APPENDIX E.4.1

HISTORIC AMERICAN ENGINEERING RECORD ENLOE DAM

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ENLOE DAM	**Historic American Engineering Record – No. WA-6**
Location	On the Similkameen River Oroville vicinity Okanogan County, Washington U.S.G.S. 15 minute Loomis and Oroville, Washington, quadrangles, Universal Transverse Mercator coordinates: 11.N5426390,E316978
Date of Construction	1919-1920
Engineer	C.F. Uhden
Builder	D.J. Broderick
Present Owner	Public Utility District No. 1 of Okanogan County P.O. Box 912 Okanogan, Washington 98840
Present Use	Abandoned
Significance	Enloe Dam represents an early hydroelectric power generation facility in the Okanogan and Sirnilkameen valleys. Mining and irrigated agriculture, both integral to the local economy, were the chief beneficiaries. The facility was listed in the National Register of Historic Places in October 1978.
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Date	December 1990

DESCRIPTION

Located in north-central Washington a few miles south of the Canadian border, Enloe Dam and Powerhouse are situated in a narrow constriction of the Similkameen River Valley. From the deep gorge cut by the river, steep hills covered with rock and sagebrush obscure views of the nearby mountains in the Okanogan Highlands to the east and North Cascades to the west. Below the dam, the Similkameen River tumbles noisily over what remains of Similkameen Falls. Above the dam the impounded river appears motionless over its approximately three-mile-long pool.

Winding steeply downhill from the paved highway above, a rough dirt road provides access to the east bank of the river. On a terrace northeast of the east dam abutment are trees planted in rows where once stood houses occupied by operators of the hydroelectric facility. Stone walls and concrete foundations are all that remain of the razed structures. Downstream below the dam is the intake channel that diverted water to the original powerhouse predating the existing plant. Concrete foundation remains mark the location of the earlier building. Further downstream directly across the river from the existing powerhouse is a steel tower that once anchored a wooden footbridge by which operators reached their workplace from the houses upstream.

The dam itself is a concrete arch-gravity structure containing over 9,700 cubic feet of concrete. Its arching spillway stands approximately 54 feet above the streambed, where its base width is over 41 feet. At the top of the 276-foot-long crest, the concrete is about six feet in width. Upstream the face of the structure is vertical, while the opposite face of the spillway is inclined downstream, with a 20 degree arc at its foot. Wooden flashboards once restrained the now unregulated flow over the spillway. Metal pipes six inches in diameter embedded 1-foot deep in the concrete abutments anchored the flashboards, which were capable of raising the pool level five feet behind the dam.

Atop the right (west) abutment are hoisting devices controlling the sluice gates that provide water to the penstocks. The devices are installed at the downstream end of intake bays and consist of heavy metal gears and threaded stems mounted on concrete footings. The tapered metal housing around the vertical threaded riser stems is stamped with the name of the manufacturer, C.D. Butchart Company of Denver, Colorado. A metal cabinet containing unspecified equipment stands behind the hoisting machinery. Open to the elements, the unroofed area containing the machinery is enclosed on the downstream and riverbank sides by concrete walls standing about 3.5 feet high.

Stamped into the downstream-facing wall on the west abutment is the inscription "Enloe Dam 1920," commemorating the official name of the facility and its date of completion. Below the inscription at the foot of the abutment are steel outlet pipes seven feet in diameter extending 8 feet outward from the concrete. Sluice gates six feet in diameter, manufactured by the Butchart Company, are seated in the abutment behind the pipes. At one time, two 7-foot-diameter wood stave penstocks were connected to the pipes.

(One of the penstocks has since been removed.) Mounted on timber supports, in places atop riprap fill, the remaining penstock extends 743 feet downstream to two elevated surge tanks. Designed to absorb surges of water through the system, the metal tanks stand directly above the penstocks to heights of 32 and 25 feet, with the taller tank being 17 feet in diameter and the smaller 24.5 feet.

Steel penstocks drop from the surge tanks into Pelton turbines installed in the Powerhouse, a structure occupying a narrow ledge carved from solid rock cliffs on the west bank of the river. Measuring 83 by 40 feet, the building consists of red brick walls standing atop a concrete foundation, topped by a gabled corrugated metal roof over the generating room. (That portion of the roof was removable for access to the turbine-generator units.) A flat concrete roof is above the transformer room in the southwest comer of the structure, and a sloping tar roof covers the storeroom and shop in the southeast comer.

The largest space in the powerhouse is the generating room, in which are the two Pelton 1600 kW turbine-generator units. Mounted horizontally, the units are aligned parallel to the river. Below the floor, tapered draft tubes provide outlets for water passing through the turbines back into the river via an arched recess under the building. Two smaller exciter generators are attached to the turbine shafts. Units functioning as governors operated wicket gates at the upstream ends of the turbines. Mounted on an I-beam above one of the turbine-generators is a movable crane, consisting of metal plates suspended from wheels running on the inner ridges of the beam. Tall metal, hinged windows light and ventilate the room, which is 41 feet high. The room has been vandalized, and there are standing pools of water on the concrete floor.

A metal walkway and stairs connect the generating room with the switchboard room immediately to the south. Raised about five feet above the floor of the generating room, the smaller room contained electrical switch gear. Today only metal racks remain. Thirty-seven metal pipes, some containing conductor cable, protrude from the concrete floor near the north end of the room. Wooden 2 by 4 inch studs mark what was the partition separating the switchboard room from the storeroom and shop to the south. The room is now empty and the walls vandalized.

Accessed either from the generating room or via a wide, sliding metal door on the Powerhouse's west facade is the transformer room. Large free-standing electrical transformers were once installed in the room, which now contains only wooden and metal equipment and bus racks, and three small Westinghouse type S single phase 10 kV transformers mounted on the west wall. Because of the explosive potential of transformers, the room was stoutly constructed, capped by a concrete ceiling. The sliding metal door, which now lies on the concrete floor, is of extremely heavy construction.

Outside the transformer room and shop, a concrete deck extends into the rock cliff south of the Powerhouse. The deck once served as an outdoor switchyard in which electrical transmission equipment was installed. Some of the equipment, which has since been removed, was mounted on large concrete pads still standing on the deck.

HISTORICAL BACKGROUND

Pre-Dam Era

The "Rock Wall" was the Indian name for the Squantl (Similkameen) Falls. The name Squantl Falls was recorded for the first time by Smith & Calkins in their U.S. Geological Survey Report entitled "A Geological Reconnaissance Across the Cascade Range (1904)." The local name for the falls before the building of the dams was Similkameen Falls. Being about 33 feet high and fairly perpendicular, the falls created a barrier beyond which anadromous fish appear never to have migrated. Susan Cohen (May 1979), an Indian woman, states that "there have never been any salmon in the Similkameen north of the Rock Wall." Cohen explained that her ancestors would gather at the base of the Rock Wall to catch the salmon as they made their annual run up the Okanogan River and into the lower part of the Similkameen, but only to the base of the falls. Indian legend has it that animals built the Rock Wall so as to trap the fish, thereby providing the wild animals with a source of food.

Another Indian legend is the tale of "Coyote" who lived in the Upper Similkameen. One day, after deciding he would like to take a wife, he left his territory, carrying his home on his back, and traveled down the Similkameen River. Wherever he saw an Indian family with daughters, he would stop and set up his home on the opposite side of the river, make himself presentable and then cross over the river and ask the father for the hand of one his daughters. He offered salmon in exchange for the daughter's hand in marriage, but was rejected by the families and their daughters as they preferred venison, elk or sheep instead of salmon for their food supply. Finally, upon reaching the junction with the Okanogan, Coyote found an Indian family who agreed to accept the salmon, and he settled there with his new wife. However, because he was so harshly rejected by the Similkameen Indians, he went back up the Similkameen and proceeded to build a very high falls, making it impossible for salmon to make their run up the Similkameen (LeMay 1979). Other variations of this myth also attributed creation of Similkameen Falls to Coyote (Bouchard and Kennedy 1984:27-30).

Early Hydroelectic Development

The earliest known power production on the Similkameen River was within the Similkameen Valley proper. An elderly German settler named Kruger placed a small waterwheel on a shaft and lowered it into the Similkameen River (Vissia 1974:8:2). The exact locations of the waterwheel and powerhouse have been lost to time. This first powerhouse with its small generator furnished electricity for the mining town of Golden six miles to the south.

J.M. Hagerty organized the Similkameen Power Company in 1902. Hagerty was a man of many talents and was heavily involved in mining in the Loomis and Nighthawk territory of Okanogan County (Hallauer 1979). It was Hagerty's other talents for which he may be best remembered, for he was not so much a mining man as he was a promoter. Hagerty was very successful at attracting capital to Okanogan properties. In 1913 (eight years after his death) a local newspaper portrayed Hagerty as an untiring hustler, genial, optimistic, a good mixer, and clever at presenting the bright side of a proposition (*Oroville Weekly Gazette* 31 January 1913:1). In 1903, Hagerty secured the water and land rights on the Similkameen River approximately 3.5 miles above Oroville at Similkameen Falls. He spent the next three years developing the site. Hagerty built a wooden crib dam above the Similkameen Falls to divert water to the powerhouse below the falls. All the equipment was hauled from Republic to Oroville by wagon train at great expense. The wooden dam and powerhouse were finally completed in 1906, about a year after his death. The enterprise was carried on by the executors of his estate: LeRoy L. Works, of Oroville; Monroe Harman, of Nighthawk; and S.P. Ecki, of Mansfield, Ohio.

Charles Mitchell and his son, Charles Jr., operated the plant without assistance until ca. 1918 when Mace Reed, Jr., a local high school student, was hired. Reed, who worked at the Hagerty powerplant at the time of the building the Enloe Dam, describes the old powerplant as a building of "wood construction" with "rooms for us to sleep in upstairs." Reed explained that "the main part ... was the generating room with the excitor and big generator and big belt and wheel underneath. Well, quite an experience for somebody who'd never been around a powerhouse at the time. Of course, there was nothing particularly tough about taking care of it, either" (Reed 1988).

The plant supplied power and light to the towns of Oroville and Nighthawk. It also supplied electricity to a 100 horsepower pump for the local irrigation project. The dam had contracts with the Owasco and Ivanhoe mines, where electric power was to be used in driving a 4,000-foot tunnel at the latter operation (Hallauer 1979). The Ruby and Caaba mine was also supplied with power, as was the Wannacut Lake mining camp of Golden. Evidence of the transmission line to the mining camp can still be found.

J.L. Harper and his associates, of Republic, leased the powerplant in June of 1910. Operating under the name of North Washington Power Company, the consortium signed a ten-year lease obligating the Company to put a power line to Republic from Oroville to service the Republic mines and mills. Construction of the line from Oroville to Republic was to have begun in September of 1910. In October of the same year J.E. McFarland, superintendent of The North Washington Power Company, had plans to add 950 horsepower to the Hagerty powerhouse (*Oroville Weekly Gazette* 2 September 1910:1).

It appears that the North Washington Power Company failed to accomplish either of its envisioned plans. In 1913 executors of the Hagerty estate moved to cancel the lease for

failure to build the power line to Republic. The executors at the time of the cancellation also decided to sell the property (*Oroville Weekly Gazette* 14 March 1913:1). The local press called the dam and site the most "meritorious property" and "the most valuable" property in the county because of its potential power production. From the time of its construction in 1906 to 1913, $125,000 had been invested in the dam and powerhouse, which generated 450 horsepower (*Oroville Weekly Gazette* 14 March 1913: 1).

In 1913, the Great Northern Railroad announced its plans to build a branch line to Oroville and possibly beyond. The railroad had stopped construction at Pateros on the Columbia River in 1910. News of the railroad's coming to Oroville created a great amount of excitement: land prices increased and irrigation expanded. The potential benefits that the railway could bring were thought to be innumerable (*Oroville Weekly Gazette* 23 May 1913:1).

It appeared, with the railroad's advance into Oroville, that the selling of the power site could be easily achieved. That was not to be the case, however. By 23 May 1913, no bids had been received for the dam. The executors of the Hagerty estate found it hard to believe that a power site with its potential did not receive many bids. The reason for the lack of bids may have been the condition of the Hagerty wooden crib dam and powerhouse. The powerhouse appeared to be in fair condition, but the crib dam was in such disrepair that nothing short of building a new dam could increase power production.

Interest in the power potential of the Similkameen Falls site appeared to be growing when, in 1915, the Okanogan Water Company, a subsidiary of the Washington Water Power Company of Spokane, contested the water rights of the Similkameen Power Company. The West Okanogan Valley Irrigation District opposed the claims of both power companies, seeking the opportunity to develop power in connection with its irrigation system (*Oroville Weekly Gazette* 29 October 1915:1). Bo Sweeney, Assistant Secretary of the Department of the Interior, awarded the title of rightful claimant to the water power in the Similkameen River to the Similkameen Power Company.

Enloe Era

Eugene Enloe incorporated the Okanogan Valley Power Company (OVP) under the laws of the State of Washington on 10 June 1913. In 1913 and 1914, the OVP acquired a powerplant on Methow River managed by Nixon-Kimmel Company of Spokane, and the property of Paul McHugh at Okanogan (Hallauer 1979). The acquisition of these two properties gave the OVP all the developed hydroelectric power generating sites in the Okanogan valley but one. The exception was Similkameen Falls, with the greatest potential for power generation. When the OVP secured the hydroelectric rights to the Similkameen River in 1916, it gave Enloe complete control of that area of Okanogan County.

On 1 June 1916, the Okanogan Valley Power Company bought the complete holdings of the Similkameen Power Company. This included the 80 by 40 foot frame powerhouse and all the machinery related to the Hagerty plant, and the power lines and substations that serviced the mines. The most important factor in Eugene Enloe's mind was "all water rights or rights for the use of waters" on the Similkameen River (Felton 1988).

On reporting the sale of the Similkameen Power Company to Okanogan Valley Power Company, the *Oroville Weekly Gazette* noted that the new owners were planning to spend approximately $100,000 on enhancing power production by building a concrete dam (9 June 1916:1). Construction of Enloe Dam began in 1919 and was nearing completion in the spring of 1920. Although significant in a local context, the dam could not compare with other hydroelectric plants in the state in so far as the amount of horsepower generated or the cost of construction and installation were concerned. The *Okanogan Independent* describes the local engineering feat at the dam: "It involved engineering features comparable in their magnitude and the ingenuity required in their solution to any that have been met with in similar undertakings in the country (20 April 1920:1). "

The design plans and survey were drawn and conducted by C.F. Uhden, an engineer of impeccable credentials. Before the contract with OVP, Uhden had written a well-received article in the *Journal of Electricity* (Sept. 1914) on Washington Water Power Company's hydroelectric generation and distribution system. The article, of a very technical nature, showed signs of a very capable man (Uhden 1914). Uhden completed the design plans for Enloe Dam in 1916, but the survey of the site was not completed until July of 1919.

Serving as construction engineer was the very able D.J. Broderick, who started work on the dam in October of 1919. Despite supply and manpower problems, Broderick kept a tight construction schedule. The problem of keeping 35 to 40 good men in a rural area proved difficult, particularly on a structure 54 feet tall and over 200 feet long. Construction of the arch-gravity dam appears to have been completed in the summer of 1920 (Anonymous 1987:1).

Eugene Enloe's daughter-in-law, Helen Enloe, was a young woman at the time and enjoyed visiting the dam during construction. Ms. Enloe described the area as deep in a treeless, "edge- of-the-moon" canyon above Oroville (*Wenatchee World* 2 October 1983:14). Gene Bowman, grandson of Eugene Enloe who worked at the dam one summer, remembers the perils of the road to and from Oroville to the dam: "It is quite a drop down the canyon so to make a safe trip we had to use the reverse pedals [on automobiles]…." The railroad made the building of the dam a reality, for without it the transportation costs would have been prohibitive (*Wenatchee World* 2 October 1983:14).

Construction of the powerhouse proved to be an equally difficult feat of engineering. The red brick and concrete plant is of considerable dimension, measuring 83 feet long and 43 feet wide. Situated approximately 800 feet downstream from the dam, the powerhouse is nestled in a man-made hollow in a sheer rock cliff on the west side of the Similkameen gorge. Mace Reed worked at both the Hagerty and Enloe powerhouses as a young man. After completion of the new powerhouse, Reed helped move everything to the new Enloe powerhouse. He recalled: "...the new powerhouse was all built [of] concrete...it was a modern building at the time...there was quite a porch...[and] the maintenance was very easy, nothing to it (Reed 1988)."

Eugene Enloe spent $150,000 of his own money on the new dam; a total of $350,000 was invested in the Similkameen River project (*Oroville Weekly Gazette* 13 May 1919:1). The dam generated 2,000 horsepower upon completion of the first unit, with space for an additional unit of 3,000 planned. In July of 1922 Enloe Dam drew the attention of large power companies. Washington Water Power (WWP) had already extended a power line into Grant County early in 1922 (*Oroville Weekly Gazette* 21 July 1922:1). That year WWP approached Eugene Enloe expressing interest in acquiring the facility. On Jan. 1, 1923, Enloe sold the property to Washington Water Power. WWP then installed (1923) a second penstock from the dam and a 3,500 horsepower unit in the powerhouse (*Oroville Weekly Gazette* 11 May 1923:1). The Company also constructed cottages (since removed) near the east abutment of the dam to house operators of the facility.

WWP continued to operate Enloe Dam and Powerhouse until 1942, when Public Utility District No. 1 of Okanogan County acquired the property. The District ceased operation of the power generators on 29 July 1958 when the Bonneville Power Administration's high-voltage transmission line brought abundant power to the Okanogan Valley. Operation of Enloe Dam then became unprofitable, and the facilities were abandoned. One of the penstocks, which had largely collapsed, was sold for salvage. Vandalism of the powerhouse led to installation of a locked gate across the abandoned railroad grade and to removal of the footbridge across the river, thus isolating the building. Vandalism appears to have continued at the site, however.

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