NPS Form 10-900
(Rev. 8-86)

OMB No. 1024-0018

498

MAY 18 1989

NATIONAL REGISTER

United States Department of the Interior
National Park Service

National Register of Historic Places Registration Form

This form is for use in nominating or requesting determinations of eligibility for individual properties or districts. See instructions in *Guidelines for Completing National Register Forms* (National Register Bulletin 16). Complete each item by marking "x" in the appropriate box or by entering the requested information. If an item does not apply to the property being documented, enter "N/A" for "not applicable." For functions, styles, materials, and areas of significance, enter only the categories and subcategories listed in the instructions. For additional space use continuation sheets (Form 10-900a). Type all entries.

1. Name of Property

historic name: Diablo Hydroelectric Power Plant
other names/site number: N/A

2. Location

street & number: N/A — [ ] not for publication
city, town: Newhalem — [x] vicinity
state: Washington — code: WA — county: Whatcom — code: 073 — zip code: 98227

3. Classification

Ownership of Property
- [ ] private
- [x] public-local
- [ ] public-State
- [ ] public-Federal

Category of Property
- [ ] building(s)
- [x] district
- [ ] site
- [ ] structure
- [ ] object

Number of Resources within Property

Contributing	Noncontributing	
1		buildings
		sites
8		structures
		objects
9	0	Total

Name of related multiple property listing:
Hydroelectric Power Plants in Washingotn State

Number of contributing resources previously listed in the National Register: 0

4. State/Federal Agency Certification

As the designated authority under the National Historic Preservation Act of 1966, as amended, I hereby certify that this [x] nomination [ ] request for determination of eligibility meets the documentation standards for registering properties in the National Register of Historic Places and meets the procedural and professional requirements set forth in 36 CFR Part 60. In my opinion, the property [x] meets [ ] does not meet the National Register criteria. [ ] See continuation sheet.

Signature of certifying official — Date: April 19, 1989

Washington State Office of Archaeology and Historic Preservation
State or Federal agency and bureau

In my opinion, the property [ ] meets [ ] does not meet the National Register criteria. [ ] See continuation sheet.

Signature of commenting or other official — Date

State or Federal agency and bureau

5. National Park Service Certification

I, hereby, certify that this property is:
- [x] entered in the National Register. [ ] See continuation sheet.
- [ ] determined eligible for the National Register. [ ] See continuation sheet.
- [ ] determined not eligible for the National Register.
- [ ] removed from the National Register.
- [ ] other, (explain:)

Signature of the Keeper — Date of Action: 6/30/89

6. Function or Use

Historic Functions (enter categories from instructions)	Current Functions (enter categories from instructions)
INDUSTRY/energy facility	INDUSTRY/energy facility

7. Description

Architectural Classification (enter categories from instructions)

Other/concrete arch dam
Other/industrial vernacular

Materials (enter categories from instructions)

foundation concrete
walls concrete
roof concrete
other

Describe present and historic physical appearance.

The Diablo Hydroelectric Power Plant is located in a narrow, deep canyon on the Skagit River, and is characterized by a massive concrete arch dam, a 200 foot long power tunnel, and a reinforced concrete powerhouse. The constituent elements are described below:

HEADWORKS: (Contributing)

Dam(1929): Concrete arch, 389 feet high, 1,180 feet long at crest, 146 feet thick at the base. Volume of concrete in dam: 35,000 cubic yards. Impounds 50,000 acre-feet of usable storage (although since completion of Ross Dam, the storage is no longer used). Dam constructed by Winston Brothers Construction Company of Minneapolis.

Spillway (1929): Consists of 20 tainter gates, 20 feet wide, sills 18 feet below high water. The 20 gates will discharge 102,000 c.f.s. Designed to carry flood waters, ranging from a normal flow of 30,000 c.f.s. to the maximum flood of 100,000 c.f.s.

Slab Bridge (1929): reinforced concrete slab bridge connects the piers between the spillway gate openings, and carries tracks for a travelling gate-hoist which operates the tainter gates. Because the slab bridge had to be above the "open" position of the tainter gates, the roadway across the arched portion of the dam had to be carried 13 feet above the dam crest. Sixteen reinforced concrete arches support the roadway along the length of the arch dam, linking the roadways across the spillway. The arches have a clear span of 32 feet, and a clear width of 17 feet. The roadway is adorned with reinforced concrete parapets and lanterns supported by reinforced concrete posts.

Outlet pipes: (1929): eight feet in diameter with full reservoir; will discharge 9,300 c.f.s.; pipes constructed of riveted steel.

Outlet valves (1929): pipes provided with eight by ten foot Philips and Davies caterpillar type sluice gates at the upstream end, and one set behind a trash rack 13 feet wide and extending up to the crest of the dam. One of the outlet pipes is provided with a 96 by 72 inch Larner-Johnson (Pelton) regulator valve at the discharge end.

Reinforced concrete valve house (1929): regulator valve and three butterfly valves are housed in a reinforced concrete valve house, supported on five concrete brackets built into the downstream face of the dam. On the upper floor are operating stands and gears for controlling the discharge valves. A steel staircase connects the valve-house with the crest of the dam.

[x] See continuation sheet

WATER CONVEYANCE SYSTEM: (Contributing)

Power Tunnel (1931): Nineteen and one-half foot diameter, 1,990 foot long power tunnel, driven through solid granite. First 1,800 feet are concrete lined; the last 190 feet are steel lined. Completed by Rumsey and Jordan Company of Seattle.

Intake Tower (1931):

Surge Tank (1931): Differential type, located at the steel-lined portion of the tunnel.

Penstocks (1931): Tunnel feeds into two 290 foot long, 15 foot diameter concrete encased steel penstocks built by Rumsey and Jordan Company of Seattle.

POWERHOUSE AND EQUIPMENT: (Contributing)

Powerhouse (1936): one-story reinforced concrete structure on concrete foundations. Sixty-eight by 225 feet in plan, 60 feet high from floor to parapet. Roof is reinforced concrete slab, supported by steel roof trusses and I-beam purlins. Reinforced concrete beams and columns support a 300 ton capacity crane. Exterior of building ornamented with parapet, long narrow sash windows, piers. Northwest portion of structure is covered with siding. Tile floor in interior with decorative pattern.

Turbines: main units include two 171.5 r.p.m., 90,700 hp, nameplate rating. House units: two 2200 hp, 720 r.p.m. Turbines and governors manufactured by S. Morgan Smith Company. Modernized in 1958; resulted in output of 108,500 hp from each unit.

Generators: two main units: each 66,700 KVA, 13, 800 volts, 2,790 amperes, 0.3 fp., three phase nameplate rating. Generators manufactured by Westinghouse Electric.

Transformers: main units consist of two banks, each composed of three 22,250 KVA single phase transformers, with one spare 22,250 KVA unit for the two banks; 13,200 to 230,000 volts with two-and-one-half percent taps above and below 230,000 volts. Transformers manufactured by Westinghouse Electric Company. House units feed directly into 2,500 volt station service bus, which is connected through a bank of three 100 KVA transformers to a 26,000 volt tie line to the Ross Plant.

Tailrace (1936): reinforced concrete, adjacent to the powerhouse on the west side; unique structure which also serves as a support for transformers, switching apparatus, and a crossing for the single-track railroad. Rectangular shape, total inside width measures 106 feet, and inside length 158 feet. Consists of a 24 inch thick sloping concrete bottom slab, vertical side walls 24 inches thick, and a beam and slab deck supported by sidewalls and columns located along the center line of the tailrace. Concrete columns on footings 10 feet by 10 feet in area, with depth varying eight to 10 feet.

Funicular Railway: climbs 68 percent grade for 600 feet; originally connected the main line project railroad with high-level trackage leading to the cement shed and aggregate bunkers. Funicular railway has a vertical rise of 313 feet and a capacity load of 158,000 pounds. A 400 hp electric motor was used to lift the carriage, which required six minutes.

List of Resources:

Contributing Building:
- Powerhouse

Contributing Structures:
- Dam (including spillway, slab bridge, outlet pipes, outlet valves, valve house)
- Power Tunnel
- Intake Tower
- Surge Tank
- Penstocks (2)
- Tailrace
- Funicular Railway

8. Statement of Significance

Certifying official has considered the significance of this property in relation to other properties:

☐ nationally ☒ statewide ☐ locally

Applicable National Register Criteria ☒ A ☐ B ☒ C ☐ D

Criteria Considerations (Exceptions) ☐ A ☐ B ☐ C ☐ D ☐ E ☐ F ☐ G

Areas of Significance (enter categories from instructions)
Engineering
Industry

Period of Significance
1927-1939

Significant Dates
1936 (operations began)

Cultural Affiliation
N/A

Significant Person
N/A

Architect/Builder Dam: Constant Angle Arch Dam Co. & Winston Brothers; Conveyance System: Rumsey & Jordan

State significance of property, and justify criteria, criteria considerations, and areas and periods of significance noted above.

The Diablo Hydroelectric Power Plant is a historically significant example of hydroelectrical technology from the 1930s, and an important component of the Seattle municipal power system. Situated in a rugged wilderness that demanded an elaborate transportation network across steep terrain, the construction of the facility was a major engineering feat. When completed, it was a landmark among hydroelectric plants: the penstocks were reported to be of unprecedented size; the 90,000 hp turbines were hailed as largest in existence; the concrete dam was the highest ever built. The plant meets the registration requirements established in the Hydroelectric Power Plants in Washington State multiple property documentation form.

Historical Background: In 1927, work finally began on the second phase of the massive Skagit River power development of the Seattle City Light system. The capacity of the 60,000 KVA Gorge Powerhouse seemed enormous when it was completed in 1924. But it was soon clear that it could not meet the mounting power loads of the city.

Because water was diverted by a low timber crib dam at Gorge Creek, the Gorge Powerhouse depended solely upon the river flow for power generation. But the flow of the Skagit River fluctuated widely, and during the winter months could slow to a trickle. In addition, the uneven flow caused problems of surge in the two mile long tunnel. Construction of the Diablo dam six miles above the Gorge plant was planned to supply water to operate an additional powerhouse and to furnish 90,000 acre feet of storage to regulate water flow to the Gorge plant and keep it operating at capacity.[1]

The site chosen for the Diablo project was located in a deep and narrow canyon where vertical granite walls rise 400 feet above the stream bed. The engineers designed a spectacular concrete arch, 389 feet high and 1,180 feet long at the crest.[2] According to Carl Condit, concrete arch dams became the standard for dams located in canyons in which the rock of the side walls was sufficiently dense to withstand the tremendous lateral trust of the arched mass of concrete.[3] Moreover, Henry Landes, a University of Washington professor, noted that the bedrock at the Diablo dam site is "of such a character that it will withstand all compressive stress which any concrete dam might impose on it...The chemical nature and state of aggregation of the constituent minerals of the rock are such as to prevent solution by water, even under pressure. The rock may be considered impervious."[4]

☒ See continuation sheet

9. Major Bibliographical References

"The Diablo Dam," Western Construction News, August 25, 1927.
"The Diablo Dam," Western Construction News, May 25, 1929.
"Plans for Completion of Diablo Power Plant," Western Construction News, September 1934.

☐ See continuation sheet

Previous documentation on file (NPS):
☐ preliminary determination of individual listing (36 CFR 67) has been requested
☐ previously listed in the National Register
☐ previously determined eligible by the National Register
☐ designated a National Historic Landmark
☐ recorded by Historic American Buildings Survey # ____
☐ recorded by Historic American Engineering Record # ____

Primary location of additional data:
☐ State historic preservation office
☐ Other State agency
☐ Federal agency
☐ Local government
☐ University
☐ Other
Specify repository: ____

10. Geographical Data

Acreage of property 52
Quadrangle Name: Diablo Dam Quadrangle Scale: 1:24000

UTM References

	Zone	Easting	Northing		Zone	Easting	Northing
A	1 0	6 3 7 5 9 0	5 3 9 7 4 0 0	B	1 0	6 3 7 5 8 0	5 3 9 6 9 6 0
C	1 0	6 3 7 3 8 0	5 3 9 7 0 0 0	D	1 0	6 3 7 4 3 0	5 3 9 7 1 3 0
E	1 0	6 3 6 9 2 0	5 3 9 7 1 7 0	F	1 0	6 3 6 7 0 0	5 3 9 7 4 2 0

☐ See continuation sheet

Verbal Boundary Description

The boundary of the nominated property is delineated by the polygon whose vertices are marked by the following UTM points (as indicated on the attached USGS map): A 10 637590 5397400, B 10 637580 5396960, C 10 637380 5397000, D 10 637430 5397130, E 10 636920 5397170, F 10 636700 5397420.

☐ See continuation sheet

Boundary Justification

The nominated property includes the headworks, water conveyance system, and powerhouse historically associated with the Diablo Hydroelectric Project which reflects the significant engineering achievements of the plant. The associated company town is not included in the nomination, but is a discrete resource that may be eligible for listing in the National Register of Historic Places.

☐ See continuation sheet

11. Form Prepared By

name/title Lisa Soderberg; history edited by Leonard Garfield
organization Office of Archaeology and Historic Pres. date October 23, 1989 (rev. 8/88)
street & number 111 West 21st Avenue, KL-11 telephone (206) 753-4011
city or town Olympia state Washington zip code 98504

At the base of the canyon, the arch abuts rock walls, while the upper 100 feet of the arch abuts concrete gravity sections which also serve as overflow spillways. A project engineer claimed that the dam was designed with the assumption that the arch carried the entire load of the water; the reduction of load due to cantilever or vertical beam action was not considered in the calculations.[5]

As was the practice in the construction of masonry dams, contraction joints spaced 75 feet apart were provided throughout the arch structure. Because the Diablo dam was completed prior to the powerhouse, it was necessary to provide four 8-foot diameter outlets to permit streamflow through the dam to the Gorge plant below. With a full reservoir, the outlet pipes discharged 9,300 c.f.s. The valves for the outlets are located in the reinforced concrete valve house, supported on five reinforced concrete brackets built into the downstream face of the dam.[6]

The construction of the Diablo dam in the wilderness was an important engineering feat. First, a 650 foot long, 20 foot diameter tunnel was driven through the canyon wall in order to divert the river during construction. Two cofferdams were also constructed which included a 250 foot long rock-filled timber diversion dam below the tunnel portal, and a similar structure below the arch dam site. The cofferdams were made water tight by cement grouting and by driving steel sheet piling above the upstream face.[7]

To build the permanent dam, a concrete mixing plant was built, located above the dam on the north side of the gorge adjacent to the arch abutment. From the mixer, the concrete flowed in chutes to the bottom of two centrally located towers. The concrete was then elevated on conveyors and transported to the place of deposit. The aggregate for the concrete was dredged a half-mile below the dam site near the construction camp and powerhouse site. It was loaded into ballast cars and transported 300 feet up a 68 percent incline on a funicular railway. It was then hauled a half-mile upstream and dumped into bins at the mixing plant. The cement, like all other equipment, materials, and supplies, was transported by means of the city's railroad which originated in Rockport at the end of a Great Northern line, and was extended four and one-half miles from the Gorge intake to the Diablo powerhouse site at the base of the funicular railway.[8]

When the dam was completed in 1929, work had not yet begun on the construction of a power house. Funding became more difficult to secure as the Great Depression took hold. For almost four years, work halted. Although the powerhouse foundations were laid in 1931, the John Rumsey Company did not begin building the reinforced concrete structure until 1935. When complete, the system conveyed water to the powerhouse by means of a 1990 foot long concrete and steel lined pressure tunnel, then through a penstock under a head of 327 feet to two 90,000 hp turbines with the highest rating in the world. On October 5, 1936, the Diablo plant transmitted its first current to Seattle.[9]

[1]"The Diablo Dam," Western Construction News, August 25, 1927, p. 52.
[2]Seattle City Light, "Power System Information," 1962, p. 13.
[3]Carl Condit, American Building, (Chicago: The University of Chicago Press, 1982), p. 267.
[4]Western Construction News, May 25, 1929, p. 255.
[5]Ibid., p. 255.
[6]Ibid., p. 258-259.
[7]Ibid., p. 260.

[8]Ibid., p. 260.

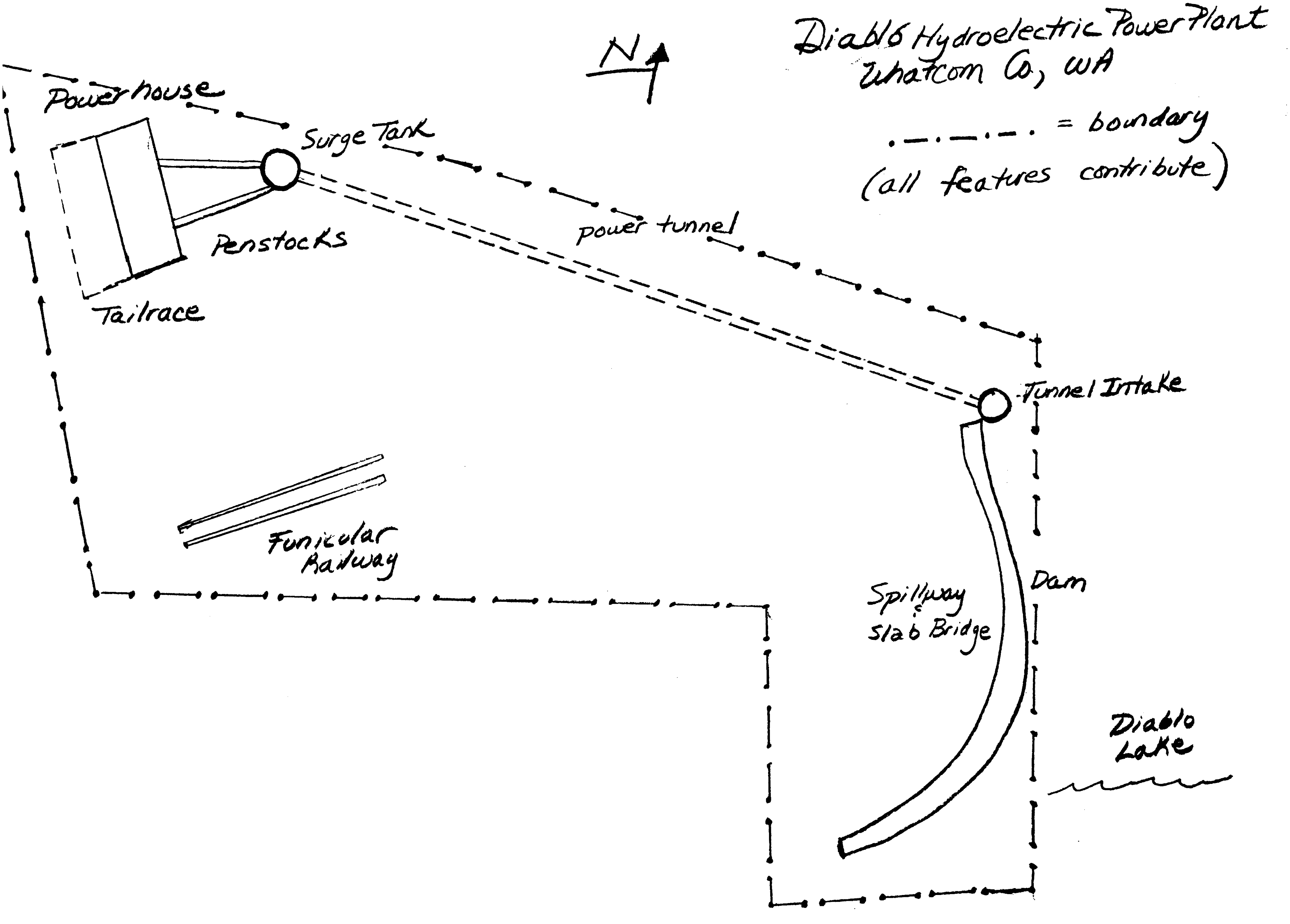
[9]"Plans for Completion of Diablo Power Plant," Western Construction News, September, 1934, p. 295; Seattle City Light, op.cit., p. 13.

United States Department of the Interior
National Park Service

National Register of Historic Places Continuation Sheet

Diablo Hydroelectric Power Plant
Whatcom County, Washington
Photos: Lisa Soderberg, August, 1986
Negatives: Office of Archaeology and Historic Preservation, Olympia, Washington

Photo No.	View
1.	Dam, looking West
2.	Dam, looking North
3.	Roadway, looking N.E.
4.	Dam, looking N.E.
5.	Dam, looking S.W.
6.	Dam, looking S.E.
7.	Dam, looking S.E.
8.	Dam, looking N.E.
9.	Dam, looking S.E.
10.	Dam, looking S.E.
11.	Dam, looking S.E.
12.	Powerhouse, looking North
13.	Powerhouse, looking S.E.
14.	Powerhouse, surge tank, looking North
15.	Powerhouse, interior, looking N.W.
16.	Penstocks, looking N.E.
17.	Surge Tank, looking N.E.
18.	Funicular, looking N.E.
19.	Substation, looking N.W.


Diablo Hydroelectric Power Plant
Whatcom Co, WA
N
= boundary
(all features contribute)
Power house
Surge Tank
Penstocks
Tailrace
power tunnel
Tunnel Intake
Funicular Railway
Spillway & Slab Bridge
Dam
Diablo Lake

NOT TO SCALE