- ELEVATION CONTOUR, 10 FOOT INTERVAL

BASIS OF BEARINGS

WASHINGTON STATE PLANE COORDINATE SYSTEM, NORTH ZONE, NAD 83/2007 ADJUSTMENT; DERIVED FROM GPS OBSERVATIONS.

VERTICAL DATUM

ELEVATIONS ARE BASED ON THE NORTH AMERICAN VERTICAL DATUM, 1988 ADJUSTMENT (NAVD 88).

Public Utility District No. 1 of Okanogan County
Enloe Hydroelectric Project
FERC No. 12569

Exhibit G
Sheet G-3

SCALE 1"=300'
0 150 300 600

TRUE NORTH
MAGNETIC 16°2'

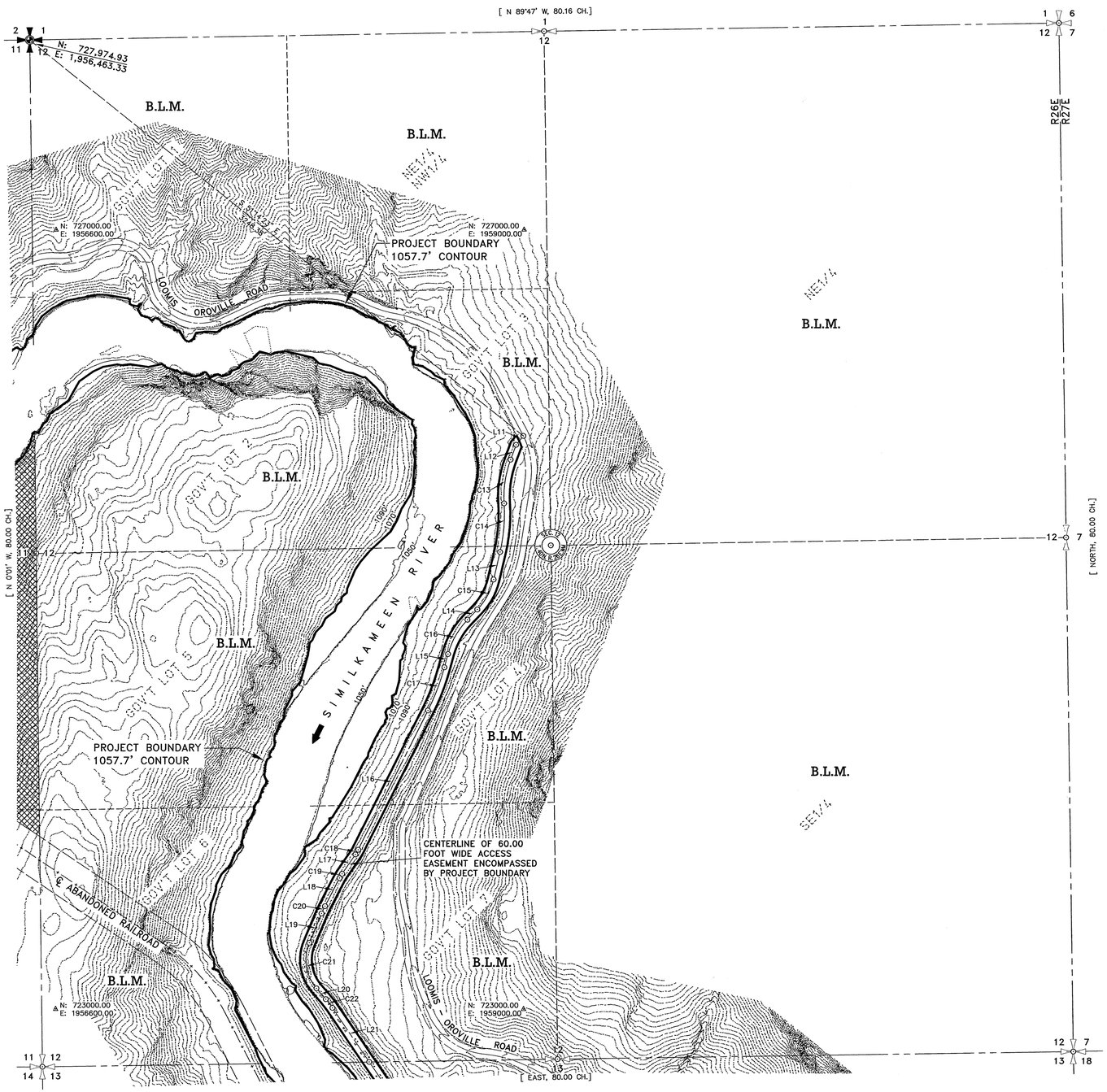
TIMOTHY R. PACHA
STATE OF WASHINGTON
S-33096
REGISTERED PROFESSIONAL LAND SURVEYOR

DATE SIGNED 9-30-13

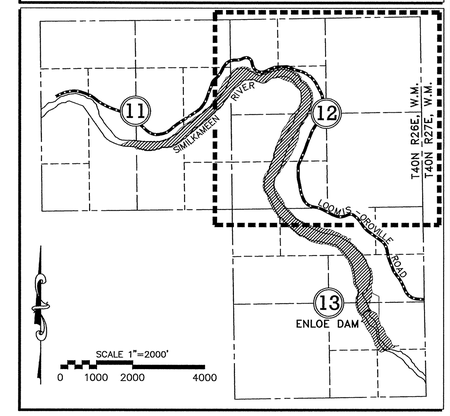
NCW Land Surveying, LLC
SURVEYING * PLANNING

1105 KOALA DRIVE
OMAK, WA
(509) 826-1763

DRAWN BY:	TRP	SCALE:	1" = 300'
DATE:	09-24-2013	JOB NO:	11069
DWG NAME:	EXHIBIT G V1.DWG		



VICINITY MAP



ACCESS ROAD CENTERLINE DATA

BEARING TABLE

LINE NO.	BEARING	DISTANCE
L11	S 39°30'24" W	58.99'
L12	S 20°22'37" W	80.78'
L13	S 13°01'17" W	145.02'
L14	S 43°40'45" W	73.15'
L15	S 15°14'37" W	70.24'
L16	S 26°31'11" W	799.60'
L17	S 34°34'40" W	120.46'
L18	S 27°22'33" W	162.02'
L19	S 22°37'08" W	162.75'
L20	S 40°34'40" E	72.94'
L21	S 34°06'38" E	336.75'

CURVE TABLE

NO.	RADIUS	ARC LENGTH	CENTRAL ANGLE	CHORD BEARING	CHORD LENGTH
C13	545.00'	227.65'	23°55'59"	S 08°24'38" W	226.00'
C14	870.00'	251.71'	16°34'38"	S 04°43'58" W	250.84'
C15	332.00'	177.65'	30°39'29"	S 28°21'01" W	175.54'
C16	413.00'	204.97'	28°26'08"	S 29°27'41" W	202.87'
C17	1200.00'	236.17'	11°16'34"	S 20°52'54" W	235.78'
C18	200.00'	28.13'	8°03'29"	S 30°32'55" W	28.10'
C19	200.00'	25.14'	7°12'07"	S 30°58'36" W	25.12'
C20	500.00'	41.51'	4°45'25"	S 24°59'50" W	41.50'
C21	226.00'	249.28'	63°11'48"	S 08°58'46" E	236.83'
C22	500.00'	56.44'	6°28'02"	S 37°20'39" E	56.41'
C23	400.00'	94.23'	13°29'50"	S 40°51'33" E	94.01'

LEGEND

- FOUND MONUMENT AS NOTED
- FOUND REBAR AS NOTED
- CALCULATED POINT ONLY, NOTHING FOUND OR SET
- SET 5/8" X 24" REBAR & CAP, L.S. 33096
- ( ) RECORD DEED DATA
- [ ] RECORD G.L.O. DATA
- FERC PROJECT BOUNDARY
- SECTION LINE
- QUARTER SECTION LINE
- 1/16 SECTION LINE
- CENTERLINE OF ABANDONED RAILROAD
- OKANOGAN COUNTY ROAD NO. 9425
- ELEVATION CONTOUR, 10 FOOT INTERVAL

BASIS OF BEARINGS

WASHINGTON STATE PLANE COORDINATE SYSTEM, NORTH ZONE, NAD 83/2007 ADJUSTMENT; DERIVED FROM GPS OBSERVATIONS.

VERTICAL DATUM

ELEVATIONS ARE BASED ON THE NORTH AMERICAN VERTICAL DATUM, 1988 ADJUSTMENT (NAVD 88).

Public Utility District No. 1 of Okanogan County
Enloe Hydroelectric Project
FERC No. 12569

Exhibit G
Sheet G-4

SCALE 1"=300'
0 150 300 600

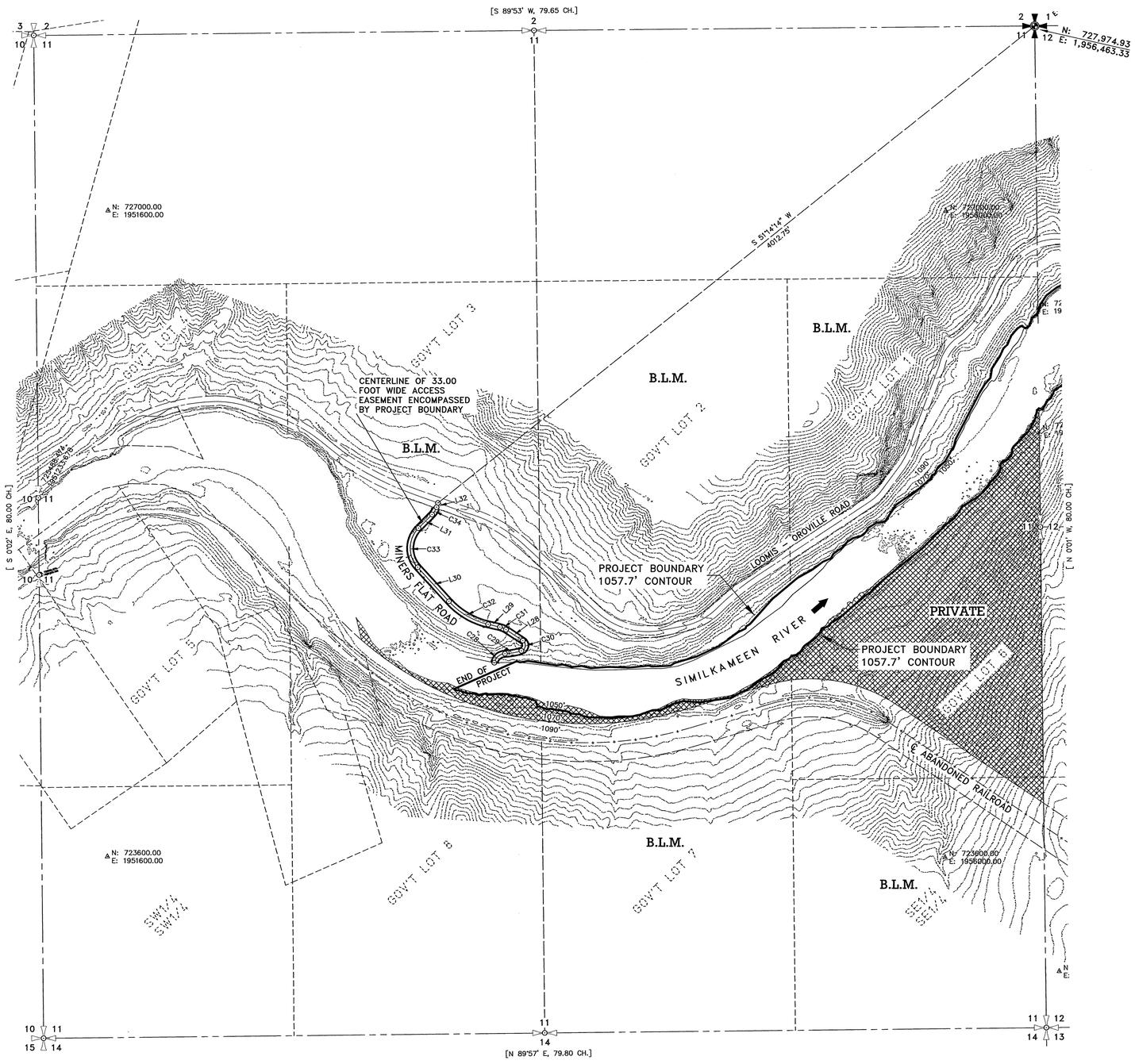
TRUE NORTH
MAGNETIC
16°2'

DATE SIGNED 9-30-13

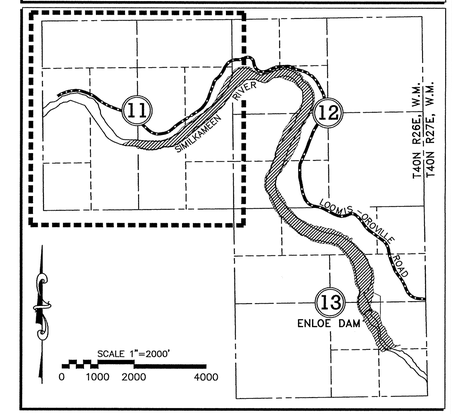
NW Land Surveying, LLC
SURVEYING * PLANNING

1105 KOALA DRIVE
OMAK, WA
(509) 826-1763

DRAWN BY:	TRP	SCALE:	1" = 300'
DATE:	09-24-2013	JOB NO:	11069
DWG NAME:	EXHIBIT G V1.DWG		



VICINITY MAP



ACCESS ROAD CENTERLINE DATA

BEARING TABLE

LINE NO.	BEARING	DISTANCE
L28	N 57°02'11" W	105.19'
L29	N 77°07'26" W	63.24'
L30	N 42°24'40" W	243.18'
L31	N 44°32'44" E	101.53'
L32	N 18°41'20" E	24.02'

CURVE TABLE

NO.	RADIUS	ARC LENGTH	CENTRAL ANGLE	CHORD BEARING	CHORD LENGTH
C28	60.00'	79.13'	75°33'50"	N 49°46'47" E	73.52'
C29	332.61'	87.84'	15°07'56"	N 79°59'44" E	87.59'
C30	30.00'	67.79'	129°27'57"	N 07°41'48" E	54.26'
C31	100.00'	35.06'	20°05'15"	N 67°04'48" W	34.88'
C32	400.00'	242.34'	34°42'46"	N 59°46'03" W	238.65'
C33	150.00'	227.65'	86°57'24"	N 01°04'02" E	206.42'
C34	100.00'	45.13'	25°51'24"	N 31°37'02" E	44.75'

LEGEND

- FOUND MONUMENT AS NOTED
- FOUND REBAR AS NOTED
- CALCULATED POINT ONLY, NOTHING FOUND OR SET
- SET 5/8" X 24" REBAR & CAP, L.S. 33096
- ( ) RECORD DEED DATA
- [ ] RECORD G.L.O. DATA
- FERC PROJECT BOUNDARY
- SECTION LINE
- QUARTER SECTION LINE
- 1/16 SECTION LINE
- CENTERLINE OF ABANDONED RAILROAD
- OKANOGAN COUNTY ROAD NO. 9425
- ELEVATION CONTOUR, 10 FOOT INTERVAL

BASIS OF BEARINGS

WASHINGTON STATE PLANE COORDINATE SYSTEM, NORTH ZONE, NAD 83/2007 ADJUSTMENT; DERIVED FROM GPS OBSERVATIONS.

VERTICAL DATUM

ELEVATIONS ARE BASED ON THE NORTH AMERICAN VERTICAL DATUM, 1988 ADJUSTMENT (NAVD 88).

Public Utility District No. 1 of Okanogan County
Enloe Hydroelectric Project
FERC No. 12569

Exhibit G
Sheet G-5

SCALE 1"=300'
0 150 300 600

TRUE NORTH
MAGNETIC 16°21'

TIMOTHY R. PASCHA
STATE OF WASHINGTON
33096
REGISTERED
PROFESSIONAL LAND SURVEYOR

DATE SIGNED 9-30-13

NW Land Surveying, LLC
SURVEYING * PLANNING

1105 KOALA DRIVE
OMAK, WA
(509) 826-1763

DRAWN BY:	TRP	SCALE:	1" = 300'
DATE:	09-24-2013	JOB NO:	11069
DWG NAME:	EXHIBIT G V1.DWG		

29 28
32 33
N: 707,149.46
E: 1,972,745.20

N 88°45'08" E
5194.38'

28 27
33 34
N: 707,262.57
E: 1,977,938.34

OROVILLE

5TH

4TH

3RD

2ND

JUNIPER

IRONWOOD

MAIN

GOLDEN

FIR

ELM

DOGWOOD

STATE ROUTE 97

N: 706000.00
E: 1975000.00

N: 706000.00
E: 1977300.00

S 37°37'41" W
3388.24'

JACKSON STREET

SIMILKAMEEN RIVER

TOP OF DIKE

PARCEL NO. 9940273384
DAVID & RUTH ALLEN
(PRIVATE)

PARCEL NO. 9940273370
DONALD & MARY CURTIS
(PRIVATE)

EDGE OF WATER
FROM OKANOGAN
COUNTY G.I.S. DATA

TOP OF DIKE

CENTERLINE OF 100.00 FOOT WIDE SIDE
CHANNEL ENHANCEMENT EASEMENT
ENCOMPASSED BY PROJECT BOUNDARY

S 13°44'22" E
250.27'

S 40°09'14" E
85.79'

S 86°44'02" E
158.60'

S 71°54'28" E
112.81'

50.00'

S 43°48'01" E
212.44'

S 56°49'21" E
116.78'

N 80°16'32" E
77.53'

N: 703600.00
E: 1975000.00

N: 703600.00
E: 1977300.00

LEGEND

- FOUND MONUMENT AS NOTED
- FOUND REBAR AS NOTED
- CALCULATED POINT ONLY, NOTHING FOUND OR SET
- SET 5/8" X 24" REBAR & CAP, L.S. 33096
- ( ) RECORD DEED DATA
- [ ] RECORD G.L.O. DATA
- FERC PROJECT BOUNDARY
- SECTION LINE
- QUARTER SECTION LINE
- 1/16 SECTION LINE
- CENTERLINE OF ABANDONED RAILROAD
- OKANOGAN COUNTY ROAD NO. 9425
- ELEVATION CONTOUR, 10 FOOT INTERVAL

BASIS OF BEARINGS

WASHINGTON STATE PLANE COORDINATE SYSTEM, NORTH ZONE, NAD 83/2007 ADJUSTMENT; DERIVED FROM GPS OBSERVATIONS.

VERTICAL DATUM

ELEVATIONS ARE BASED ON THE NORTH AMERICAN VERTICAL DATUM, 1988 ADJUSTMENT (NAVD 88).

Public Utility District No. 1 of Okanogan County
Enloe Hydroelectric Project
FERC No. 12569

Exhibit G
Sheet G-6

SCALE 1"=200'
0 100 200 400

TRUE NORTH
MAGNETIC 16°2'

TIMOTHY R. POLETA
STATE OF WASHINGTON
33096
REGISTERED
PROFESSIONAL LAND SURVEYOR

DATE SIGNED 9-30-13

NW Land Surveying, LLC
SURVEYING * PLANNING

1105 KOALA DRIVE
OMAK, WA
(509) 826-1763

DRAWN BY:	TRP	SCALE:	1" = 200'
DATE:	09-24-2013	JOB NO:	11069
DWG NAME:	EXHIBIT G V1.DWG		