COLUMBIA BASIN PROJECT, BANKS LAKE,
DRY FALLS DAM AND MAIN CANAL HEADWORKS
At south end of Banks Lake, 1/2 mile northwest of Coulee City
GRAND Coulee ~~City~~
Grant County
Washington

HAER No. WA-139-F

HAER
WASH
13-GRACO,
1F-

BLACK & WHITE PHOTOGRAPHY

HISTORIC AMERICAN ENGINEERING RECORD
National Park Service
U.S. Department of the Interior
National Park Service
Cultural Resources
1849 C Street, N.W., Room NC 300
Washington, D.C. 20240

ADDENDUM TO:
COLUMBIA BASIN PROJECT, BANKS LAKE DRY FALLS DAM &
MAIN CANAL HEADWORKS
South end of Banks Lake, 1/2 mile northwest of Coulee City
Grand Coulee
Grant County
Washington

HAER WA-139-F
HAER WASH,13-GRACO,1F-

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

HISTORIC AMERICAN ENGINEERING RECORD
PACIFIC WEST REGIONAL OFFICE
National Park Service
U.S. Department of the Interior
333 Bush Street
San Francisco, CA 94104

HISTORIC AMERICAN ENGINEERING RECORD

COLUMBIA BASIN PROJECT, BANKS LAKE DRY FALLS DAM AND MAIN CANAL HEADWORKS

HAER No. WA-139-F

Location: At south end of Banks Lake, ½ mile northwest of Coulee City
Grand Coulee
Grant County
Washington

The northwest end of the Banks Lake Dry Falls Dam and Main Canal Headworks is located at latitude: 47.6266; longitude: -119.3302. The southeast end is located at latitude: 47.61535, longitude: -119.2943. The latitude and longitude coordinates were converted from the UTMs via Montana State University and Yellowstone National Park RCN Utilities and Tools web site on November 18, 2013.

Dates of Construction: 1946-50

Engineers: Bureau of Reclamation

Original Owner: Bureau of Reclamation

Original Use: Dam and main canal headworks

Present Owner: Bureau of Reclamation

Present Use: Dam and main canal headworks

Significance: The development potential of the Grand Coulee, a gorge carved out by the Columbia River before that waterway shifted its course, was a deciding factor in Reclamation's choice for the location of a massive irrigation project served by the waters of the Columbia River. The coulee's significance was underscored by the adoption of its name for the entire project. A dam at each end of the coulee has created an equalizing reservoir, filled by water pumped from the Columbia, that supplies the irrigation system. The North Dam is at the upper end of the reservoir, known as Banks Lake, while the Dry Falls Dam is at the south end, where the headworks

controls the flow from the reservoir to the main channel of the irrigation system.

Project Information: This documentation study was initiated by the Bureau of Reclamation's Pacific Northwest Regional Office in Boise, Idaho. Joseph Pratt was the contracting officer; Derek Beery, Mike Flowers, Sean Hess, Pei-Lin Yu, and Lynne MacDonald served as contracting officer representatives. Hess, Roise and Company, a historical consulting firm based in Minneapolis, Minnesota, was the prime contractor for the project, with photography and delineation completed by subcontractor Clayton Fraser of FraserDesign, Loveland, Colorado. Charlene Roise, principal of Hess Roise, was the project manager and historian, with research assistance from staff historian Elizabeth Gales and staff researcher Penny Petersen. CH2M Hill's Boise office provided editorial and other assistance, under the supervision of Mark Bransom, as a subcontractor to Hess Roise.

Introduction

The development potential of the Grand Coulee, a gorge carved out by the Columbia River before the river shifted course, was a deciding factor in Reclamation's choice for the location of a massive irrigation project served by the waters of the Columbia River. The coulee's significance was underscored by the adoption of its name for the entire project. A dam at each end of the coulee would create an equalizing reservoir filled by water pumped from the Columbia, which would supply the irrigation system. The two dams that would block the ends of the coulee were planned and built in tandem—it took both to create the reservoir. As a result, the following narrative provides the history of both the North Dam and the Dry Falls Dam (also known as the South Dam), as well as the headworks associated with the latter. A separate report for the North Dam (HAER No. WA-139-K: Columbia Basin Project, North Dam) will reference this narrative and largely rely on it for documentation.

The North and Dry Falls Dams are about 27 miles apart. The surface area of the reservoir, which runs southwest from its upper reach at the North Dam, is approximately 27,000 acres. Its active storage capacity is 715,000 acre-feet and its total capacity is 1,275,000 acre-feet. Beyond the Dry Falls Dam, the water passes through the Main Canal Headworks and is distributed through a series of canals, siphons, tunnels, and relift pumping stations to irrigate fertile land that receives too little rain for profitable farming. The area planned for irrigation by this system totals more than 1 million acres.[1]

The reservoir was named Banks Lake in honor of Frank Banks, who joined Reclamation in 1906 and was appointed construction engineer for the Columbia Basin Project in 1933. He remained closely involved with Grand Coulee in a variety of roles—including supervising engineer for the Columbia Basin Project when construction of the irrigation system began—until his retirement in 1950. In a speech at Reed College in 1938, Banks explained the intended outcome of the irrigation project: "As the irrigable lands are reclaimed, thousands of small farms should be established, not for the purpose of one crop farming to raise products of which there may already be a large surplus, but for the purpose of establishing farm homes with such surroundings that families may live there in comfort, largely from the products of their own farms, under diversified farming methods that will also permit the marketing of a sufficient amount of products to meet the running expenses."[2]

The North Dam is about two miles southwest of Grand Coulee Dam and has a north-south alignment. Its 1,450′-long crest, which carries a 30′-wide roadway, is at elevation 1580.0. The dam's maximum base width is 1,000′ and its maximum height from the base of its foundation is about 148′. It rises about 95′ above the original ground surface and has a hydraulic height of 77′.

---

[1] D. L. Brechner, "Columbia River Water Will Bring Life to Thousands of Small Farms," *Spokane Spokesman-Review*, August 13, 1950.

[2] Bureau of Reclamation, Annual Project History, Columbia Basin Project, Vol. 18, 1950, 25; Frank A. Banks, "Development of Power at Grand Coulee Dam," 9, speech at Reed College, Portland, Oregon, July 5, 1938; typescript of text at Frank A. Banks Papers, Washington State University, Pullman (hereafter cited as FAB Papers).

The non-overflow, zoned, earth-fill structure contains four classes of embankment material totaling 1,473,000 in volume. The upstream face is protected by a 3′ riprap blanket above elevation 1530.[3]

The Dry Falls Dam takes its name from an adjacent massive ledge that once created a waterfall, the outlet for the Columbia River as it carved the Grand Coulee. Like the North Dam, the Dry Falls Dam is a non-overflow, zoned, earth-fill structure that rises to elevation 1580.0. Its dimensions, however, are quite different. At 123′ high, it is slightly lower than the North Dam, but it comprises a larger volume of rock and earth, some 1,658,000 cubic yards. Its hydraulic height is 53.0′. The dam's 9,800′-long crest is more than six times longer than that of the North Dam, and it is wider at the top (42′) and narrower at the base, with a maximum width of 480′. A six-cell, reinforced-concrete barrel conduit near the dam's east end delivers water to the six 12′ x 18′ radial gates of the Main Canal Headworks. The headworks, with a capacity of 14,400 cfs, controls the flow of water into the main irrigation canal from Banks Lake.[4]

Searching for Sound Sites

Reclamation anticipated that the design of the dam structures would not present significant engineering challenges. As Banks observed in 1934, shortly after development of the Grand Coulee project had begun in earnest: "The north and south dikes will be respectively 92 and 97′ in height above the original ground and will present no unusual features." Thanks to the area's notoriously fickle soil conditions, however, Reclamation put a great deal of effort into finding the best site for the dams and installing adequate foundations.[5]

Because of this challenge, the suitability of the Grand Coulee for storage purposes as well as the most appropriate locations for the two dams that would form the reservoir were debated even after construction of the Grand Coulee Dam had begun. Dr. Charles Berkey, a geologist from Columbia University and a member of the Grand Coulee Board of Consulting Engineers, conducted a preliminary investigation of geological conditions in early 1935. His report, issued in May, recommended a more detailed examination of one likely site for the upper dam and four potential sites for the lower dam: "the North dam site, at the north end of Grand Coulee; the Lewis site, eight miles north of Coulee City; the Orchard site, four miles north of Coulee City; the Ankeny site, one mile north of Coulee City; and the Coulee City site, adjoining Coulee City on the northwest." He also recommended digging test pits at these sites and in other locations around the basin to guide development of a plan for more extensive drilling.[6]

---

[3] Bureau of Reclamation, Annual Project History, Columbia Basin Project, Vol. 17, 1949, 245; "North Dam and Feeder Canal," 1, Inspection Report, October 7, 1970, appended to Bureau of Reclamation, Annual Project History, Grand Coulee Dam Operations Office-Columbia Basin Project, Vol. 1, 1970.
[4] Bureau of Reclamation, *Columbia Basin Project* (Washington, D.C.: Government Printing Office, 1963), 12.
[5] Frank A. Banks, "Columbia Basin and Grand Coulee Project," *Civil Engineering* 4 (September 1934): 457.
[6] Bureau of Reclamation, Annual Project History, Columbia Basin Project, Vol. 3, 1935, 83.

Reclamation conducted work throughout the summer, producing maps that identified springs, wells, significant rock and overburden formations, and other conditions throughout the reservoir. These maps, along with data from ten test pits, were examined by the Board of Consulting Engineers when it met at the Grand Coulee in September. The board tentatively approved the site of the North Dam, subject to additional foundation investigations. The findings for the Dry Falls Dam were less conclusive. The Lewis and Ankeny locations appeared to be the best, but Orchard was still in the running. The board recommended further investigations of these sites, as well as "extensive tests . . . to determine underground water conditions and the physical structure of the floor or the Coulee."[7]

By 1938, Ankeny was the preferred location. "Drill hole exploration of the proposed Ankeny dam site was in progress the greater part of the year," a Reclamation report noted. As the investigation of the Ankeny site progressed, though, some unfavorable conditions emerged. The Board of Consulting Engineers reported in November 1939 that "excessive losses by deep underground leakage" in the reservoir were most likely to occur in the lower end of the coulee—around the Ankeny, Orchard, Gault, and Coulee City sites." One troublesome area was a monocline with faulted areas discovered in a test shaft at the Ankeny site. In addition to modifying the potential dam alignment at that location, the board recommended continuing explorations at the Gault and Coulee City sites. The board's report noted that "additional information in regard to the monocline structure, cover, etc. would be very valuable even if nothing could be done about it."[8]

At its March 1940 meeting where the Coulee reservoir was a major item on the agenda, the board remained ambivalent about the Ankeny site. "The board was of the opinion that a safe and effective dam could be built along the line of this site," the 1940 project history reported, but "recommended that the proposed Coulee City dam site be explored in order that a comparison could be made with the Ankeny site" about a mile and a half to the north.[9]

By September, "the Board advised that the findings to date favored the Coulee City site but recommended that additional drill hole work be completed, in order that the information regarding the Coulee City site would be on a parity with that related to the modified Ankeny." The site for the North Dam was also still in flux, with the board suggesting that a location about half a mile to the east of the leading site be investigated. At the same time, Reclamation crews were examining options for borrow pits.[10]

---

[7] Bureau of Reclamation, Annual Project History, Columbia Basin Project, Vol. 3, 1935, 83-84.
[8] Bureau of Reclamation, Annual Project History, Columbia Basin Project, Vol. 3, 1935; Bureau of Reclamation, Annual Project History, Columbia Basin Project, Vol. 6, 1938, 69; Bureau of Reclamation, Annual Project History, Columbia Basin Project, Vol. 7, 1939, 50-51.
[9] Bureau of Reclamation, Annual Project History, Columbia Basin Project, Vol. 3, 1935; Bureau of Reclamation, Annual Project History, Columbia Basin Project, Vol. 8, 1940, 36.
[10] Bureau of Reclamation, Annual Project History, Columbia Basin Project, Vol. 3, 1935, 38, 66.

By its meeting in mid-March 1942, the Board of Consulting Engineers was strongly in support of the Coulee City site. Geological conditions were acceptable for a dam at either the Coulee City or Ankeny sites, so economics became the deciding factor. The Coulee City dam would be about $2 million cheaper to construct because it required a smaller embankment and a shorter main canal. Hence, the Coulee City site was selected.[11] (See ILLUSTRATION 1: Plans for the Layout of the Irrigation Works as of 1948.)[12]

With that decision made, plans could be finalized for the water distribution system beyond the reservoir. The Board of Consulting Engineers issued its preferred alternative in July 1943. The main canal leading from the reservoir would be lined for 1.8 miles to a 1,000′-long siphon and a 1.9-mile-long tunnel at Bacon Coulee. "The siphon and tunnel will both be built in two stages because their full capacity will not be required for some years." Trail Lake would provide the next 2.4-mile segment. From there, a 2.3-mile canal would extend to a waterfall at Long Lake, where a 165′-head powerplant would be built at a future date. From the lake, which extended 5.7 miles, a 6.6-mile lined canal would extend to the bifurcation works. The East Low Canal, stretching for 130 miles, would serve lower elevations to the east, while the West Canal would go 88 miles to the west. The higher lands to the east would be served by the 110-mile-long East High Canal, starting at the forebay of the Long Lake Powerplant. There would also be a reservoir and canals at Potholes, a pumping plant on the Columbia River near Pasco, and a pumping plant on the south side of the Snake River.[13]

While engineers considered an array of locations for the dam at the reservoir's south end, only two alternatives seemed viable for the North Dam. Both remained under consideration in mid-February 1942 when Reclamation sent out drill rigs to test foundation conditions. In mid-March, the Board of Consulting Engineers remained undecided: "Although the major features of these sites are well outlined by . . . explorations, and a preference might be warranted, it is clearly advisable to continue the work on both sites to more conclusive results." Finally, by the board's meeting in late November 1942, additional testing had convinced the board that the North Dam should be located at site No. 1.[14]

This did not end the debate. In a May 1943 report entitled "Stability Analysis of the GC Reservoir North Dam Foundation," Reclamation engineer Philip Ehrenhard wrote: "It is the writer's opinion that there are unusual foundation conditions present at the proposed damsite which should be considered in designing the dam structure. These conditions are such that, if not

---

[11] Bureau of Reclamation, Annual Project History, Columbia Basin Project, Vol. 3, 1935; Bureau of Reclamation, Annual Project History, Columbia Basin Project, Vol. 10, 1942, 45.
[12] Bureau of Reclamation, "Feeder Canal-Sta. 0+00 to Sta. 94+00-Location Map," Drawing 222-D-13323, September 14, 1948.
[13] Board of Bureau Engineers to Chief Engineer, July 20, 1943, memorandum regarding "development of irrigation plan," in Record Group (RG) 115, Engineering and Research Center, Project Reports, 1910-1955, 8NNN-115-85-019, Box 290, National Archives and Records Administration-Rocky Mountain Region, Denver (hereafter cited as NARA-RMR); also described in Bureau of Reclamation, Annual Project History, Columbia Basin Project, Vol. 14, 1946, 62-64.
[14] Bureau of Reclamation, Annual Project History, Columbia Basin Project, Vol. 10, 1942, 28, 31, 45, 49.

given proper consideration, they might result in the failure of the structure." He continued: "It is the writer's opinion that the only possible failure of this dam will be a foundation failure occurring near the end of the construction period. . . . The increased load created by the construction of the dam will result in building up high pore pressures in these questionable soils. . . . A high pore pressure unstabilizes the material in which it acts." He recommended additional fieldwork and laboratory testing to find ways to reduce this risk.[15]

Analysis of foundation conditions at the North Dam site continued into 1945 when Reclamation forces drilled fifteen more test holes. An engineer explained that "preliminary investigations . . . showed that the foundation for the North Coulee Dam consists of strata of swamp muck, sand, clay (Nespelem silt) and shale together with several large basalt slide blocks. This heterogeneous mass is underlain by granite. . . . The swamp muck and the Nespelem silt are questionable materials on which to construct an earth dam of the size proposed." The goal of the subsurface investigations was "to determine more clearly the geological conditions and relationships of the Nespelem silt and clay to the other geologic formations at the dam site."[16]

In the end, the silt was an advantage. In March 1947, a geologist concluded: "The chief concern of the North Dam area is the possible leakage of water through the ancient glacial channel under the dam. However, as this channel is blanketed by Nespelem silt and clay and by Latah shale, it is felt that little seepage will occur." Swampy soils at the dam site, though, were removed.[17]

Damming the Coulee

The Dry Falls Dam was the first to undergo construction. In May 1946, Reclamation opened bids for its construction. The team of Roy L. Bair and Company and James Crick and Sons, both of Spokane, submitted the low bid of $2,771,887. By mid-July, Bair and Crick had started to excavate the approach channel to the Dry Falls Dam. The contractors had removed 519,000 cubic yards of rock and common material by the end of September.[18]

In the meantime, Reclamation had awarded a contract to J. G. Shotwell of Albuquerque, New Mexico, for preparing 40,000 cubic yards of sand and 70,000 cubic yards of coarse aggregate for concrete for the Dry Falls Dam, part of the main canal, and the Bacon siphon and tunnel. The materials were to be obtained from the Odair deposit about one mile east of Coulee City. The R. S. McClintock Company, a subcontractor to Bair and Crick, was grouting holes along the axis of the Dry Falls Dam by the end of August. In February 1947, the first rock was placed for the west end of the dam, and compaction of the embankment began in May. The dam was not the

[15] Philip E. Ehrenhard, "Stability Analysis of the GC Reservoir North Dam Foundation," May 29, 1943, in RG 115-00-148, Box 9, NARA-RMR
[16] Philip E. Ehrenhard, "Foundation Investigations for the North CD," November 20, 1945, in RG 115-00-148, Box 9, NARA-RMR; Bureau of Reclamation, Annual Project History, Columbia Basin Project, Vol. 13, 1945, 99.
[17] W. E. Walcott, geologist, "Geological Report and Digest on North CD of the GC Equalizing Reservoir," March 26, 1947, 5-6, in RG 115-00-148, Box 9, NARA-RMR.
[18] Bureau of Reclamation, Annual Project History, Columbia Basin Project, Vol. 14, 1946, 50, 52-53.

only construction effort during this period. As the project advanced and more workers came to the sparsely populated area, the contractor had to provide housing, work space, and other facilities. By the end of April 1947, "major construction of 36 temporary houses, 3 dormitories, a concrete and soils laboratory, maintenance shop, and a community hall had been completed." The construction proceeded methodically, and the dam was finished in 1950. A final step was paving the two-mile-long road atop the dam. On August 18 of that year, the road opened to the public. [19]

While construction progressed, Reclamation worked on assembling the six 12′ x 18′ radial gates that would control the outlets for the Main Canal Headworks at the Dry Falls Dam. Components of the gates came from three sources. The George T. Gerhardt Company of San Francisco supplied the radial gate frames, the American Bridge Company's Denver division provided the radial gates, and the United Engineering Company was responsible for the screw-lift hoists for the gates.[20]

When the components were delivered, only United's screw-lift hoists met with Reclamation's approval. The gates produced by American Bridge's plant in Gary, Indiana, were rejected "because of poor workmanship, which showed up as irregular curvature of the skin plate, all rivets inferior in that they did not fill rivet holes, numerous loose rivets and considerable poor welding." Following a dispute regarding the extent of the problems, the company agreed that Reclamation should re-drive loose rivets and fix other items in the field. Moreover, the seal seats did not conform to specified tolerances, delaying their installation by three weeks. The screw holes in the hinge bases and pedestals of the gates were not properly aligned, so the pedestals had to be taken to the Machine Shop in the Industrial Area for reaming.[21]

Because of these problems, installing the gates was a difficult task for the Sparling Steel Company of Seattle, which served as a subcontractor to Bair and Crick. Unlike the component suppliers, however, Sparling "met the requirements of the specifications as to workmanship and accuracy," a Reclamation report observed. "They were at all times willing to cooperate with the contracting officers and displayed a desire to get the job done right." Their work was finished and formally accepted in September 1949.[22]

In April 1949, Reclamation awarded the contract for construction of the North Dam, concrete placement in the Feeder Canal, and related relocations of a highway and the construction railroad to J. A. Terteling and Sons for $4.7 million. Early in the following month, the contractor began

---

[19] Bureau of Reclamation, Annual Project History, Columbia Basin Project, Vol. 14, 1946, 52, 314; Bureau of Reclamation, Annual Project History, Columbia Basin Project, Vol. 15, 1947, 56-58; Bureau of Reclamation, Annual Project History, Columbia Basin Project, Vol. 18, 1950, 141-142.
[20] M. L. Berg to Chief, Electrical and Mechanical Section, Memorandum on Radial Gate Installation at the South Coulee Dam, December 1, 1949, in RG 115-00-148, Box 9, File 510, NARA-RMR.
[21] M. L. Berg to Chief, Electrical and Mechanical Section, Memorandum on Radial Gate Installation at the South Coulee Dam, December 1, 1949, in RG 115-00-148, Box 9, File 510, NARA-RMR.
[22] Bureau of Reclamation, Annual Project History, Columbia Basin Project, Vol. 17, 1949, 41.

stripping operations. By June, the project history reported that Terteling, "while slightly behind schedule, is making good progress on dam excavation, south abutment parking area, relocation of highway and construction railway, feeder canal excavation, and forms for 'cut-and-cover' section of the feeder canal."[23]

The report also noted that "further exploration of the 'rock line' at the south abutment is being made by diamond drilling." The stability of the ground in this area, dubbed the "Delano Saddle," was suspect. Investigations discovered a narrow channel "with bedrock bottom at elevation 1500± and an overburden of boulders, clay, gravel and sand." The irregularities of the granite bedrock caused concern about the location of the south abutment, which was proposed for the immediate vicinity. Addressing this concern required an expansion of the project's scope, so Reclamation issued a draft change order in October 1949. Grout curtains were installed under both abutments.[24]

The North Dam and the Feeder Canal (see "Columbia Basin Project, Banks Lake Feeder Canal and Headgates," HAER No. WA-193-E) were completed January 9, 1951. The initial contract had grown to $5.3 million with change orders and extra work orders. On May 10, 1951, Reclamation started to fill the equalizing reservoir.[25]

The inaugural year brought some surprises. In May, for example, "two large sink holes developed in a bed of silt" at the base of the North Dam's reservoir face, "causing some alarm." Water "was seeping into the Zone Four material of the dam and was removing the fine silt by dissolving the material from underneath. Other similar sinks developed in this material until it became submerged by rising reservoir water." In general, though, the dams and reservoir performed as planned. Reclamation staff conducted "periodic inspections . . . by boat to determine if any significant areas of water loss existed but nothing unusual was discovered."[26]

In subsequent years, reservoir levels fluctuated in response to supply and demand. Reclamation planned to maintain the water level in the equalizing reservoir at elevation 1565 in 1955, a level it reached by early July. This goal was accomplished for the rest of the season, with the water that was withdrawn for irrigation replaced by pumping. With an elevated river flow in the fall, though, the water level in November marked a new record high: elevation 1568.39. By the end of the year, it hit elevation 1570 for the first time. In 1957, the elevation varied from elevation 1560.32 to elevation 1567.64.[27]

---

[23] Bureau of Reclamation, Annual Project History, Columbia Basin Project, Vol. 17, 1949, 35-36, 38.
[24] Bureau of Reclamation, Annual Project History, Columbia Basin Project, Vol. 17, 1949, 35-36, 38, 41, 44, 245.
[25] Bureau of Reclamation, Annual Project History, Columbia Basin Project, Vol. 19, 1951, 2, 15; Bureau of Reclamation, Annual Project History, Columbia Basin Project, Vol. 18, 1950, 142; caption for photograph CB-11863, May 10, 1951, H. W. Fuller, photographer, in Box 185, Album 29, NARA-RMR.
[26] Bureau of Reclamation, Annual Project History, Columbia Basin Project, Vol. 19, 1951, 19-20.
[27] Bureau of Reclamation, Annual Project History, Columbia Basin Project, Vol. 23, 1955, 8-9; Bureau of Reclamation, Annual Project History, Columbia Basin Project, Vol. 25, 1957, I.

The banks of the reservoir were a longer-term problem. Reclamation had encountered unstable soil in nearly every aspect of the project's construction, and it was expressed at the reservoir by erosion around the perimeter. In November 1956, Reclamation awarded a contract to the Lindbergh Construction and Transport Company and Fred Merriman to install riprap in some areas. The project was scheduled for completion by the end of March 1957.[28]
Also in 1957, the death of Frank Banks prompted plans to memorialize the man who had played such a significant role in the development of Grand Coulee. Reclamation concluded that a fitting tribute would be to name the equalizing reservoir in his honor. A ceremony to christen Banks Lake took place on September 5, 1958, the twenty-fifth anniversary of the start of construction at Grand Coulee.[29]

Two decades later, in 1977, Reclamation made improvements to a public area around a plaque commemorating Frank Banks on the right abutment of the North Dam. The Engineering and Resources Division at Grand Coulee prepared the plans, which called for realigning part of the road at the North Dam; upgrading the landscaping to create an overlook of the lake with a picnic area and comfort station; installing a sprinkler irrigation system; and providing better access along the bank for fishing. The plans were sent to Boise, where specifications were developed and put out to bid.[30]

Contractor Morrill Asphalt Paving Company of Malaga, Washington, received the contract in January 1978 with a bid of $141,025, and began work on the roadway in March. Most of the improvements were in place by mid-July, starting a sixty-day period for establishing the grass and other plantings. Reclamation inspected the site in December and determined that five or six trees would need to be replaced, but the project was otherwise finished. Due to a change order that included some additional work, the final amount paid to the contractor was $180,166.[31]

---

[28] Bureau of Reclamation, Annual Project History, Columbia Basin Project, Vol. 24, 1956, II.
[29] Bureau of Reclamation, Annual Project History, Columbia Basin Project, Vol. 26, 1958, I.
[30] Bureau of Reclamation, Annual Project History, Grand Coulee Project Office-Columbia Basin Project, 1977, Vol. 3, 32; Bureau of Reclamation, Annual Project History, Grand Coulee Third Powerplant-Columbia Basin Project, Vol. 4, 1978, 53-54.
[31] Bureau of Reclamation, Annual Project History, Grand Coulee Third Powerplant-Columbia Basin Project, Vol. 4, 1978, 53-54.

SOURCES OF INFORMATION

Collections frequently cited have been identified by the following abbreviations:
FAB Papers *Frank A. Banks Papers, Washington State University, Pullman*
NARA-RMR *National Archives and Records Administration-Rocky Mountain Region, Denver*

Primary Sources

Banks, Frank A. "Development of Power at Grand Coulee Dam." Speech at Reed College, Portland, Oregon, July 5, 1938; typescript of text at FAB Papers.

Berg, M. L., to Chief, Electrical and Mechanical Section. Memorandum on Radial Gate Installation at the South Coulee Dam. December 1, 1949. Record Group (RG) 115-00-148, Box 9, File 510, NARA-RMR.

Coulee Dam. December 1, 1949. RG 115-00-148, Box 9, File 510, NARA-RMR.

Ehrenhard, Philip E. "Foundation Investigations for the North CD." November 20, 1945. RG 115-00-148, Box 9, NARA-RMR.

U.S. Department of the Interior, Bureau of Reclamation. Annual Project History. Columbia Basin Project. Vol. 3, 1935.

———. Annual Project History. Columbia Basin Project. Vol. 6, 1938.

———. Annual Project History. Columbia Basin Project. Vol. 7, 1939.

———. Annual Project History. Columbia Basin Project. Vol. 8, 1940.

———. Annual Project History. Columbia Basin Project. Vol. 10, 1942.

———. Annual Project History. Columbia Basin Project. Vol. 13, 1945.

———. Annual Project History. Columbia Basin Project. Vol. 14, 1946.

———. Annual Project History. Columbia Basin Project. Vol. 15, 1947.

———. Annual Project History. Columbia Basin Project. Vol. 17, 1949.

———. Annual Project History. Columbia Basin Project. Vol. 18, 1950.

———. Annual Project History. Columbia Basin Project. Vol. 19, 1951.

———. Annual Project History. Columbia Basin Project. Vol. 23, 1955.

———. Annual Project History. Columbia Basin Project. Vol. 24, 1956.

———. Annual Project History. Columbia Basin Project. Vol. 25, 1957.

———. Annual Project History. Columbia Basin Project. Vol. 26, 1958.

———. Annual Project History. Grand Coulee Project Office-Columbia Basin Project. Vol. 3, 1977.

———. Annual Project History. Grand Coulee Third Powerplant-Columbia Basin Project. Vol. 4, 1978.

———. Board of Bureau Engineers to Chief Engineer. Memorandum. July 20, 1943. RG 115, Engineering and Research Center, Project Reports, 1910-1955, 8NNN-115-85-019, Box 290, NARA-RMR.

———. "North Dam and Feeder Canal." Inspection report. October 7, 1970. Appended to Annual Project History, Grand Coulee Dam Operations Office-Columbia Basin Project, Vol. 1.

———. "Stability Analysis of the GC Reservoir North Dam Foundation." May 29, 1943. RG 115-00-148, Box 9, NARA-RMR.

Walcott, W. E. "Geological Report and Digest on North CD of the GC Equalizing Reservoir." March 26, 1947. RG 115-00-148, Box 9, NARA-RMR.

Secondary Sources

Banks, Frank A. "Columbia Basin and Grand Coulee Project." *Civil Engineering* 4 (September 1934): 456-459.

Brechner, D. L. "Columbia River Water Will Bring Life to Thousands of Small Farms." *Spokane Spokesman-Review*, August 13, 1950.

Bureau of Reclamation. *Columbia Basin Project.* Washington, D.C.: Government Printing Office, 1963.

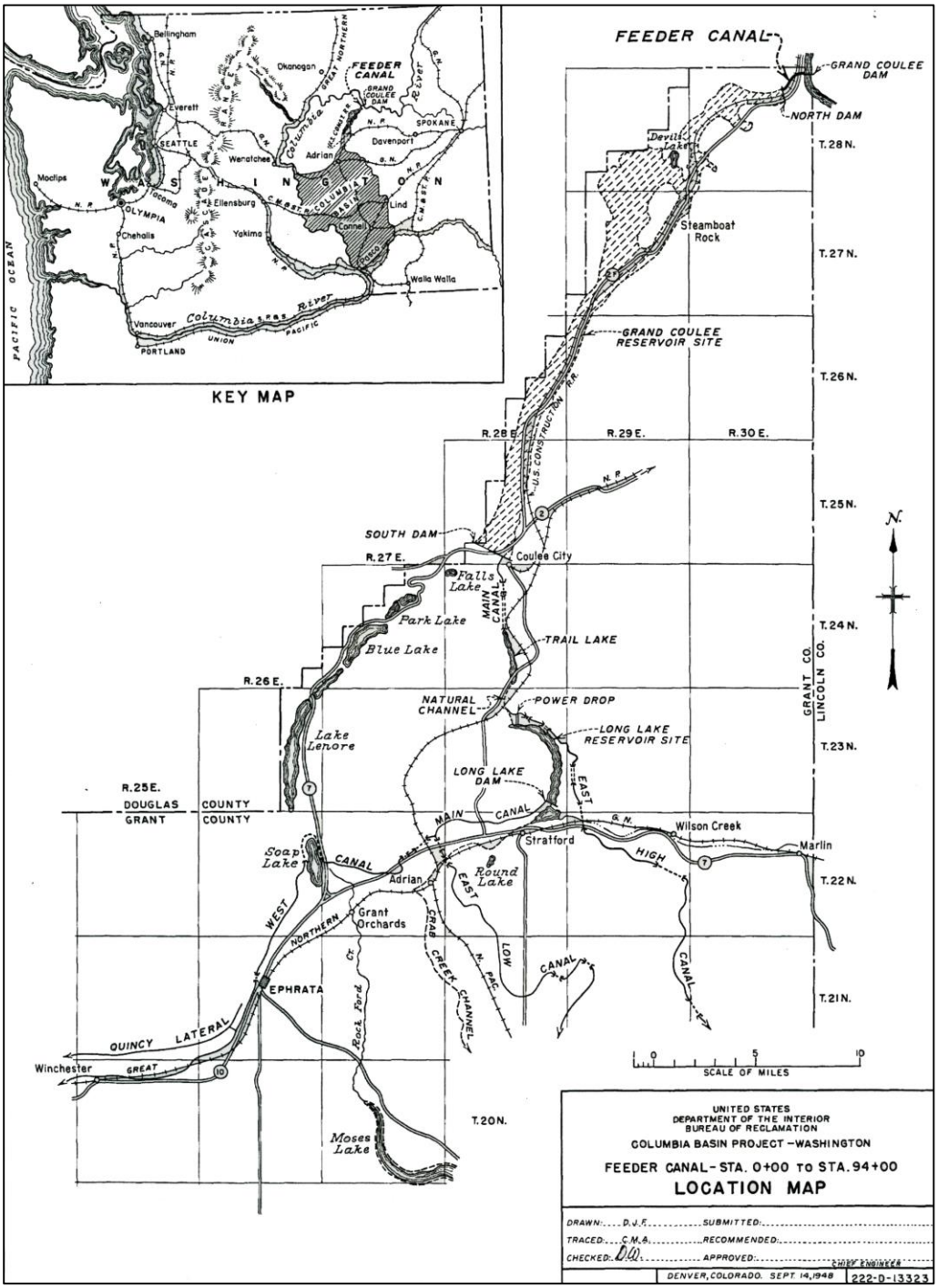

ILLUSTRATION 1: Plans for the Layout of the Irrigation Works as of 1948.
(Bureau of Reclamation, "Feeder Canal-Sta. 0+00 to Sta. 94+00-Location Map," Drawing 222-D-13323, September 14, 1948.)